Exhibit C.1
Situation Summary
June 2004

INITIAL CONSIDERATION OF STATUS OF FISHERIES AND INSEASON ADJUSTMENTS (IF NECESSARY)

Situation: The Groundfish Management Team (GMT) is scheduled to begin consideration of the status of 2004 groundfish fisheries and inseason adjustments the morning of Monday, June 14 (see Ancillary B, GMT Agenda). The GMT will meet with the Groundfish Advisory Subpanel (GAP) that afternoon to discuss issues and analyses relative to inseason adjustments (see Ancillary A, GAP Agenda). This agenda item was scheduled on an "if necessary" basis to provide the GMT and the GAP an opportunity to pose any key policy questions that would substantially facilitate further GMT analysis on inseason adjustments. Council guidance on these matters is intended to focus GMT analyses of proposed inseason adjustments prior to final Council action, scheduled for Tuesday afternoon, June 15 (Agendum C.3).

Council Task:

1. **Consider the comments/questions of the GMT and the GAP, as well as comments of other advisory bodies and the public, and provide guidance, if necessary.**

Reference Materials:

None.

Agenda Order:

a. Agendum Overview	Mike Burner
b. Groundfish Management Team (GMT)/Groundfish Advisory Subpanel (GAP) Comments/Questions	Michele Robinson/Rod Moore
c. Reports and Comments of Advisory Bodies	
d. Public Comment	
e. Council Guidance	

PFMC
05/19/04

Exhibit C.1.b
Supplemental GMT Report
June 2004

GROUNDFISH MANAGEMENT TEAM (GMT) REPORT ON INITIAL CONSIDERATION OF INSEASON ADJUSTMENTS

The GMT has several inseason adjustments for the Council's consideration regarding the commercial fisheries which will be addressed in our statement under agenda item C.3. The GMT has updated the current bycatch scorecard (Attachment 1) for status quo fisheries, and has estimated the potential results of the inseason adjustments that will be considered under C.3. (Attachment 2); changes are noted in bold. Under this agenda item, the GMT would like to bring to your attention these primary issues:

Sablefish Tier Limits

There was an error in the calculation of the sablefish tier limits that were published in the Federal Register. The calculation was made based on the sablefish ABC, rather than the OY, which resulted in higher tier limits for the primary fishery (see Exhibit C.6.a., Attachment 1, Chapter 2, p. 34). Specifically:

Tier	Incorrect Tier Limits (lbs) Calculated Using ABC	Correct Tier Limits (lbs) Calculated Using OY
1	69,600	64,300
2	31,600	29,200
3	18,100	16,700

Some of these tier limits have already been achieved and sablefish daily trip limit (DTL) catches are tracking higher (through May) this year than last year (256 mt compared to 241 mt). The GMT notes that if the sablefish tier limits are not changed, and if the full amount of the tier limits are achieved, then the estimated catch of sablefish will be 172 mt over the 2004 sablefish OY. The tier limits through April are tracking slower this year than last year, and the GMT believes that it is unlikely that all of the sablefish tier limits will be maximized. However, if the sablefish tier limits are corrected (which will take about two weeks to take effect), then fishers may maximize their tier limits in anticipation of the reduction. The DTL sablefish fishery limits were raised in November 2003 to 300 lbs/day; 900 lbs/week; not to exceed 3600 lbs/2 months (from 300 lbs/day; 800 lbs/week; not to exceed 3200 lbs/2 months).

The GMT has identified the alternative of reducing the DTL limits for both limited entry and open access back to the pre-November levels. The GMT believes that this action will result in a total sablefish mortality of 20 mt above the OY of 7,500 mt (0.27% over the OY). Action alternatives for this fishery include:

1. Change the sablefish tier limits to the correct amounts based on the OY, and/or
2. Reduce the DTL limits for limited entry and open access

With regard to not taking any action at this time, the GMT estimates that by the September Council meeting, over 80% of the DTL (limited entry and open access combined) will have occurred, as well as the majority of the tier limits. This would likely put us over the sablefish OY and would require inseason action to constrain other fisheries that harvest sablefish, such as trawl. The GMT may have additional information on this issue as part of our C.3. report.

Whiting Trawl Fishery

There was a larger than anticipated catch of canary rockfish in the mothership sector of the whiting fishery in early June. Specifically, one catcher vessel caught an estimated 3.9 mt of canary off Heceta Bank, bringing the estimated mothership canary catch to 4.0 mt (compared to the 0.9 mt the GMT has estimated for this sector in the bycatch scorecard). To date, it is estimated that the mothership, catcher-processor, and tribal whiting fisheries combined have caught 4.5 mt of canary rockfish (note: the shoreside fishery has begun in northern California, and starts today off Oregon and Washington).

The GMT has identified some alternatives for the whiting fishery to help ensure that the whiting fisheries stay within an estimated impact of 7.3 mt of canary rockfish (as projected in the scorecard) and has shared these alternatives with the GAP. The GMT does not know if all of these alternatives are available for inseason management. Our understanding is that a few of these alternatives are available to be implemented now, while other will require emergency action by NMFS. These alternatives (which are not mutually exclusive) include:

Available Now

1. Status quo (do nothing now and address in September, if needed)
2. Voluntary area closure until rule is adopted
3. Impose a trip limit in the whiting fishery in the interim
4. Include area restrictions for the shoreside fishery through the EFP permit

Require Emergency Action (which would take about six weeks to implement)

5. Create an RCA closure (for whiting fishery) through emergency action
6. Area closure around Heceta Bank for whiting fishery and/or other area closures

Legal Guidance

7. Explore whether the Council could give NMFS authority to impose an RCA or close the fishery outside of a Council meeting if the whiting fishery exceeds the 7.3 mt catch projection (through emergency action)

Research Catches

The GMT has received an update from the NWFSC that the current catch of canary rockfish in the NMFS shelf trawl survey is 1.0 mt during the first of five segments off northern Washington (note: the GMT had anticipated a total of 1.0 mt of canary in all research catches (including SRPs and LOAs) combined–NMFS Triennial trawl survey, NMFS shelf trawl survey, NMFS slope survey, IPHC halibut survey, and Canadian whiting survey). At this time, the GMT cannot predict the total amount of canary rockfish that will be taken in the research surveys. The GMT would appreciate guidance from the Council on what measures to take to provide for those higher than anticipated catches. The GMT notes that as stocks under rebuilding plans recover, the survey catches will likely increase which could jeopardize fishing opportunity.

GMT Recommendations

1. Provide guidance on inseason adjustments to the fixed gear sablefish fisheries
    - Does the Council want to add any alternatives for consideration?
2. Provide guidance on inseason adjustments to the whiting fisheries
    - Does the Council want to add or remove any of the alternatives for consideration?
    - Are there preferred alternatives?
3. Provide guidance on how to account for research catches of canary rockfish

C.1.b Attachment 1. Initial Consideration of Inseason Adjustments Scorecard

7/15/2013 13:46 a

Fishery	**Bocaccio a/**	**Canary**	**Cowcod**	**Dkbl**	**Lingcod**	**POP**	**Widow**	**Yelloweye**
Limited Entry Groundfish								
Trawl- Non-whiting	51.0	**10.0**	0.5	73.5	104.7	90.7	2.5	0.3
Fixed Gear	13.4	0.9	0.1	0.8	20.0	0.3	0.5	2.5
Whiting								
At-sea whiting motherships		**4.0**		1.4	0.3	1.7	59.7	0.0
At-sea whiting cat-proc		1.3		7.6	0.4	10.1	84.6	0.4
Shoreside whiting		0.4		0.5	0.7	0.4	29.9	0.0
Tribal whiting		4.7		0.0	0.5	1.5	37.1	0.0
Open Access								
Groundfish directed	10.6	1.0	0.1	0.2	70.0	0.1		0.6
CA Halibut	0.1			0.0	2.0	0.0		
CA Gillnet b/	0.5			0.0		0.0	0.0	
CA Sheephead b/				0.0		0.0	0.0	0.0
CPS- wetfish b/	0.3							
CPS- squid c/								
Dungeness crab b/	0.0		0.0	0.0		0.0		
HMS b/		0.0	0.0	0.0				
Pacific Halibut b/	0.0		0.0	0.0		0.0	0.0	0.5
Pink shrimp	0.1	0.5	0.0	0.0	0.5	0.0	0.1	0.1
Ridgeback prawn	0.1	0.0	0.0	0.0	0.0	0.0	0.0	0.0
Salmon troll	0.2	1.6	0.0	0.0	0.3	0.0	0.0	0.2
Sea Cucumber	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
Spot Prawn (trap)								
Tribal								
Midwater Trawl		1.3		0.0	0.1	0.0	40.0	0.0
Bottom Trawl		0.5		0.0	9.0	0.0	0.0	0.0
Troll		0.5		0.0	1.0	0.0		0.0
Fixed gear		0.3		0.0	15.0	0.0	0.0	2.3
Recreational Groundfish								
WA d/		1.7			65.0			3.5
OR		6.8			109.7		1.4	3.2
CA e/	62.8	9.3	1.8		268.9		1.4	3.7
Research: Based on 2 most recent NMFS trawl shelf and slope surveys, the IPHC halibut survey, and LOAs with expanded estimates for south of Pt. Conception.								
	2.0	**3.0**		1.6	3.0	3.0	1.5	1.1
Non-EFP Total	141.1	47.8	2.5	85.6	671.1	107.8	258.7	18.5
EFPs f/								
CA: NS FF trawl	10.0	0.5	0.5		20.0			0.5
OR: DTS g/		**0.0**		**0.2**		**0.6**		**0.0**
WA: AT trawl		**1.0**		3.0	4.5	8.5	5.5	0.5
WA: dogfish LL		**0.0**		**0.0**	**0.5**	**0.0**	**0.0**	**0.0**
WA: pollock		0.1					1.5	0.1
EFP Subtotal	10.0	1.6	0.5	3.2	25.0	9.1	7.0	1.1
TOTAL	151.1	49.4	3.0	88.8	696.1	116.9	265.7	19.6
2004 OY	250	47.3	4.8	240	735	444	284	22
Difference	98.9	-2.1	1.8	151.2	38.9	327.1	18.3	2.4
Percent of OY	60.4%	104.5%	62.5%	37.0%	94.7%	26.3%	93.6%	88.9%
Key		= either not applicable; trace amount (<0.01 mt); or not reported in available data sources.						

a/ South of 40°10' N. lat.

b/ Mortality estimates are not hard numbers; based on the GMT's best professional judgement.

c/ Bycatch amounts by species unavailable, but bocaccio occurred in 0.1% of all port samples and other rockfish in another 0.1% of all port samples (and squid fisheries usually land their whole catch). In 2001, out of 84,000 mt total landings 1 mt was groundfish. This suggests that total bocaccio was caught in trace amounts.

d/ Estimates for yelloweye have not been updated.

e/ Estimates for bocaccio, cowcod, widow, and yelloweye have not been updated.

f/ Values are proposed EFP bycatch caps, not estimates of total mortality. The EFP is terminated inseason if the cap is projected to be attained early.

g/ The darkblotched rockfish and Pacific ocean perch caps are not defined yet for this EFP but are expected to be lower than the placeholders in this scorecard.

C.1.b Attachment 2. Estimated Impacts as a Result of Inseason Adjustments Proposed Under Agendum C.3 Scorecard

7/15/2013 13:46

a

Fishery	Bocaccio a/	Canary	Cowcod	Dkbl	Lingcod	POP	Widow	Yelloweye
Limited Entry Groundfish								
Trawl- Non-whiting	**47.4**	**9.2**	**0.4**	**75.6**	**104.7**	**95.0**	2.5	**0.2**
Fixed Gear	13.4	0.9	0.1	0.8	20.0	0.3	0.5	2.5
Whiting								
At-sea whiting motherships		**4.0**		1.4	0.3	1.7	59.7	0.0
At-sea whiting cat-proc		1.3		7.6	0.4	10.1	84.6	0.4
Shoreside whiting		0.4		0.5	0.7	0.4	29.9	0.0
Tribal whiting		4.7		0.0	0.5	1.5	37.1	0.0
Open Access								
Groundfish directed	10.6	1.0	0.1	0.2	70.0	0.1		0.6
CA Halibut	0.1			0.0	2.0	0.0		
CA Gillnet b/	0.5			0.0		0.0	0.0	
CA Sheephead b/				0.0		0.0	0.0	0.0
CPS- wetfish b/	0.3							
CPS- squid c/								
Dungeness crab b/	0.0		0.0	0.0		0.0		
HMS b/		0.0	0.0	0.0				
Pacific Halibut b/	0.0		0.0	0.0		0.0	0.0	0.5
Pink shrimp	0.1	0.5	0.0	0.0	0.5	0.0	0.1	0.1
Ridgeback prawn	0.1	0.0	0.0	0.0	0.0	0.0	0.0	0.0
Salmon troll	0.2	1.6	0.0	0.0	0.3	0.0	0.0	0.2
Sea Cucumber	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
Spot Prawn (trap)								
Tribal								
Midwater Trawl		1.3		0.0	0.1	0.0	40.0	0.0
Bottom Trawl		0.5		0.0	9.0	0.0	0.0	0.0
Troll		0.5		0.0	1.0	0.0		0.0
Fixed gear		0.3		0.0	15.0	0.0	0.0	2.3
Recreational Groundfish								
WA d/		1.7			65.0			3.5
OR		6.8			109.7		1.4	3.2
CA e/	62.8	9.3	1.8		268.9		1.4	3.7
Research: Based on 2 most recent NMFS trawl shelf and slope surveys, the IPHC halibut survey, and LOAs with expanded estimates for south of Pt. Conception.								
	2.0	**3.0**		1.6	3.0	3.0	1.5	1.1
Non-EFP Total	137.5	47.0	2.4	87.7	671.1	112.1	258.7	18.4
EFPs f/								
CA: NS FF trawl	10.0	0.5	0.5		20.0			0.5
OR: DTS g/		**0.0**		**0.2**		**0.6**		**0.0**
WA: AT trawl		**1.0**		3.0	4.5	8.5	5.5	0.5
WA: dogfish LL		**0.0**		**0.0**	**0.5**	**0.0**	**0.0**	**0.0**
WA: pollock		0.1					1.5	0.1
EFP Subtotal	10.0	1.6	0.5	3.2	25.0	9.1	7.0	1.1
TOTAL	147.5	48.6	2.9	90.9	696.1	121.2	265.7	19.5
2004 OY	250	47.3	4.8	240	735	444	284	22
Difference	102.5	-1.3	1.9	149.1	38.9	322.8	18.3	2.5
Percent of OY	59.0%	102.8%	60.4%	37.9%	94.7%	27.3%	93.6%	88.5%
Key	▨	= either not applicable; trace amount (<0.01 mt); or not reported in available data sources.						

a/ South of 40°10' N. lat.

b/ Mortality estimates are not hard numbers; based on the GMT's best professional judgement.

c/ Bycatch amounts by species unavailable, but bocaccio occurred in 0.1% of all port samples and other rockfish in another 0.1% of all port samples (and squid fisheries usually land their whole catch). In 2001, out of 84,000 mt total landings 1 mt was groundfish. This suggests that total bocaccio was caught in trace amounts.

d/ Estimates for yelloweye have not been updated.

e/ Estimates for bocaccio, cowcod, widow, and yelloweye have not been updated.

f/ Values are proposed EFP bycatch caps, not estimates of total mortality. The EFP is terminated inseason if the cap is projected to be attained early.

g/ The darkblotched rockfish and Pacific ocean perch caps are not defined yet for this EFP but are expected to be lower than the placeholders in this scorecard.

Exhibit C.2
Situation Summary
June 2004

NATIONAL MARINE FISHERIES SERVICE REPORT ON GROUNDFISH MANAGEMENT

Situation: The National Marine Fisheries Service (NMFS) will report on its regulatory and scientific activities relevant to groundfish fisheries. On April 30, 2004, NMFS announced Pacific whiting stock status as fully rebuilt and set 2004 Pacific whiting harvest levels, see Exhibit C.2.a, Attachment 1.

Council Task:

1. Discussion.

Reference Materials:

1. Exhibit C.2.a, Attachment 1: *Federal Register* notice of 2004 Pacific whiting fishery specifications final rule and stock status.

Agenda Order:

a. Regulatory Activities	Bill Robinson
b. Science Center Activities	Elizabeth Clarke
c. Reports and Comments of Advisory Bodies	
d. Public Comment	
e. Council Discussion	

PFMC
05/19/04

Exhibit C.2.a
Attachment 1
June 2004

DEPARTMENT OF COMMERCE

National Oceanic and Atmospheric Administration

50 CFR Part 648

[Docket No. 040112010–4114–02; I.D. 122203A]

RIN 0648–AN17

Magnuson-Stevens Fishery Conservation and Management Act Provisions; Fisheries of the Northeastern United States; Northeast (NE) Multispecies Fishery; Amendment 13; Correction

AGENCY: National Marine Fisheries Service (NMFS), National Oceanic and Atmospheric Administration (NOAA), Commerce.

ACTION: Final rule; correction.

SUMMARY: This document contains a correction to the final rule implementing Amendment 13 to the NE Multispecies Fishery Management Plan (FMP) published on April 27, 2004. Because publication of the Amendment 13 final rule followed publication of the Electronic Dealer Reporting (EDR) final rule, § 648.7 of Amendment 13 unintentionally superceded § 648.7 of the EDR final rule, creating confusion as to which set of regulatory changes were, in fact, being implemented. Therefore, this document corrects the error contained in the Amendment 13 final rule as it relates to § 648.7.

DATES: Effective May 1, 2004.

FOR FURTHER INFORMATION CONTACT: Thomas Warren, Fishery Policy Analyst, 978- 281- 9347, fax 978- 281- 9135; email *thomas.warren@noaa.gov*. Michael Pentony, Senior Fishery Policy Analyst, 978- 281- 9283, fax 978- 281- 9135, email *michael.pentony@noaa.gov*.

SUPPLEMENTARY INFORMATION: NMFS recently published two final rules, EDR (69 FR 13482, March 23, 2004) and Amendment 13 (69 FR 22906, April 27, 2004), both of which implement revised regulatory text for § 648.7. Amendment 13 was under development by the New England Fishery Management Council, in cooperation with NMFS, for several years. It was originally anticipated that publication of the Amendment 13 final rule would precede publication of the implementing regulations for the EDR final rule. The preamble to the Amendment 13 final rule clearly indicates that NMFS would be issuing electronic dealer reporting requirements in a separate, future rulemaking (i.e., the EDR Rule). The Amendment 13 revision to § 648.7 was intended initially only as a place-holder until such time that the EDR final rule was implemented. However, in order to ensure that the EDR final rule became effective by May 1, 2004, and to accommodate the 30-day delay in effectiveness pursuant to the Administrative Procedure Act, NMFS published the EDR final rule first, on March 23, 2004. NMFS inadvertently failed to remove the place-holder language in the Amendment 13 final rule to reflect the new requirements contained in the EDR final rule at § 648.7. Because of this oversight, and unless corrected, the Amendment 13 implementing regulations will supercede the EDR § 648.7 revised text. Therefore, NMFS corrects the final rule implementing Amendment 13 by removing all reference to § 648.7. This section will be implemented as published in the EDR final rule that published on March 23, 2004 (69 FR 13482).

Correction

PART 648—[CORRECTED]

■ The publication on April 27, 2004, at 69 FR 22906, FR Doc. 04- 8884 is corrected as follows:

§ 648.7 [Corrected]

■ On page 22946, in the second column, first complete paragraph, remove the entire instruction 4, including the amendatory text in instruction 4 and the corresponding regulatory text, and renumber the remaining instructions accordingly.

Dated: April 27, 2004.

Rebecca Lent,

Deputy Assistant Administrator for Regulatory Programs, National Marine Fisheries Service.

[FR Doc. 04- 9845 Filed 4- 27- 04; 2:54 pm]

BILLING CODE 3510–22–S

DEPARTMENT OF COMMERCE

National Oceanic and Atmospheric Administration

50 CFR Part 660

[Docket No. 031216314–4118–03; I.D. 112803A]

RIN 0648–AR54

Magnuson-Stevens Fishery Conservation and Management Act Provisions; Fisheries Off West Coast States and in the Western Pacific; Pacific Coast Groundfish Fishery; Annual Specifications; Pacific Whiting

AGENCY: National Marine Fisheries Service (NMFS), National Oceanic and Atmospheric Administration (NOAA), Commerce.

ACTION: Final rule; 2004 groundfish fishery specifications; request for comments.

SUMMARY: This final rule establishes the 2004 fishery specifications for whiting in the U.S. exclusive economic zone (EEZ) and state waters off the coasts of Washington, Oregon, and California as authorized by the Pacific Coast Groundfish Fishery Management Plan (FMP). This **Federal Register** document also serves to announces that the whiting resource is estimated to be above the target rebuilding biomass and will no longer have an overfished species status, and amends the final rule implementing the specifications and management measures for the 2004 fishing year, which were published March 9, 2004. These specifications include the allowable biological catch (ABC), optimum yield (OY), tribal allocation, and allocations for the non-tribal commercial sectors. The intended effect of this action is to establish allowable harvest levels of whiting based on the best available scientific information. NMFS is specifically seeking comments on changes to the ABC in this final rule. These changes are described below in the section of the preamble titled ABC/OY Recommendations.

DATES: Effective April 27, 2004, through December 31, 2004. Comments on the 2004 whiting ABC must be received by June 1, 2004.

ADDRESSES: You may submit comments, identified by [031216314- 01 and/or 0648- AR54], by any of the following methods:

- *E-mail: GWhiting2004ABC.nwr@noaa.gov*: identified by [031216314- 01 and/or 0648- AR54] in the subject line of the message.
- *Federal eRulemaking Portal: http://www.regulations.gov*. Follow the instructions for submitting comments.
- *Fax:* 206- 526- 6736.
- *Mail:* D. Robert Lohn, Administrator, Northwest Region (Regional Administrator), NMFS, 7600 Sand Point Way, NE., Seattle, WA 98115- 0070; Robert Lohn, Administrator.

Copies of the final environmental impact statement (FEIS) for this action are available from Donald McIsaac, Executive Director, Pacific Fishery Management Council (Council), 7700 NE. Ambassador Place, Portland, OR 97220, phone: 503- 820- 2280. These documents are also available online at the Council's Web site at *http://www.pcouncil.org.* Copies of additional reports referred to in this document may also be obtained from the Council. Copies of the Record of Decision (ROD), final regulatory flexibility analysis (FRFA), and the Small Entity Compliance Guide are available from D. Robert Lohn, Northwest Regional Administrator, NMFS, 7600 Sand Point Way, NE., Seattle, WA 98115–0070.

FOR FURTHER INFORMATION CONTACT: Becky Renko or Yvonne deReynier (Northwest Region, NMFS) 206–526–6150; or Svein Fougner (Southwest Region, NMFS) 310–980–4040.

SUPPLEMENTARY INFORMATION:

Electronic Access

This final rule is accessible via the Internet at the Office of the Federal Register's Web site at *http://www.gpoaccess.gov/fr/index.html.* Background information and documents are available at the NMFS Northwest Region Web site at *http://www.nwr.noaa.gov/sustfsh/gdfsh01.htm.*

Background

The Pacific Coast Groundfish Fishery Management Plan (FMP) requires that fishery specifications be evaluated biennially or annually and revised as necessary, that OYs be specified for groundfish species or species groups that need protection, and that management measures designed to achieve the OYs be published in the **Federal Register**. Specifications include ABCs and harvest levels (OYs, harvest guidelines, allocations, or quotas). In anticipation of a new whiting stock assessment that would be available in early 2004 and given the small amount of whiting typically landed under trip limits prior to the April 1 start of the primary season, the Council chose to delay its final whiting recommendation until its March 2004 meeting.

A proposed rulemaking to implement the 2004 specifications and management measures for the Pacific Coast groundfish fishery was published on January 8, 2004 (69 FR 1380). NMFS requested public comment on the proposed rule through February 8, 2004. During that comment period, NMFS received four letters of comment that were addressed in the preamble of the final rule published on March 9, 2004 (69 FR 11064). One comment, comment 9, which is not being repeated in the preamble discussion for this action, addressed the process for establishing a harvest level for whiting. For additional background information on the fishery, see the preamble of the proposed and final rules for the 2004 annual specifications and management measures.

Stock Status

In general, whiting is a very productive species with highly variable recruitment (the biomass of fish that mature and enter the fishery each year) patterns and a relatively short life span when compared to other overfished groundfish species. In 1987, the whiting biomass was at a historical high level due to an exceptionally large number of fish that spawned in 1980 and 1984 (fished spawned during a particular year are referred to as year classes). As these large year classes of fish passed through the population and were replaced by moderate sized year classes, the stock declined. The whiting stock stabilized between 1995 and 1997, but then declined to its lowest level in 2001.

In 2002, a whiting stock assessment was prepared. It estimated the female spawning biomass to be less than 20 percent of the unfished biomass. As a result of the 2002 assessment, the whiting stock was believed to be below the overfished threshold in 2001 and was, therefore, declared overfished on April 15, 2002 (67 FR 18117). Since 2001, the whiting stock has increased substantially as a strong 1999 year class has matured and entered the spawning population.

In 2003, whiting was managed under the 40–10 harvest policy, which appeared to be adequate to achieve rebuilding. The 40–10 policy is intended to prevent species or stocks from becoming overfished. If the stock biomass is larger than the biomass needed to produce MSY, the OY may be set equal to or less than ABC. For further discussion see the preamble of the proposed rule for the 2003 specifications and management measures (68 FR 949, January 7, 2003). An age-structured assessment model was used to prepare a new coastwide stock assessment in 2004. This model was similar to the model used in the previous stock assessment in 2002. New data in this stock assessment included updated catch through 2003, recruitment indices from the juvenile survey in 2003, and the results of the 2003 U.S./Canada acoustic survey. The stock assessment was examined by a joint U.S./Canada Pacific Hake (Whiting) Stock Assessment Review (STAR) panel in early February of 2004.

The STAR panel considered the stock assessment to be complete and suitable for use by the Council and its advisory bodies for ABC projections. However, the amount of whiting that the hydroacoustic survey was able to measure relative to the total whiting in the surveyed area (survey catchability coefficient or q) was identified as a major source of uncertainty in the stock assessment. Therefore, two sets of ABC/OY projections, with different assumptions about the survey catchability, were brought forward for decision making. This range of projections was intended to represent a plausible range of the stock's status. The more optimistic or less risk averse model run assumed that q equaled 0.6, while the less optimistic or more risk averse model run assumed that q equaled 1.0. A catchability coefficient of 1.0 is the value that has been used in the previous assessments. The Council's Scientific and Statistical Committee (SSC) also reviewed the assessment.

As a result of the new whiting stock assessment, the estimated abundance of whiting has increased substantially since the last assessment. However, the pattern of stock growth is very similar to what has been estimated in past assessments. The stock was estimated to be 47 percent of its unfished biomass in 2003 (2.7 million mt of age 3+ fish) when a survey catchability coefficient of 1.0 was applied and at 51 percent (4.2 million mt of age 3+ fish) of its unfished biomass in 2003 when a survey catchability coefficient of 0.6 was applied. Under both scenarios, the whiting biomass in 2003 is estimated to be above the target rebuilding biomass. However, in the absence of a large year class after 1999, the stock is projected to decline again.

Whiting was declared overfished on April 15, 2002 (67 FR 18117) as a result of the 2002 stock assessment which estimated that the female spawning biomass was less than 20 percent of the unfished biomass. In retrospect, the abundance of the whiting stock in 2001, as estimated from the current stock assessment, is now believed to have been at 27 percent of its unfished biomass in 2001 when a survey catchability coefficient of 1.0 is applied, and at 31 percent of its unfished biomass in 2001 when a survey catchability coefficient of 0.6 was applied.

With the publication of this document, NMFS is announcing that the whiting stock is estimated to be above the target rebuilding biomass in 2003 and will no longer be considered an overfished stock. Consequently, the adoption of a whiting rebuilding plan under Amendment 16–4 to the FMP, scheduled to be completed by November 2004, may no longer be necessary.

During 2003, while whiting was under NMFS's overfished designation, an order was entered in *Natural Resources Defense Council* v. *Evans*, 290 F. Supp. 2d 1051, 1057 (N.D. Calif. 2003), requiring NMFS to approve or adopt a rebuilding plan for whiting by November 30, 2004 pursuant to 16 U.S.C. 1854(c) of the Magnuson-Stevens Fishery Conservation and Management Act (Magnuson-Stevens Act). NMFS will move the Court to amend its order on the grounds that a rebuilding plan for whiting is no longer necessary because the stock is no longer in an overfished status.

U.S.-Canada Whiting Negotiations

Since 1977, the U.S. and Canada have periodically held negotiations to address whiting fishery management issues, particularly catch sharing between the two countries. Through 2003, the U.S. fisheries have been managed to take 80 percent of the OY, while the Canadian fisheries have been managed to take 30 percent of the U.S.-Canada coastwide harvest. In the fall of 2002, after the whiting stock had been declared overfished, international negotiations were resumed.

In February 2003, U.S.-Canada negotiations reached a tentative agreement detailing the conservation, research, and catch sharing of whiting. A new process for conducting stock assessments and managing whiting was developed and is described in a treaty which was signed by both countries on November 21, 2003. This treaty is currently awaiting ratification by the U.S. Senate and passage of implementing legislation by the U.S. Congress. Treaty provisions include the use of a default harvest rate of $F_{40\%}$ with a 40/10 adjustment. A rate of $F_{40\%}$ can be explained as that which reduces spawning potential per female to 40 percent of what it would have been under natural conditions (if there were no mortality due to fishing). The treaty's catch sharing plan provides 73.88 percent of the total catch OY to the U.S. fisheries and 26.12 percent to the Canadian fisheries. Although the international agreement and implementing legislation are not expected to be effective until 2005, the negotiators recommended that each country informally implement the agreed upon treaty provisions, to the extent possible, beginning in 2004.

ABC/OY Recommendations

At its September 2003 meeting, the Council considered a range of ABCs and OYs that were consistent with historical values and expected to encompass results of the upcoming 2004 assessment. The four ABC and OY options considered by the Council were: An ABC of 94,000 mt with an OY of 74,100 mt, which represents 50 percent of the 2003 ABC and OY; an ABC of 188,000 mt with an OY of 148,200 mt, which was the 2003 ABC and OY; an ABC of 282,000 mt with an OY of 222,300 mt, which is 50 percent greater than the 2003 ABC and OY; and an ABC of 325,000 mt with an OY of 250,000 mt, which was an intermediate value recommended by the Council.

The Council recommended a preferred OY of 250,000 mt to accommodate any biomass increase that could result from the 2004 stock assessment, while recognizing that incidental catch of widow rockfish could constrain harvest levels of whiting. Widow rockfish, an overfished species, is often caught with whiting. Because the 2004 widow rockfish OY is very low to allow for rebuilding, estimates of incidental widow rockfish catch in the whiting fishery suggested that widow OY might be exceeded if the whiting OY were not constrained. It was announced throughout the specification process that the ABC and OY for whiting would be implemented in a separate final rule from the rest of the groundfish specifications.

At its March 2004 meeting in Tacoma, Washington, the Council reviewed the results of the new stock assessment for whiting. The coastwide ABCs considered by the Council were 514,441 mt (q=1.0) and 780,758 (q=0.6). Both ABCs were based on an F_{MSY} harvest rate of $F_{40\%}$ which is consistent with the U.S./Canada treaty for whiting. F_{MSY} is the default harvest rate that the Council uses as a proxy for the fishing mortality rate.

Because the whiting biomass is estimated to be above 40 percent of its unfished biomass, the 40/10 adjustment was not applied. With the stock above the target rebuilding biomass, the OY could be set as high as the ABC. The SSC recommended that the Council use the decision table presented in the whiting stock assessment (Table 13) to evaluate the consequences of alternate OY options on the whiting biomass. This assessment is available from the Council (*see* **ADDRESSES**). In addition to the two OYs based on different values for the q, 0.6 and 1.0, the consequences of a constant harvest rate of 250,000 mt annually for the U.S. was also considered in the decision table.

The Council's groundfish management team (GMT) considered the 2004 OY alternatives in relation to the impacts of incidental catch of overfished species, particularly widow rockfish. In September 2003, when projecting the impacts of the whiting fishery on widow rockfish, the GMT applied an average bycatch rate for 1998–2002 for each sector. Based on this rate, it was projected that the whiting OY would need to be constrained to 120,000 mt as not to exceed the widow rockfish rebuilding OY.

At the March meeting, the 2003 whiting bycatch data were available. However, the GMT could not reach consensus on the best approach to calculating the widow bycatch projections. The influence of fishers' ability to reduce bycatch rates by changing fishing practices, as compared to the influence on bycatch rates due to the relationship between the two stocks and the frequency of widow rockfish interactions, are not well understood at this time. Therefore, the GMT presented two OYs based on alternative bycatch projections that fixed the widow rockfish take at 220 mt, to the Council. The first whiting OY was 260,343 mt, which was based on a weighted 4-year average with more weight being given to recent years. The second whiting OY was 205,782 mt, and was based on an equally weighted four year average. In addition, the GMT estimated the widow rockfish catch (211 mt) with a fixed OY of 250,000 mt, and with the application of a weighted 4-year average.

Following discussion and public testimony concerning the new 2004 stock assessment, the Council recommended adopting an ABC of 514,441 mt, based on the new assessment with model runs using q=1.0, and an OY of 250,000 mt. As explained above, the Council initially considered a range of ABCs that were expected to encompass the results of the new stock assessment. However, the 514,441 mt ABC based on the new assessment is greater than the range of ABC alternatives (based on the 2002 stock assessment) that were initially considered by the Council, analyzed in the EIS, and presented in the proposed rule.

Because it is the OY harvest level that determines the effects of the fisheries on the environment and not the ABC, there is no functional difference in environmental impacts between the high ABC of 325,000 mt and the ABC of 514,441 mt. The environmental impacts of the 250,000 mt OY, including impacts on overfished species, resulting from the whiting harvest specification were fully considered within the range of alternatives in the EIS and there are no additional environmental impacts on whiting or bycatch species over those already considered.

As in past years, the whiting fisheries are will be managed with near real-time data to achieve, but not exceed the OY. The Council recognized efforts by fishery participants to avoid bycatch of overfished species and asked that the industry continue to share information and avoid widow rockfish ''hot spots''.

Economic Impact

The U.S. OY recommended by the Council represents a 68 percent increase from the 2003 whiting OY. When the OY was substantially reduced to allow for rebuilding of the stock, it was not economically feasible for some shoreside or at-sea processors who had historically participated in the fishery to remain in the fishery. The increased OY for 2004 may result in financial improvements and may likely encourage some fishers and processors to return to the fishery. In the short term, the increased OY is expected to have a substantial economic impact on harvesters and processors. It is also expected that the length of the whiting season will increase proportionately with the OY, thereby likely reducing some fishing pressure on already constrained non-whiting fisheries such as flatfish and DTS, in which whiting vessels also participate.

Sector Allocations

In 1994, the United States formally recognized that the four Washington coastal treaty Indian tribes (Makah, Quileute, Hoh, and Quinault) have treaty rights to fish for groundfish in the Pacific Ocean. In general terms, the quantification of those rights is 50 percent of the harvestable surplus of groundfish that pass through the tribes' usual and accustomed ocean fishing areas (described at 60 CFR 660.324).

The Pacific Coast Indian treaty fishing rights, described at 50 CFR 660.324, allow for the allocation of fish to the tribes through the annual specification and management process. A tribal allocation is subtracted from the species OY before limited entry and open access allocations are derived. The tribal whiting fishery is a separate fishery, and is not governed by the limited entry or open access regulations or allocations. To date only the Makah tribe has participated. It regulates, and in cooperation with NMFS, monitors this fishery so as not to exceed the tribal allocation.

The sliding scale methodology used to determine the treaty Indian share of whiting is the subject of ongoing litigation. In *United States* v. *Washington*, Subproceeding 96–2, the Court held that the methodology is consistent with the Magnuson-Stevens Act, and is the best available scientific method to determine the appropriate allocation of whiting to the tribes. *See United States* v. *Washington*, 143 F.Supp.2d 1218 (W.D. Wash. 2001). This ruling was reaffirmed in July 2002, *Midwater Trawlers Cooperative* v. *Daley*, C96–1808R (W.D. Wash.) (Order Granting Defendants' Motion to Supplement Record, July 17, 2002), and again in April 2003, *id.*, Order Granting Federal Defendants' and Makah's Motions for Summary Judgment and Denying Plaintiffs' Motions for Summary Judgment, April 15, 2003. The latter ruling has been appealed to the Ninth Circuit, but no decision has been rendered as yet. At this time, NMFS remains under a Court order in Subproceeding 96–2 to continue use of the sliding scale methodology unless the Secretary finds just cause for its alteration or abandonment, the parties agree to a permissible alternative, or further order issues from the Court. Therefore, NMFS is obliged to continue to use the methodology unless one of the events identified by the Court occurs. Since NMFS finds no reason to change the methodology, it has been used to determine the 2004 tribal allocation.

Beginning in 1999, NMFS set the tribal allocation according to an abundance-based sliding scale allocation method, proposed by the Makah Tribe in 1998. *See*, 64 FR 27928, 27929 (May 29, 1999); 65 FR 221, 247 (January 4, 2000); 66 FR 2338, 2370 (January 11, 2001). Under the sliding scale allocation method, the tribal allocation varies with U.S. whiting OY, ranging from a low of 14 percent (or less) of the U.S. OY when OY levels are above 250,000 mt, to a high of 17.5 percent of the U.S. OY when the OY level is at or below 145,000 mt. For 2004, using the sliding scale allocation method the tribal allocation will be 32,500 mt. The Makah are the only Washington Coast tribe that requested a whiting allocation for 2004.

The 2004 non-tribal commercial OY for whiting is 215,500 mt. This is calculated by deducting the 32,500 mt tribal allocation and 2,000 mt for research catch and bycatch in non-groundfish fisheries from the 250,000 mt total catch OY. Regulations at 50 CFR 660.323(a)(4) divide the commercial OY into separate allocations for the non-tribal catcher/processor, mothership, and shore-based sectors of the whiting fishery. The catcher/processor sector is comprised of vessels that harvest and process whiting. The mothership sector is comprised of motherships and catcher vessels that harvest whiting for delivery to motherships. Motherships are vessels that process, but do not harvest, whiting. The shoreside sector is comprised of vessels that harvest whiting for delivery to shoreside processors. Each sector receives a portion of the commercial OY, with the catcher/processors getting 34 percent (73,270 mt), motherships getting 24 percent (51,720 mt), and the shore-based sector getting 42 percent (90,510 mt).

All whiting caught in 2004 before the effective date of this action will be counted toward the new OY. As in the past, the specifications include fish caught in state ocean waters (0–3 nautical miles (nm) offshore) as well as fish caught in the EEZ (3–200 nm offshore).

NMFS Actions

For the reasons stated here, NMFS is amending the 2004 annual specifications and management measures in the preamble of the final rule (69 FR 11064, March 9, 2004) with the following changes:

1. Tables 1a and 1b (69 FR 11074) are revised to include the Pacific whiting ABC and OYs and to correct footnote x/ to add the term ''harvest guideline'' to clarify that the black rockfish OY subdivisions between the States of Washington, Oregon and California.

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Table 1a. 2004 Specifications of Acceptable Biological Catch (ABC), Optimum Yields (Oys), and Limited Entry and Open Access Allocations, by International North Pacific Fisheries Commission (INPFC) Areas (weights in metric tons).

	ACCEPTABLE BIOLOGICAL CATCH (ABC)						OY (Total catch)	Commercial OY (Total Catch) and Harvest guidelines	Allocations total catch			
Species	Vancouver a/	Columbia	Eureka	Monterey	Conception	Total Catch			Limited Entry		Open Access	
									Mt	%	Mt	%
ROUNDFISH												
Lingcod b/	1,385					1,385	735	180.7	--	81.0	--	19.0
Pacific Cod	3,200		c/			3,200	3,200	3,200	--	--	--	--
Pacific Whiting d/	514,441					514,441	250,000	215,500	--	--	--	--
Sablefish e/ (north of 36°)	8,185				--	8,185	7,510	6,687	6,059	90.6	629	9.4
Sablefish f/ (south of 36°)	--				302	302	276	276	--	--	--	--
FLATFISH												
Dover sole g/	8,510					8,510	7,440	7,380	--	--	--	--
English sole	2,000		1,100			3,100	na	-	-	-	-	-
Petrale sole h/	1,262		500	800	200	2,762	na	-	-	-	-	-
Arrowtooth flounder	5,800					5,800	na	-	-	-	-	-
Other flatfish i/	700	3,000	1,700	1,800	500	7,700	na	-	-	-	-	-

	ACCEPTABLE BIOLOGICAL CATCH (ABC)						OY (Total catch)	Commercial OY (Total Catch) and Harvest guidelines	Allocations total catch			
Species	Vancouver	Columbia	Eureka	Monterey	Conception	ABC			Limited Entry		Open Access	
									Mt	%	Mt	%
ROCKFISH:												
Pacific Ocean Perch j/	980					980	444	117.7	--	--	--	--
Shortbelly k/	13,900					13,900	13,900	13,900	--	--	--	--
Widow l/	3,460					3,460	284	280.4	--	97.0	--	3.0
Canary m/	256					256	47.3	24.2	--	87.7	--	12.3
Chilipepper n/	c/			2,700		2,700	2,000	1,985	1,106	55.7	879	44.3
Bocaccio o/	c/			400		400	250	108.5	--	52.7	--	44.3
Splitnose p/	c/			615		615	461	461	--	--	--	--
Yellowtail q/	4,320			c/		4,320	4,320	4,291	3,935	91.7	356	8.3
Shortspine thornyhead r/ north of 34°27'	1,030					1,030	983	974	971	99.7	3	0.27
Longspine thornyhead s/ north of 36°	2,461				--	2,461	2,443		--	--	--	--
south of 36° t/	--				390	390	195	195	--	--	--	--
Cowcod u/	c/			19	--	19	2.4	0	--	--	--	--
	c/			--	5	5	2.4	0	--	--	--	--
Darkblotched v/	240					240	240	122.1		--		--
Yelloweye w/	53					53	22	5.8		--		-
Black x/	540	775			--	1,315	1,315					

	ACCEPTABLE BIOLOGICAL CATCH (ABC)						OY (Total catch)	Commercial OY (Total Catch) and Harvest guidelines	Allocations total catch			
Species	Vanco u-ver	Colum-bia	Eureka	Mont-erey	Conce p-tion	Total Catch			Limited Entry		Open Access	
									Mt	%	Mt	%
Minor Rockfish North y/	3,680			--		3,680	2,250	2,128	1,979	91.7	179	8.3
Minor Rockfish South z/	--			3,412		3,412	1,968	1,390	774	55.7	616	44.3
Remaining Rockfish	1,612			854		--	--	--	--	--	--	--
bank aa/	c/			350		350	--	--	--	--	--	--
blackgill bb/	c/			75	268	343	--	--	--	--	--	--
bocaccio - north	318					318	--	--	--	--	--	--
chilipepper-north	32					32	--	--	--	--	--	--
redstripe	576			c/		576	--	--	--	--	--	--
sharpchin	307			45		352	--	--	--	--	--	--
silvergrey	38			c/		38	--	--	--	--	--	--
splitnose	242			c/		242	--	--	--	--	--	--
yellowmouth	99			c/		99	--	--	--	--	--	--
yellowtail-south				116		116	--	--	--	--	--	--
Other rockfish cc/	2,068			2,558		--	--	--	--	--	--	--
OTHER FISH dd/	2,500	7,000	1,200	2,000	2,000	14,700	na	-	--	--	--	-

Table 1b. 2004 OYs for minor rockfish by depth sub-groups (weights in metric tons).

Species	Total Catch ABC	OY (Total Catch)			Harvest Guidelines (total catch)			
		Total Catch OY	Recreational Estimate	Commercial OY for minor rockfish and HG for depth sub-groups	Limited Entry		Open Access	
					Mt	%	Mt	%
Minor Rockfish North x/	3,680	2,250 x/	78	2,158	1,979	91.7	179	8.3
Nearshore		122 x/	68	40				
Shelf		968	10	958				
Slope		1,160	0	1,160				
Minor Rockfish South y/	3,412	1,968 y/	435	1,390	774	55.7	616	44.3
Nearshore		615 y/	375	97				
Shelf		714	60	654				
Slope		639	0	639				

a/ ABC applies to the U.S. portion of the Vancouver area, except as noted under individual species.

b/ Lingcod was declared overfished on March 3, 1999. A stock assessment, that included parts of Canadian waters, was done in 2000 and updated for 2001. Lingcod was believed to be at 15 percent of its unfished biomass coastwide in 2000, 17 percent in the north and 15 percent in the south. The U.S. portion of the ABC for the Vancouver area was set at 44 percent of the total for that area. The ABC projection for 2004 is 1,385 mt and was calculated using an F_{MSY} proxy of F45%. The total catch OY of 735 mt is based on a rebuilding plan with a 60 percent probability of rebuilding the stock to B_{MSY} by the year 2009 (T_{MAX}). The harvest control rule will be 0.0531 in the north and 0.0610 in the south. The total catch OY is reduced by 473.6 mt for the amount that is estimated to be taken by the recreational fishery, 3 mt for the amount estimated to be taken during research fishing, 2.8 mt for the amount estimated to be taken in non-groundfish fisheries, and 49.8 mt which will be held in a buffer (see the preamble section "OY Management for overfished species" for the discussion of buffers), the resulting commercial harvest guideline of 205.8 mt. The tribes do not have a specific allocation at this time but are expected to take 25.5 mt of the commercial OY.

c/ "Other species", these are neither common nor important to the commercial and recreational fisheries in the areas footnoted. Accordingly, Pacific cod is included in the non-commercial OY of "other fish" and rockfish species are included in either "other rockfish" or "remaining rockfish" for the areas footnoted.

d/ Pacific whiting -The most recent stock assessment was prepared in early 2004, and was estimated to be above 40 percent of its unfished biomass. The U.S. ABC of 514,441 mt is based on the 2004 assessment results with the application of an Fmsy proxy harvest rate of 40%. The U.S. ABC is 73.88 percent of the coastwide ABC. Because the unfished biomass is believed to be above 40 percent the default OY could be set equal the ABC. However, the OY which is being set at 250,000 mt was constrained because of widow rockfish. The total catch OY is further reduced by 32,500 mt for the tribal allocation, 200 mt for the amount estimated to be taken during research fishing, and 1,800 mt for the estimated catch in non-groundfish fisheries, resulting in a commercial OY of 215,500 mt. The commercial OY is allocated between the sectors with 42 percent (90,510 mt) going to the shore-based sector, 34 percent (73,270 mt) going to the catcher/processor sector, and 24 percent (51,720 mt) going to the mothership sector. Discards of whiting are estimated from the observer data and counted towards the OY inseason.

e/ Sablefish north of 36° N lat. - A new sablefish assessment was done in 2001 for the area north of Point Conception (34°27'N lat.) and updated for 2002. Following the assessment update, sablefish north of 34° 27'N lat. was believed to be between 31 percent and 38 percent of its unfished biomass. The coastwide ABC of 8,487 mt is based on environmentally driven projections with the F_{MSY} proxy of F45%. The ABC for the management area north of 36° N lat. is 8,185 mt (96.45 percent of the coastwide ABC). The coastwide OY of 7,786 mt is based on the density-dependent model and the application of the 40-10 harvest policy. The total catch OY for the area north of 36° N lat is 7,510 mt and is 96.05 percent of the coastwide OY of 7,786 mt. The total catch OY is reduced by 10 percent (751 mt) for the tribal set aside, 53.0 mt for the amount estimated to be taken as research catch, and 18.5 mt for the amount estimated to be taken in non-groundfish fisheries. The remainder (6,687 mt) is the commercial total catch OY. The open access allocation is 9.4 percent of the commercial OY, resulting in an open access total catch OY of 629 mt. The limited entry total catch OY is 6,059 mt. The limited entry total catch OY is further divided with 58 percent (3,514 mt) allocated to the trawl fishery and 42 percent (2,545 mt) allocated to the non-trawl fishery. To provide for bycatch in the at-sea whiting fishery 15 mt of the limited entry trawl allocation will be set aside.

f/ Sablefish south of 36° N lat. - The ABC of 302 mt is 3.55 percent of the ABC from the 2002 coastwide assessment update. The total catch OY of 276 mt is 3.55 percent of the OY from the 2002 coastwide assessment update. There are no limited entry or open access allocations in the Conception area at this time.

g/ Dover sole north of 34° 27'N lat. was assessed in 2001 and was believed to be at 29 percent of its unfished biomass. The ABC of 8,510 mt is based on an F_{MSY} proxy of F40%. The total catch QY of 7,440 mt is the three year average OY for 2002-2004 as forecast in the 2001 stock assessment. Because the biomass is estimated to be in the precautionary zone, the 40-10 harvest rate policy was applied to the total catch OY. The OY is reduced by 58 mt for the amount estimated to be taken as research catch, and 2 mt for estimated catch in non-groundfish fisheries resulting in commercial OY of 7,380 mt.

h/ Petrale Sole was believed to be at 42 percent of its unfished biomass following a 1999 assessment. For 2004, the ABC for the Vancouver-Columbia area (1,262 mt) is based on a four year average projection from 2000-2003 with a F40% F_{MSY} proxy. Management measures to constrain the harvest of overfished species, have reduced the availability of these stocks to the fishery during the past several years. Because the harvest assumptions (from the most recent assessment) used to forecast future harvest were likely overestimates, carrying the previously used ABCs and OYs forward into 2004 was considered to be conservative and based on the best available data. The ABCs for the Eureka, Monterey, and Conception areas (1,500 mt) are based on historical landings data and continue at the same level as 2003.

i/ Other flatfish are those species that do not have individual ABC/OYs and include butter sole, curlfin sole, flathead sole, Pacific sand dab, rex sole, rock sole, sand sole, and starry flounder. The ABC is based on historical catch levels.

j/ Pacfic ocean perch (POP) was declared as overfished on March 3, 1999. A new stock assessmet was prepared in 2003 and POP was determined to be at 25 percent of its unfished biomass. The ABC of 980 mt was projected from a new assessment and is based on an F_{MSY} proxy of F50%. The OY of 444 mt is based on a 70 percent probability of rebuilding the stock to B_{MSY} by the year 2042 (T_{MAX}). The harvest control rule will be 0.0257. The OY is reduced by 3 mt for the amount estimated to be taken during research fishing and 323.3 mt which will be placed in a buffer (see the preamble section "OY Management for overfished species" for the discussion of buffers) resulting in a commercial harvest guideline of 117.7 mt.

k/ Shortbelly rockfish remains as an unexploited stock and is difficult to assess quantitatively. The 1989 assessment provided 2 alternative yield calculations of 13,900 mt and 47,000 mt. NMFS surveys have shown poor recruitment in most years since 1989, indicating low recent productivity and a naturally declining population in spite of low fishing pressure. The ABC and OY therefore are set at 13,900 mt, the low end of the range in the assessment.

l/ The widow rockfish stock was declared overfished on January 11, 2001 (66 FR 2338). A new assessment was prepared for widow rockfish in 2003. The spawning stock biomass is believed to be at 22.4 percent of its unfished biomass. The ABC of 3,460 mt is based an F50% F_{MSY} proxy. The OY 284 mt is based on a 60.1 percent probability of rebuilding the stock to B_{MSY} by the year 2042 (T_{MAX}). The harvest control rule is 0.0093. The OY is reduced by 2 mt for the amount estimated to be taken as recreational catch, 1.5 mt for the amount estimated to be taken during research fishing, 0.1 mt for the amount estimated to be taken in non-groundfish fisheries resulting in a commercial OY of 280.4 mt. Specific open access/limited entry allocations have been suspended during the rebuilding period as necessary to meet the overall rebuilding target while allowing harvest of healthy stocks. Tribal vessels are estimated to land about 40 mt of widow rockfish in 2004, but do not have a specific allocation at this time. Set asides for widow rockfish taken in the Pacific whiting fisheries will be announced in 2004 with the whiting specifications.

m/ Canary rockfish was declared overfished on January 4, 2000 (65 FR 221). A new assessment was completed in 2002 for canary rockfish and the stock was believed to be at 8 percent of its unfished biomass coastwide. The coastwide ABC of 256 mt is based on a F_{MSY} proxy of F50%. The coastwide OY of 47.3 mt is based on the rebuilding plan which has a 60 percent probability of rebuilding the stock to B_{MSY} by the year 2076 (T_{MAX}) and a catch sharing arrangement which has 64.5 percent going to the commercial fisheries and 35.5 percent going to the recreational fishery. The harvest control rule will be 0.0220. The OY is reduced by 15.5 mt for the amount estimated to be taken in the recreational fishery, 1 mt for the amount estimated to be taken during research fishing, 2.1 mt for the amount estimated to be taken in non-groundfish fisheries, and 4.6 mt to be held in a buffer (see the preamble section "OY Management for overfished species" for the discussion of buffers), resulting in a commercial harvest guideline of 24.2 mt. Specific open access/limited entry allocations have been suspended during the rebuilding period as necessary to meet the overall rebuilding target while allowing harvest of healthy stocks. Tribal vessels are estimated to land about 3.6 mt of canary rockfish under the commercial OY, but do not have a specific allocation at this time.

n/ Chilipepper rockfish - the ABC (2,700 mt) for the Monterey-Conception area is based on a three year average projection from 1999-2001 with a F50% F_{MSY} proxy. Because the unfished biomass is believed to be above 40 percent the default OY could be set equal the ABC. However, the OY is set at 2,000 mt to discourage effort on chilipepper, which is taken with bocaccio rockfish. Management measures to constrain the harvest of overfished species, have reduced the availability of these stocks to the fishery during the past several years. Because the harvest assumptions (from the most recent assessment) used to forecast future harvest were likely overestimates, carrying the previously used ABCs and OYs forward into 2004 was considered to be conservative and based on the best available data. The OY is reduced by 15 mt for the amount estimated to be taken in the recreational fishery, resulting in a commercial OY of 1,985 mt. Open access is allocated 44.3 percent (879 mt) of the commercial OY and limited entry is allocated 55.7 percent (1,106 mt) of the commercial OY.

o/ Bocaccio rockfish was declared overfished on March 3, 1999. A new stock assessment and a new rebuilding analysis was prepared for bocaccio rockfish in 2003. The bocaccio rockfish stock is believed to be at 7.4 percent of its unfished biomass. The ABC of 400 mt is based on a F50% F_{MSY} proxy. The OY of 250 mt is based on the rebuilding analysis and has a >70 percent probability of rebuilding the stock to B_{MSY} by the year 2032 (T_{MAX}). The harvest control rule is 0.041. The OY is reduced by 2.0 mt for the amount estimated to be taken during research fishing and 1.3 mt for the amount estimated to be taken in the non-groundfish fisheries. Of the remaining 246.7 mt, 56 percent (138.2 mt) will be applied to the recreational fishery and 44 percent (108.5 mt) will be applied to the commercial harvest guideline. The recreational fishery is estimated to take 62.8 mt, leaving a buffer (see the preamble section "OY Management for overfished species" for the discussion of buffers) of 75.4 mt and the commercial fishery is estimated to take to take 70.8 mt, leaving a buffer of 37.7 mt.

p/ Splitnose rockfish - The 2001 ABC is 615 mt in the southern area (Monterey-Conception). The 461 mt OY for the southern area reflects a 25 percent precautionary adjustment because of the less rigorous assessment for this stock. In the north, splitnose is included in the minor slope rockfish OY.

q/ Yellowtail rockfish - A new yellowtail rockfish stock assessment was prepared in 2003 for the Vancouver-Columbia-Eureka areas. Yellowtail rockfish is believed to be at 46 percent of its unfished biomass. The ABC of 4,320 mt is based on the 2003 stock assessment with the F_{MSY} Proxy of F50%. The OY of 4,320 mt was set equal to the ABC, because the stock is above the precautionary threshold. The OY is reduced by 15 mt for the amount estimated to be taken in the recreational fishery, 8 mt for the amount estimated to be taken during research fishing, and 5.8 mt for the amount taken in non-groundfish fisheries, resulting in a commercial OY of 4,291 mt. The open access allocation (356 mt) is 8.3 percent of the commercial OY. The limited entry allocation (3,935 mt) is 91.7 percent the commercial OY. For anticipated bycatch in the at-sea whiting fishery, 300 mt is subtracted from the limited entry allocation. Tribal vessels are estimated to land about 407 mt of yellowtail rockfish in 2003, but do not have a specific allocation at this time.

r/ Shortspine thornyhead was last assessed in 2001 and the stock was believed to be between 25 and 50 percent of its unfished biomass. The ABC (1,030 mt) for the area north of Pt. Conception (34° 27'N lat.) is based on a F50% F_{MSY} proxy. The OY of 983 mt is based on the 2001 survey with the application the 40-10 harvest policy. The OY is reduced by 9 mt for the amount estimated to be taken during research fishing, resulting in a commercial OY of 974 mt. Open access is allocated 0.27 percent (3 mt) of the commercial OY and limited entry is allocated 99.73 percent (971 mt) of the commercial OY. There is no ABC or OY for the southern Conception area. Tribal vessels are estimated to land about 3 mt of shortspine thornyhead in 2004, but do not have a specific allocation at this time.

s/ Longspine thornyhead is believed to be above 40 percent of its unfished biomass. The ABC (2,461 mt) in the north (Vancouver-Columbia-Eureka-Monterey) is based on the average of the 3-year individual ABCs at a F50%. The total catch OY (2,461 mt) is set equal to the ABC. The OY is further reduced by 18 mt for the amount estimated to be taken during research fishing, resulting in a commercial OY of 2,443 mt.

t/ Longspine thornyhead - A separate ABC (390 mt) is established for the Conception area and is based on historical catch for the portion of the Conception area north of 34°27' N. lat. (Point Conception). To address uncertainty in the stock assessment due to limited information, the ABC was reduced by 50 percent to obtain the OY, 195 mt. There is no ABC or OY for the southern Conception Area.

u/ Cowcod in the Conception area was assessed in 1999 and was believed to be less than 10 percent of its unfished biomass. Cowcod was declared as overfished on January 4, 2000 (65 FR 221). The ABC in the Conception area (5 mt) is based on the 1999 assessment, while the ABC for the Monterey (19 mt) is based on average landings from 1993-1997. An OY of 4.8 mt (2.4 mt in each area) is based on the rebuilding plan which has a 55 percent probability of rebuilding the stock to B_{MSY} by the year 2099 (T_{MAX}). The harvest control rule is 0.0136. Cowcod retention will not be permitted in 2004. The OY will be used to accommodate discards of cowcod rockfish resulting from incidental take.

v/ Darkblotched rockfish was assessed in 2000 and an assessment update was prepared in 2003. The darkblotched rockfish stock was declared overfished on January 11, 2001 (66 FR 2338). Following the 2003 assessment update, the Darkblotched rockfish stock is believed to be at 11 percent of its unfished biomass. The ABC is projected to be 240 mt and is based on an F_{MSY} proxy of F50%. The OY of 240 mt is based on the rebuilding analysis and has a >80% probability of rebuilding the stock to B_{MSY} by the year 2047 (T_{MAX}). The harvest control rule will be 0.032. The OY is reduced by 1.6 mt and 116.3 mt to be held in a buffer (see the preamble section "OY Management for overfished species" for the discussion of buffers), resulting in a 122.1 mt commercial harvest guideline. For anticipated bycatch in the at-sea whiting fishery, 6.7 mt is set aside.

w/ Yelloweye rockfish was assessed in 2001 and updated for 2002. On January 11, 2002 yelloweye rockfish was declared overfished (67 FR 1555). In 2002 following the assessment update, yelloweye rockfish was believed to be at 24.1 percent of its unfished biomass coastwide. The 53 mt coastwide ABC is based on an F_{MSY} proxy of F50%. The OY of 22 mt is based on a revised rebuilding analysis (August 2002) with a 50% probability of rebuilding to B_{MSY} by the year 2050 (T_{MID}), which can also be expressed as 92 percent probability of rebuilding to B_{MSY} by the year 2071 (T_{MAX}). The harvest control rule is 0.0139. The OY is reduced by 7.7 mt for the amount estimated to be taken in the recreational fishery, 1.1 mt for the amount estimated to be taken during research fishing, 0.8 mt for the amount taken in non-groundfish fisheries, and 6.6 mt to be held in a buffer (see the preamble section "OY Management for overfished species" for the discussion of buffers), resulting in a commercial harvest guideline of 5.8 mt. Tribal vessels are estimated to land about 2.3 mt of yelloweye rockfish of the commercial OY in 2004, but do not have a specific allocation at this time.

x/ Black rockfish - the ABC of 1,315 mt is the sum of the ABC (775 mt)from the 2003 Columbia and Eureka area assessment plus the ABC (540 mt) for the Vancouver area from the 2000 assessment. Because the two assessments overlap in the area between Cape Falcon and the Columbia river, projections from the 2000 assessment were adjusted downward by 12 percent to account for the overlap. The ABCs were derived using an F_{MSY} proxy of F50%. Because the unfished biomass is believed to be above 40 percent, the the OY was set equal to the ABC. The black rockfish OY is subdivided between the three states and results in the following harvest guidelines: 540 mt will be attributed to the area north of 46°16' N. lat. (Washington/Oregon border), 450 mt will be attributed to the area between 46°16' N. lat. and 42°00' N. lat. (Oregon/California border), and 326 mt will be attributed to the area south of 42°00' N. lat. Of the 326 mt attributed to the area south of 42°00' N. lat., 194 mt of black rockfish will be applied to the area north of 40°10 min N. lat. and 131 mt to the area south of 40°10 min N. lat. Black rockfish was included in the minor rockfish north category until 2004.

y/ Minor rockfish north includes the "remaining rockfish" and "other rockfish" categories in the Vancouver, Columbia, and Eureka areas combined. These species include "remaining rockfish", which generally includes species that have been assessed by less rigorous methods than stock assessments, and "other rockfish", which includes species that do not have quantifiable assessments. The ABC of 3,680 mt is the sum of the individual "remaining rockfish" ABCs plus the "other rockfish" ABCs. The remaining rockfish ABCs continue to be reduced by 25 percent (F=0.75M) as a precautionary adjustment. To obtain the total catch OY of 2,250 mt, the remaining rockfish ABCs are further reduced by 25 percent and other rockfish ABCs were reduced by 50 percent. This was a precautionary measure due to limited stock assessment information. The OY is reduced by 78 mt for the amount estimated to be taken in the recreational fishery and 2,158 mt the amount estimated to be taken in the commercial fishery, leaving 14 mt in a buffer. Open access is allocated 8.3 percent (179 mt) of the commercial OY and limited entry is allocated 91.7 percent (1,979 mt) of the commercial OY. Tribal vessels are estimated to land about 14 mt of minor rockfish (10 mt of shelf rockfish, and 4 mt of slope rockfish) in 2004, but do not have a specific allocation at this time.

z/ Minor rockfish south includes the "remaining rockfish" and "other rockfish" categories in the Monterey and Conception areas combined. These species include "remaining rockfish" which generally includes species that have been assessed by less rigorous methods than stock assessment, and "other rockfish" which includes species that do not have quantifiable assessments. The ABC of 3,412 is the sum of the individual "remaining rockfish" ABCs plus the "other rockfish" ABCs. The remaining rockfish ABCs continue to be reduced by 25 percent (F=0.75M) as a precautionary adjustment. To obtain total catch OY of 1,968 mt, the remaining rockfish ABCs are further reduced by 25 percent, with the exception of blackgill rockfish, and the other rockfish ABCs were reduced by 50 percent. This was a precautionary measure due to limited stock assessment information. The OY is reduced by 435 mt for the amount estimated to be taken in the recreational fishery and 1,390 mt the amount estimated to be taken in the commercial fishery, leaving 143 mt in a buffer. Open access is allocated 44.3 percent (616 mt) of the commercial OY and limited entry is allocated 55.7 percent (774 mt) of the commercial OY.

aa/ Bank rockfish -- The ABC is 350 mt which is based on a 2000 assessment for the Monterey and Conception areas. This stock contributes 263 mt towards the minor rockfish OY in the south.

bb/ Blackgill rockfish is believed to be at 51 percent of its unfished biomass. The ABC of 343 mt is the sum of the Conception area ABC of 268 mt, based on the 1998 assessment with an F_{MSY} proxy of F50%, and the Monterey area ABC of 75 mt. This stock contributes 306 mt towards minor rockfish south (268 mt for the Conception area ABC and 38 mt for the Monterey area). The OY for the Monterey area is the ABC reduced by 50 percent as a precautionary measure because of lack of information.

cc/ "Other rockfish" includes rockfish species listed in 50 CFR 660.302 and California scorpionfish. The ABC is based on the 1996 review of commercial Sebastes landings and includes an estimate of recreational landings. These species have never been assessed quantitatively.

dd/ "Other fish" includes sharks, skates, rays, ratfish, morids, grenadiers, and other groundfish species noted above in footnote c/.

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2. Section IV *NMFS Actions*, B. *Limited Entry Fishery*, (3) *Whiting* (69 FR 11114) is revised; and Section V *Washington Coastal Tribal Fisheries*, E. *Pacific Whiting* (69 FR 11121) is revised.

B. Limited Entry Fishery

* * * * *

(3) *Whiting.* Additional regulations that apply to the whiting fishery are found at 50 CFR 660.306 and at 50 CFR 660.323(a)(3) and (a)(4).

(a) *Allocations.* The non-tribal allocations, based on percentages that are applied to the commercial OY of 215,500 mt in 2004 (*see* 50 CFR 660.323(a)(4)), are as follows:

(i) Catcher/processor sector—73,270 mt (34 percent);

(ii) Mothership sector—51,720 mt (24 percent);

(iii) Shore-based sector—90,510 mt (42 percent). No more than 5 percent (4,526 mt) of the shore-based whiting allocation may be taken before the shore-based fishery begins north of 42° N. lat. on June 15, 2004.

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V. Washington Coastal Tribal Fisheries

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E. *Pacific Whiting.* The tribal allocation is 32,500 mt.

Classification

The final whiting specifications and management measures for 2004 are issued under the authority of the Magnuson-Stevens Fishery Conservation and Management Act and are in accordance with 50 CFR parts 660, the regulations implementing the Pacific Coast groundfish FMP.

The Pacific Coast Groundfish FMP requires that fishery specifications be evaluated biennially or annually using the best scientific information available. A stock assessment for whiting was prepared in early 2004, using the most recent survey data. Because of the timing of the resource survey upon which the assessment is based, the stock assessment could not be completed and ready for use in the June-September management cycle when the rest of the groundfish specifications were set. The Council and NMFS decided it was best to delay the adoption of the 2004 ABC and OY in order to use the newest data, rather than use old data from the prior survey. Preliminary indications from catch and survey data were that the biomass had increased in recent years and the ABC and OY recommended for 2004 would be substantially higher than those in 2003. For the most socio-economic benefits to harvesters and communities relying on the harvest of whiting, it was particularly important to delay the ABC and OY adoption in order to use the most recent data. Finally, since the major fishery for whiting does not start until April 1, there was time to delay the adoption of the new ABC and OY, until the new information was available to the Council in March.

The proposed rulemaking to implement the 2004 specifications and management measures, published on January 8, 2004 (69 FR 1380), addressed the delayed in adopting the whiting ABC and harvest specifications. NMFS requested public comment on the proposed rule through February 8, 2004. The final rule was published on March 9, 2004 (69 FR 11064). In this rule, NMFS responded to one public comment regarding the process for establishing a harvest level for Pacific whiting by stating that the specification would be adjusted following the Council's March meeting and announced in the **Federal Register** as a final rule. This action has been publicized widely through the Council process.

The proposed and final rules for the 2004 specifications and management measures contained a range of ABCs and OYs for whiting. The specifications announced here are within the scope of the proposed and final rules. Implementing these specifications as soon as possible is necessary because the 2004 whiting fishery is already underway and is operating under the lower 2003 OYs.

For the reasons described above, pursuant to 5 U.S.C. 553(d)(3), the Assistant Administrator for Fisheries, NOAA, finds good cause to waive the 30-day delay in effectiveness, so that this final rule may become effective as soon as possible after the April 1, 2004, fishery start date.

The environmental impacts associated with the Pacific whiting harvest levels being adopted by this action were considered in the final environmental impact statement for the 2004 specification and management measures. Copies of the FEIS and the ROD are available from the Council (*see* **ADDRESSES**) Because the impacts of this action were already considered in the FEIS, it is categorically excluded under NAO 216–6 and NEPA from both further analysis and the requirements to prepare additional environmental documents.

The Council prepared an Initial Regulatory Flexibility Analysis and NMFS prepared a FRFA for the 2004 harvest specifications and management measures which included the impacts of this action. A summary of the FRFA analysis was published in the final rule on March 9, 2004 (69 FR 11064). A copy of the FRFA is available from NMFS Northwest Region (*see* **ADDRESSES**)

Pursuant to Executive Order 13175, this final rule was developed after meaningful consultation with tribal officials during the Council process. This final rule has been determined to be not significant for purposes of Executive Order 12866.

Dated: April 27, 2004.

Rebecca Lent,

Deputy Assistant Administrator for Regulatory Programs, National Marine Fisheries Service.

[FR Doc. 04–9844 Filed 4–27–04; 4:54 pm]

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DEPARTMENT OF COMMERCE

National Oceanic and Atmospheric Administration

50 CFR Part 679

[Docket No. 030922237–4111–02; I.D. 082503D]

RIN 0648–AQ98

Fisheries of the Exclusive Economic Zone Off Alaska; Individual Fishing Quota Program; Community Purchase

AGENCY: National Marine Fisheries Service (NMFS), National Oceanic and Atmospheric Administration (NOAA), Commerce.

ACTION: Final rule.

SUMMARY: NMFS issues a final rule to implement Amendment 66 to the Fishery Management Plan for Groundfish of the Gulf of Alaska (FMP), and an amendment to the Pacific halibut (halibut) commercial fishery regulations for waters in and off of Alaska. Amendment 66 to the FMP and the regulatory amendment modify the Individual Fishing Quota (IFQ) Program by revising the eligibility criteria to receive halibut and sablefish IFQ and quota share (QS) by transfer to allow eligible communities in the Gulf of Alaska (GOA) to establish non-profit entities to purchase and hold QS for lease to, and use by, community residents as defined by specific elements of the proposed action. This action improves the effectiveness of the IFQ Program by providing additional opportunities for residents of fishery dependent communities and is necessary to promote the objectives of the Magnuson-Stevens Fishery Conservation and Management Act (Magnuson-Stevens Act) and the Northern Pacific Halibut Act of 1982 (Halibut Act) with respect to the IFQ fisheries.

DATES: Effective June 1, 2004, except for §§ 679.5(l)(8), 679.41(d)(1), (l)(3), and (l)(4), which will be effective after approval of the collection-of-information request submitted to Office of Management and Budget (OMB) under OMB approval number 0648–0272 and notification of the effective date is published in the **Federal Register**.

ADDRESSES: Copies of Amendment 66 and the Environmental Assessment/ Regulatory Impact Review/Initial Regulatory Flexibility Analysis (EA/ RIR/IRFA) prepared for the proposed rule and final Environmental Assessment/Regulatory Impact Review/ Final Regulatory Flexibility Analysis (EA/RIR/FRFA) prepared for the final rule may be obtained from the Alaska Region, NMFS, P.O. Box 21668, Juneau, AK 99802–1668, Attn: Lori Durall, (907) 586–7247.

FOR FURTHER INFORMATION CONTACT: Glenn Merrill, 907–586–7228 or email at *glenn.merrill@noaa.gov*.

SUPPLEMENTARY INFORMATION:

Background

The groundfish fisheries in the Exclusive Economic Zone of the GOA are managed under the FMP. The FMP was developed by the North Pacific Fishery Management Council (Council) under the Magnuson-Stevens Act (Pub. L. 94–265, 16 U.S.C. 1801). The FMP was approved by the Secretary of Commerce and became effective in 1978. Fishing for halibut (*Hippoglossus stenolepis*) is managed by the International Pacific Halibut Commission (IPHC) and the Council under the Halibut Act. The IFQ Program, a limited access management system for the fixed gear halibut and sablefish (*Anoplopoma fimbria*) fisheries off Alaska, was recommended by the Council in 1992 and approved by NMFS in January 1993. Initial implementing rules were published on November 9, 1993 (58 FR 59375). Fishing under the IFQ Program began on March 15, 1995. The IFQ Program limits access to the halibut and sablefish fisheries to those persons holding QS in specific management areas. The IFQ Program for the sablefish fishery is implemented by the FMP and Federal regulations at 50 CFR part 679 under authority of the Magnuson-Stevens Act. The IFQ Program for the halibut fishery is implemented by Federal regulations at 50 CFR part 679 under the authority of the Halibut Act.

The IFQ Program originally was designed to resolve conservation and management problems that are endemic to open access fisheries. The background issues leading to the Council's initial action recommending the adoption of IFQs are described in the preamble to the proposed rule establishing the IFQ Program published December 3, 1992 (57 FR 57130).

A central concern of the Council in developing the IFQ Program was that QS, from which IFQ is derived, would become increasingly held by corporate entities instead of independent fishermen who typically own and operate their own vessels. To prevent this outcome, the Council designed the IFQ Program such that QS could, in most cases, be held only by individuals or natural persons, and not by corporate entities. The Council provided limited exemptions to this basic approach to accommodate existing corporate ownership of vessels at the time of implementation and to recognize the participation by corporately owned freezer vessels. However, the overall intent of the IFQ Program was for catcher vessel QS eventually to be held only by individual fishermen. The IFQ Program is designed to limit corporate holding of QS and increase holdings of QS by individual fishermen as corporate owners divest themselves of QS. This provision is implemented through the QS and IFQ transfer regulations at 50 CFR 679.41.

This final rule revises the existing IFQ Program regulations and policy to explicitly allow a new group of non-profit entities to hold QS on behalf of residents of specific rural communities located adjacent to the coast of the GOA. This change would allow a non-profit corporate entity that meets specific criteria to receive transferred halibut or sablefish QS on behalf of an eligible community and to lease the resulting IFQ to fishermen who are residents of

Exhibit C.2.a
Supplemental NMFS VMS Report
June 2004

Vessel Monitoring System Report for
Pacific Fisheries Management Council
June 14-18, 2004

As of January 2004, the NOAA Fisheries, Office for Law Enforcement (OLE) is electronically monitoring Limited Entry Permit vessels fishing in State and Federal waters off the West Coast of the United States. Moreover, OLE has also implemented a call-in telephone declaration system for vessel owners to declare the gear type their vessel will be using while engaged in authorized fishing activity with a Rockfish Conservation Area (RCA).

Electronic monitoring of vessels through the OLE Vessel Monitoring System (VMS) is achieved through a five step process.

- Mobile Transceiver Units (MTU's) installed on fishing vessels derive their latitude and longitude position from Global Position Satellites (GPS).
- These GPS positions are then sent to an orbiting communications satellite.
- The communications satellite forwards the position report to a Land Earth Station (LES).
- The Land Earth Station (LES) forwards the position report to the OLE VMS.
- The OLE VMS processes the data received from the LES.

Mobile Transceiver Units

Vessel position reports are generated and delivered to a communications satellite via an MTU purchased by the vessel owner. Currently, there are four MTU's type approved by NOAA Fisheries, Office for Law Enforcement for the Pacific Coast Groundfish Fishery. The MTU Type Approval process ensures that approved units meet minimum technical requirements for accurate operations.

The four type approved units are;

Satellite Network	Manufacturer	Model Number
Inmarsat C	Thrane and Thrane	3022D-NMFS
Inmarsat C	Thrane and Thrane	3026-NMFS
Inmarsat D+	Satamatics	SAT 101 NMFS/PCG
Orbcomm	Stellar	2500G-NMFS

** Argos MTU's have been "grand fathered" into the West Coast Groundfish Fishery for those vessels that also fish in Alaska, and are required to have an active type approved VMS unit for Alaska fisheries. **

Communications Providers / Land Earth Stations

Depending on the MTU purchased by the vessel owner, several communications providers are available to provide “air time”. The “air time” component of VMS is comparable to the purchase of a cell phone, where the user purchases a cell phone (hardware) and minutes per month (air time). Similarly, the VMS system requires an MTU (hardware) and messages from the MTU (air time) that take the form of position reports or other message traffic such as email. The various communication providers sell “air time” in two ways, by the message, such as by position report, or by a monthly flat fee which provides a set amount of “air time”. The communications providers approved for the Pacific Coast Groundfish Fishery are;

Communication Provider	Satellite Network	MTU’s
Telenor	Inmarsat C	TT3022D, TT3026
Xantic	Inmarsat C	TT3022D, TT3026
Satamatics	Inmarsat D+	SAT 101
Skymate Wireless	Orbcomm	Stellar 2500G

Equipment Performance

Since the rollout of VMS for the West Coast Groundfish Fishery, OLE has received consistent position reports from most MTU’s. However, OLE has observed and encountered the following issues and/or anomalies regarding some type approved MTU’s.

The MTU that we have experienced the majority of issues with is the Skymate / Stellar 2500 G. The reason the majority of all issues encountered are with the Skymate unit is, that the Skymate unit accounts for 83% of all new MTU’s sold for the West Coast Groundfish Fishery. Even when accounting for Argos units that have been “grand fathered” in for vessels from Alaska, Skymate accounts for over 70% of all MTU’s in the fleet.

Skymate has provided us with the following breakdown for all MTU issues that they have encountered.

- Approximately 85% of all issues encountered by Skymate are a result of MTU self installs. Skymate indicates that the most common self install issues are;

    1. Poor placement of MTU hardware. Placement of antennas is especially critical, so that the MTU can properly “see” the satellite. Installing an antenna that is blocked by an obstruction, or is installed too close to like frequency antennas (VHF) that can interfere with the proper functioning of the MTU antenna.

2. Cables that have been damaged or kinked during installation.

- Approximately 15% of issues encountered by Skymate are a result of firmware anomalies (i.e., computer programming issues) on the MTU. One issue concerned vessels that did not have computers connected to the Skymate MTU. As Skymate messaging to and from the MTU is sent in the form of an email message, vessels that did not have a computer connected to the MTU experienced an inbox overflow error. The immediate solution was to reboot these units when errors were encountered, clearing the inbox. The permanent solution is to re-program the MTU firmware to eliminate the error. Re-programming of the MTU firmware has been accomplished and has been installed on test vessels. The upgraded firmware will be installed on all Skymate units in the fleet (at no cost to vessel owners) by July 1, 2004.

Other day to day issues encountered are more basic, including;

- Vessel owners that have purchased and installed units, but have failed to activate them.
- Vessel owners that fail to make new declarations when they change fisheries.
- Interpretation of groundfish regulations

Currently the OLE NW Division VMS has 270 activated units out of a potential pool of approximately 360 platforms. Position reports currently exceed 700,000.

Declaration System

Running in tandem with the VMS system is the Pacific Coast Groundfish declaration system. The declaration system was established in conjunction with the VMS regulations to provide vessel owners a method to declare their intentions to fish in a conservation area consistent with the requirements of the regulations, and to specify the gear type their vessel will be using. The declaration system is a complimentary tool to VMS and assists Law Enforcement personnel in determining if a fishing vessel is in a proper location relative to a conservation area.

To date, NW OLE has received 540 declarations reports. The predominant number of declaration reports have fallen into the following categories; crab or lobster gear, limited entry bottom trawl gear, and limited entry fixed gear.

Future Projects

The MTU's type approved for the Pacific Coast Groundfish Fishery are two way messaging capable, that is, the units are able to send and receive messages. Two way messaging capability will enables future fisheries projects to be undertaken in addition to vessel position reporting. Future projects may include; catch and effort reporting and at sea declarations via e-mail

Expansion

The NOAA Fisheries Office of Law Enforcement (OLE) reports that the Pacific Coast Groundfish VMS is online and operating as intended. The declaration system is working well in tandem with VMS. At the November 2003 PFMC meeting, the Ad Hoc VMS Committee advised the Council that future expansion of the VMS Program should begin with the Directed Groundfish Open Access Fleet, a fleet comprised of approximately 1,200 vessels. The OLE is confident that VMS expansion can be accommodated under the current system and is prepared to move forward with expansion if the Council chooses this course of action.

Exhibit C.3
Situation Summary
June 2004

FINAL CONSIDERATION OF 2004 INSEASON ADJUSTMENTS

Situation: The Council set optimum yield (OY) levels and various management measures for the 2004 groundfish management season with the understanding these management measures will likely need to be adjusted periodically through the year in order to attain, but not exceed, the OYs.

The Groundfish Management Team (GMT) and the Groundfish Advisory Subpanel (GAP) may pose key policy questions and receive Council guidance on inseason actions under agendum C.1. Under this agendum, the Council will receive updates on appropriate groundfish fisheries and consider adopting final inseason adjustments.

The GMT incorrectly recommended sablefish tier limits that were calculated using the 2004 acceptable biological catch (ABC) for the area north of 36° N. lat. (8,185 mt) instead of the OY for that area (7,510 mt). The Council will consider remedial inseason action at their June 2004 meeting to keep from exceeding the limited entry fixed gear sablefish allocation. Other potential topics under this agendum include, corrective trip limit adjustments to limited entry trawl flatfish and midwater fisheries north of 40°10' N. lat., and consideration of midwater trawl opportunities for chilipeppers south of 40°10' N. lat.

The Council is to consider advice from advisory bodies and the public on the status of ongoing fisheries and recommended inseason adjustments and adopt changes as necessary.

Council Action:

1. **Consider information on the status of ongoing fisheries.**
2. **Consider and adopt inseason adjustments as necessary.**

Reference Materials:

None.

Agenda Order:

a. Agendum Overview — Mike Burner
b. Reports and Comments of Advisory Bodies
c. Public Comment
d. **Council Action:** Approve Inseason Adjustments in the 2004 Groundfish Fishery

PFMC
05/25/04

Exhibit C.3.b
Supplemental GAP Report
June 2004

GROUNDFISH ADVISORY SUBPANEL STATEMENT ON FINAL CONSIDERATION OF 2004 INSEASON ADJUSTMENTS

The Groundfish Advisory Subpanel (GAP) met jointly with the Groundfish Management Team (GMT) to discuss various inseason adjustments. The GAP makes the following recommendations.

Sablefish Tier Limits

As was noted by the GMT, a calculation error resulted in sablefish tier limits being set too high, leading to the risk that the fixed gear sablefish portion of the optimum yield (OY) might be exceeded. The GAP explored a number of different options that would put the burden of solving the problem on the fishery that inadvertently received a benefit. Unfortunately, with the time and data available to us, we were unable to construct a plan that would both provide equity and prevent the fishery from exceeding total catch limits. The majority of the GAP therefore recommends that the Council reduce the daily trip limit fishery north of 36° to 300 lbs/day - 900 lbs./week with a 2 month cumulative limit of 3,200 lbs. We also request that the fixed gear sablefish fishery be closely monitored so that an in-season adjustment can be made at the October/November Council meeting to raise the daily trip limit fishery in period 6 if warranted.

A minority of the GAP put forward a separate option which would reduce only the limited entry portion of the daily-trip-limit fishery to the level recommended above. The minority believes that the level of participation in the open access segment of the daily trip limit fishery is low enough so that the necessary savings can be achieved without reducing that fishery.

Whiting Trawl Fishery

As a result of a single "disaster" tow, canary bycatch in the mothership sector of the whiting fishery exceeds by nearly four times the pre-season projected bycatch amount. The cause of the large tow remains unclear, but there is some correlation with the location being fished (near Heceta Bank) and the high tides that occurred at the time the tow was made.

The mothership fleet responded by leaving the area and in fact the mothership fishery is no longer operating at this point in the season. In the catcher-processor sector, only one vessel is operating and that vessel has received instructions to avoid the area and to temporarily stop fishing during the next high tide occurrence on July 4th. The main shore-based fishery based fishery began on June 15th. Shore-based processors who are members of the West Coast Seafood Processors Association have been told to advise their vessels to avoid Heceta Bank and to temporarily stop fishing during the July high tide period.

Given the facts that the bycatch overage was caused by a single unpredictable tow, that the industry has already taken voluntary steps to avoid a recurrence if at all possible, and that the total projected canary impacts in the whiting fishery have not yet been reached, plus considering the guidance provided by the Council earlier today, the GAP recommends that industry and state and federal agencies work together to ensure the highest possible level of voluntary avoidance of canary rockfish throughout the whiting fishery. In addition, the GAP recommends that a regulatory process be started which would allow an early closure of the entire whiting fishery if a cumulative catch of 7.3 mt of canary is reached. Given the uncertainty of projections, the GAP emphasizes that the closure should occur when the 7.3 mt amount is reached, not based on a projection.

California Line Adjustment

The GAP is aware that a minor adjustment needs to be made to the coordinates of a line near Half Moon Bay. The GAP supports the adjustment.

Limited Entry Fixed Gear Fishery

The GAP recommends that the limited entry fixed gear cumulative limit for bocaccio rockfish between 40°10' and Point Conception be increased to 300 lbs./2 months. The increase in bocaccio population in this area has resulted in higher discards in the fixed gear fishery; the increase will allow those discards to be landed. We understand that the GMT has no objection to this recommendation.

Limited Entry Trawl Fishery

1. The GAP agrees with the GMT recommendations to make clerical changes which would specify that petrale is a sublimit of other flatfish north of 40°10'; that would remove the reference to a midwater yellowtail fishery in period 6; and that would provide for a midwater chilipepper fishery seaward of the Rockfish Conservation Area (RCA) south of 40°10'.

2. The GAP agrees with the changes to trawl cumulative limits recommended by the GMT in order to avoid early attainment of the OY on several species.

3. The GAP recommends three minor changes in cumulative limits that would allow landing incidental harvest which currently must be discarded:

   * provide an incidental limit of 500 lbs./ 2 months of lingcod coastwide by vessels using large footrope gear. The recovery of lingcod stocks has caused them to spread to deeper water seaward of the RCA, where they are more frequently being incidentally taken in the large footrope trawl fishery.

   * provide an incidental limit of 300 lbs./2 months of bocaccio south of 40°10' by vessels using either large or small footrope gear. Similar to the situation with fixed gear, this minor retention allowance will convert discard mortality to landed catch.

   * provide an incidental limit of 300 lbs./2 months of minor shelf rockfish north of 40°10' by vessels using large footrope gear. Their name notwithstanding, shelf rockfish are often found in deeper water seaward of the RCA. The small limit will not induce targeting and the OY for shelf rockfish will not have a chance of being attained.

The GAP understands that the GMT has no objection to these recommendations.

Exhibit C.3.b.
Supplemental GMT Report
June 2004

GROUNDFISH MANAGEMENT TEAM (GMT) REPORT ON FINAL CONSIDERATION OF INSEASON ADJUSTMENTS

The GMT has several inseason adjustments for the Council's consideration regarding the commercial fisheries. Based on the Council guidance under agenda item C.1., the GMT has estimated the potential results of the inseason adjustments that will be considered under this agenda item (Attachment 1); changes are noted in bold.

PRIMARY ISSUES

Sablefish Tier Limits

There was an error in the calculation of the sablefish tier limits that were published in the Federal Register. The calculation was made based on the sablefish ABC, rather than the OY, which resulted in higher tier limits for the primary fishery (see Exhibit C.6.a., Attachment 1, Chapter 2, p. 34). Specifically:

Tier	Incorrect Tier Limits (lbs) Calculated Using ABC	Correct Tier Limits (lbs) Calculated Using OY
1	69,600	64,300
2	31,600	29,200
3	18,100	16,700

Some of these tier limits have already been achieved and sablefish daily trip limit (DTL) catches are tracking higher (through May) this year than last year (256 mt compared to 241 mt). The GMT notes that if the sablefish tier limits are not changed, and if the full amount of the tier limits are achieved, then the estimated catch of sablefish will be 172 mt over the 2004 sablefish OY (see Attachment 2.). The tier limits through April are tracking slower this year than last year, and the GMT believes that it is unlikely that all of the sablefish tier limits will be maximized. However, if the sablefish tier limits are corrected (which will take about two weeks to take effect), then fishers may maximize their tier limits in anticipation of the reduction. The DTL sablefish fishery limits were raised in November 2003 to 300 lbs/day; 900 lbs/week; not to exceed 3600 lbs/2 months (from 300 lbs/day; 800 lbs/week; not to exceed 3200 lbs/2 months).

The GMT has identified the alternative of reducing the DTL limits for both limited entry and open access back to the pre-November levels. The GMT believes that this action will result in a total sablefish mortality of 45 mt above the OY of 7,510 mt (0.6% over the OY). Action alternatives for this fishery include:

1. Change the sablefish tier limits to the correct amounts based on the OY, and/or
2. Reduce the DTL limits for limited entry and open access

With regard to not taking any action at this time, the GMT estimates that by the September Council meeting, over 80% of the DTL (limited entry and open access combined) will have occurred, as well as the majority of the tier limits. This would likely put us over the sablefish OY and would require inseason action to constrain other fisheries that harvest sablefish, such as trawl.

Although there is a formal allocation of sablefish to the open-access fleet, historically it has proven difficult to precisely manage the daily-trip-limit (DTL) fisheries in limited entry and open access independently. Closure of the limited-entry DTL fishery would allow all permitted vessels to use their endorsed gear to fish under the open-access limits. If the limited-entry fishery remains open, but the trip limit is reduced, relative to open access, any or all of the higher open-access limit can be landed by a limited-entry vessel using a non-endorsed gear. In either of these cases, the landings of limited-entry vessels continue to accrue to the limited-entry fleet. As a result, management has typically had to manage these fisheries to their combined target tonnage.

Whiting Trawl Fishery

There was a larger than anticipated catch of canary rockfish in the mothership sector of the whiting fishery in early June. Specifically, one catcher vessel caught an estimated 3.9 mt of canary off Heceta Bank, bringing the estimated mothership canary catch to 4.0 mt (compared to the 0.9 mt the GMT has estimated for this sector in the bycatch scorecard). To date, it is estimated that the mothership, catcher-processor, and tribal whiting fisheries combined have caught 4.5 mt of canary rockfish (note: the shoreside fishery has begun in northern California, and starts today off Oregon and Washington).

In order to help ensure that the whiting fisheries stay within an estimated impact of 7.3 mt of canary rockfish, the GMT supports the Council's guidance to advocate voluntary area closures for the whiting fishery, including the area off Heceta Bank as well as areas off northern Washington that have been identified through the Washington arrowtooth flounder EFP. In addition, the GMT understands that NMFS will monitor the bycatch in the whiting fishery and will take emergency action to close all or some of the sectors of the fishery to stay within the 7.3 mt projected bycatch of canary rockfish, if necessary.

Research Catches

The GMT has received an update from the NWFSC that the current catch of canary rockfish in the NMFS shelf trawl survey is 1.0 mt during the first of five segments off northern Washington (note: the GMT had anticipated a total of 1.0 mt of canary in all research catches (including SRPs and LOAs) combined–NMFS Triennial trawl survey, NMFS shelf trawl survey, NMFS slope survey, IPHC halibut survey, and Canadian whiting survey). At this time, the GMT cannot predict the total amount of canary rockfish that will be taken in the research surveys, but believes that 3.0 mt is a reasonable placeholder.

LIMITED ENTRY TRAWL

The GMT recommends the following regulatory corrections and inseason adjustments:

Regulatory Corrections

North of 40°10'

1. Specify petrale sublimit of 100,000/2 mo. for large footrope and midwater gear as a sublimit of "All other flatfish," not as additional fish, for periods 2-5
2. Remove midwater widow and yellowtail fishery currently scheduled in trip limit table for period 6

South of 40°10'

3. Clarify that there is no small footrope trip limit differential S. of 40°10'; fishers are not constrained to smaller trip limits for the entire period if small footrope gear is used (this restriction only applies N. of 40°10')

Inseason Adjustments

Coastwide

4. As a result of QSM tracking higher than projected for shortspine, sablefish, Dover and petrale, adjust trip limits downward as specified in Attachment 3.
5. Allow a lingcod incidental trip limit of 500 lbs/2 mo. seaward of the RCA for large footrope (N. of 40°10') and for large footrope and midwater gear (S. of 40°10') for the remainder of the year

North of 40°10'

6. Allow a widow and minor shelf rockfish incidental trip limit of 300 lbs/2 mo. seaward of the RCA for large footrope for the remainder of the year
7. As midwater gear is not used other than in the whiting fishery, and the only incidental catch allowance for the whiting fishery is for widow and yellowtail rockfish, the GMT recommends removing references to midwater gear in the trip limit tables, except for the midwater whiting, widow and yellowtail trip limits (Note: The attached trip limit tables do not reflect this change).
8. With regard to having more than one type of gear onboard, vessels that have both large footrope and midwater trawl gear onboard while trawling seaward of the RCA would be allowed to access the higher large footrope trip limits (Note: The attached trip limit tables do not reflect this change).

South of 40°10'

9. Allow midwater gear seaward of RCA only to provide chilipepper fishery without impacting bocaccio; trip limits would be same as large footrope limit of 12,000 lbs/2 mo. for July and August, then 8,000 lbs/2 mo. for September through December. Because midwater gear is being tied with large footrope, trip limits for canary and minor nearshore will now be the same as large footrope (which is closed) for the remainder of the year.
10. Increase trip limit for bocaccio for large footrope and midwater trawl seaward of the RCA to the same amount as limited entry fixed gear to accommodate incidental catches to 300 lbs/2 mo. for the remainder of the year

LIMITED ENTRY FIXED GEAR

Between 40°10' and 34°27' (Pt. Conception)

11. Increase trip limit for bocaccio to the same amount as limited entry fixed gear south of Pt. Conception to accommodate incidental catches to 300 lbs/2 mo. for the remainder of the year

MANAGEMENT LINES

12. Adjust the coordinates for the 75-fm RCA boundary to adhere more closely to the depth contour which will allow access to sandy area for sanddab fishing in the Half Moon Bay area

GMT Recommendations

1. Adopt changes to sablefish fixed gear fisheries; specific options include:
   - Change the sablefish tier limits to the correct amounts based on the OY, and/or
   - Reduce the DTL limits for limited entry and open access
2. Confirm the inseason adjustment for the whiting fishery as presented under agenda item C.1.
3. Adopt commercial fishery regulatory corrections and inseason adjustments for limited entry trawl, limited entry fixed gear, and the 75-fm management line off California (Commercial Alternatives 1-12)

DRAFT C.3.b Attachment 1. Estimated Impacts as a Result of Proposed Inseason Adjustments

6/15/04 10:29

a

Fishery	Bocaccio a/	Canary	Cowcod	Dkbl	Lingcod	POP	Widow	Yelloweye
Limited Entry Groundfish								
Trawl- Non-whiting	**47.4**	**9.2**	**0.4**	**75.6**	**104.7**	**95.0**	2.5	**0.2**
Fixed Gear	13.4	0.9	0.1	0.8	20.0	0.3	0.5	2.5
Whiting								
At-sea whiting motherships		7.3		1.4	0.3	1.7	59.7	0.0
At-sea whiting cat-proc				7.6	0.4	10.1	84.6	0.4
Shoreside whiting				0.5	0.7	0.4	29.9	0.0
Tribal whiting				0.0	0.5	1.5	37.1	0.0
Open Access								
Groundfish directed	10.6	1.0	0.1	0.2	70.0	0.1		0.6
CA Halibut	0.1			0.0	2.0	0.0		
CA Gillnet b/	0.5			0.0		0.0	0.0	
CA Sheephead b/				0.0		0.0	0.0	0.0
CPS- wetfish b/	0.3							
CPS- squid c/								
Dungeness crab b/	0.0		0.0	0.0		0.0		
HMS b/		0.0	0.0	0.0				
Pacific Halibut b/	0.0		0.0	0.0		0.0	0.0	0.5
Pink shrimp	0.1	0.5	0.0	0.0	0.5	0.0	0.1	0.1
Ridgeback prawn	0.1	0.0	0.0	0.0	0.0	0.0	0.0	0.0
Salmon troll	0.2	1.6	0.0	0.0	0.3	0.0	0.0	0.2
Sea Cucumber	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
Spot Prawn (trap)								
Tribal								
Midwater Trawl		1.3		0.0	0.1	0.0	40.0	0.0
Bottom Trawl		0.5		0.0	9.0	0.0	0.0	0.0
Troll		0.5		0.0	1.0	0.0		0.0
Fixed gear		0.3		0.0	15.0	0.0	0.0	2.3
Recreational Groundfish								
WA d/		1.7			65.0			3.5
OR		6.8			109.7		1.4	3.2
CA e/	62.8	9.3	1.8		268.9		1.4	3.7
Research: Based on 2 most recent NMFS trawl shelf and slope surveys, the IPHC halibut survey, and LOAs with expanded estimates for south of Pt. Conception.								
	2.0	**3.0**		1.6	3.0	3.0	1.5	1.1
Non-EFP Total	137.5	43.9	2.4	87.7	671.1	112.1	258.7	18.4
EFPs f/								
CA: NS FF trawl	10.0	0.5	0.5		20.0			0.5
OR: DTS g/		**0.0**		**0.2**		**0.6**		**0.0**
WA: AT trawl		**1.0**		3.0	4.5	8.5	5.5	0.5
WA: dogfish LL		**0.0**		**0.0**	**0.5**	**0.0**	**0.0**	**0.0**
WA: pollock		0.1					1.5	0.1
EFP Subtotal	10.0	1.6	0.5	3.2	25.0	9.1	7.0	1.1
TOTAL	147.5	45.5	2.9	90.9	696.1	121.2	265.7	19.5
2004 OY	250	47.3	4.8	240	735	444	284	22
Difference	102.5	1.8	1.9	149.1	38.9	322.8	18.3	2.5
Percent of OY	59.0%	96.2%	60.4%	37.9%	94.7%	27.3%	93.6%	88.5%
Key	▨	= either not applicable; trace amount (<0.01 mt); or not reported in available data sources.						

a/ South of 40°10' N. lat.

b/ Mortality estimates are not hard numbers; based on the GMT's best professional judgement.

c/ Bycatch amounts by species unavailable, but bocaccio occurred in 0.1% of all port samples and other rockfish in another 0.1% of all port samples (and squid fisheries usually land their whole catch). In 2001, out of 84,000 mt total landings 1 mt was groundfish. This suggests that total bocaccio was caught in trace amounts.

d/ Estimates for yelloweye have not been updated.

e/ Estimates for bocaccio, cowcod, widow, and yelloweye have not been updated.

f/ Values are proposed EFP bycatch caps, not estimates of total mortality. The EFP is terminated inseason if the cap is projected to be attained early.

g/ The darkblotched rockfish and Pacific ocean perch caps are not defined yet for this EFP but are expected to be lower than the placeholders in this scorecard.

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Jim Hastie

Attachment 2.--Review of potential overage amounts in the limited-entry fixed-gear primary sablefish fishery

	Percentage of participating permits that take the higher limits		
	100%	75%	50%
Limited-entry primary fishery			
Overage (mt) if all permits landed their limits	172 mt	129	86
Unlanded 2003 tier tonnage	46 mt	46	46
Net overage if same tonnage unlanded in 2004	126 mt	83	40
Limted-Entry DTL fishery			
Tonnage difference between 2003 landings and 2004 target	84	84	84
Net LE overage if same DTL mts as in ~~2004~~ 2003	41	-2	-45
OA DTL fishery			
Difference between 2003 landings and 2004 target	35	35	35
Net overage if same DTL mts as in ~~2004~~ 2003	6	-37	-80

	Monthly distribution of primary fishery landings	
Month	Monthly percentage	Cumulative percentage
4	2%	2%
5	10%	12%
6	18%	30%
7	20%	50%
8	15%	65%
9	25%	90%
10	10%	100%

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Attachment 3

Table 1. Initial Model Projection vs. QSM

QSM and Model Projected Limited Entry Landings through Period 2 (April)

		Period 1	Initial Period 1 Model Projection	Period 2	Initial Period 2 Model Projection	Total QSM thru April	Total Model Thru April
N 40 10	Longspine THDS	23.2	32.8	56.6	82.8	112.5	115.6
	Shortspine THDS	26.1	23.1	59.1	47.7	108.3	70.9
	TWL Sable (V&C&E&M)	145.4	113.5	196.6	165.8	455.6	279.4
	Dover sole	930.5	770.4	1,142.1	1,139.6	2,842.9	1,910.0
	Petrale	861.8	771.5	215.8	185.6	1,849.1	957.1
	English Sole	123.7		55.8		179.5	
	Arrowtooth Flounder	269.6	100.2	226.9	148.8	596.7	249.0
	Remaining Flatfish	89.4		72.9		162.3	
	Remaining Flat & Eng	213.1	308.6	128.7	437.0	341.7	745.6
S 40 10	Longspine THDS	58.8	20.9	49.4	37.8	129.2	58.7
	Shortspine THDS	19.7	18.7	22.5	28.2	61.0	46.9
	TWL Sable (V&C&E&M)	44.6	42.7	58.4	58.8	145.7	101.5
	Dover sole	191.5	149.6	231.9	242.4	573.1	392.0
	Petrale	30.2	51.3	57.2	27.8	138.7	79.1
	English Sole	16.3		14.2		30.5	
	Arrowtooth Flounder	0.4	2.4	0.1	1.2	2.8	3.6
	Remaining Flatfish	37.6		61.1		98.7	
	Remaining Flat & Eng	53.9	260.0	75.3	143.5	129.3	403.5

Table 2. Revised Total Mortality Estimates using new Bimonthly Limits

		North	South	Total
Rebuilding Species	Lingcod	64.7	30.5	95.2
	Canary	8.6	0.7	9.2
	POP	95.0	0.0	95.0
	Darkblotche	62.9	12.7	75.6
	Widow	2.4	0.1	2.5
	Bocaccio	0.0	47.3	47.3
	Y'eye	0.1	0.1	0.2
	Cowcod	0.0	0.4	0.4
Target Species	Sablefish	2,695	583	3,278
	Longspine	357	372	729
	Shortspine	663	243	906
	Dover	4,944	2,198	7,142
	Arrowt'th	2,051	211	2,262
	Petrale	2,347	285	2,632
	Othr Flat & Eng. Sole	2,634	1,518	4,152
	Slope Rock	203	332	536

Table 3. Revised Trip Limit and RCA Boundaries

SUBAREA	Period	INLINE	OUTLINE	Sablefish	Longspine	Shortspine	Dover	Othr Flat & Eng	Petrale Sublimit	Arrowtooth	Slope Rock
N 40 10	1	75	150	9,300	15,000	3,100	67,500	100,000	No Limit	No Limit	8,000
	2	60	150	9,300	15,000	3,100	67,500	100,000	100,000	150,000	8,000
	3	60	150	16,000	18,000	4,500	32,000	100,000	100,000	150,000	8,000
	4	75	150	15,000	18,000	4,100	31,000	100,000	30,000	150,000	8,000
	5	75	150	15,000	18,000	4,100	31,000	100,000	30,000	150,000	8,000
	6	75	150	11,000	18,000	4,100	50,000	100,000	No Limit	No Limit	8,000
North Small Footrope Limit	1	75	150	2,000	1,000	1,000	10,000	30,000	10,000	4,000	
	2	60	150	2,000	1,000	1,000	10,000	30,000	10,000	4,000	
	3	60	150	10,000	1,000	3,000	27,000	80,000	30,000	11,000	
	4	75	150	10,000	1,000	3,000	27,000	80,000	26,000	11,000	
	5	75	150	10,000	1,000	3,000	27,000	80,000	26,000	11,000	
	6	75	150	5,000	1,000	1,000	18,000	70,000	20,000	8,000	
38 - 40 10	1	75	150	11,200	15,000	3,000	39,000	100,000	No Limit	No Limit	10,000
	2	75	150	11,200	15,000	3,000	39,000	100,000	20,000	10,000	10,000
	3	100	150	14,500	18,000	4,500	49,000	120,000	20,000	10,000	50,000
	4	100	150	13,000	18,000	4,100	48,000	120,000	20,000	10,000	50,000
	5	75	150	13,000	18,000	4,100	48,000	120,000	20,000	10,000	50,000
	6	75	150	13,000	18,000	4,100	49,000	120,000	No Limit	No Limit	50,000
S 38	1	75	150	11,200	15,000	3,000	39,000	100,000	No Limit	No Limit	40,000
	2	75	150	11,200	15,000	3,000	39,000	100,000	20,000	10,000	40,000
	3	100	150	14,500	18,000	4,500	49,000	120,000	20,000	10,000	50,000
	4	100	150	13,000	18,000	4,100	48,000	120,000	20,000	10,000	50,000
	5	75	150	13,000	18,000	4,100	48,000	120,000	20,000	10,000	50,000
	6	75	150	13,000	18,000	4,100	49,000	120,000	No Limit	No Limit	50,000

Table 3 (North). 2004 Trip Limits and Gear Requirements[1/] for Limited Entry Trawl Gear North of 40°10' N. Latitude[2/]

Other Limits and Requirements Apply -- Read Sections IV. A. and B. NMFS Actions before using this table

062004

		JAN-FEB	MAR-APR	MAY-JUN	JUL-AUG	SEP-OCT	NOV-DEC
	Rockfish Conservation Area[10/] (RCA): North of 40°10' N. lat.	75 fm - modified 200 fm[11/]	60 fm - 200 fm	60 fm - 150 fm	75 fm - 150 fm		
Small footrope or midwater trawl gear is required shoreward of the RCA; all trawl gear (large footrope, midwater trawl, and small footrope gear) is permitted seaward of the RCA.							
A vessel may have more than one type of limited entry bottom trawl gear on board, but the most restrictive trip limit associated with the gear on board applies for that trip and will count toward the cumulative trip limit for that gear. A vessel that is trawling within the RCA (or other closed area) with trawl gear authorized for use within the RCA (or other closed area) may not have any other type of trawl gear on board. **See IV.A.(14)(iv) for details.**							
1	**Minor slope rockfish[3/]**	4,000 lb/ 2 months		8,000 lb/ 2 months			
2	**Pacific ocean perch**	3,000 lb/ 2 months					
3	**DTS complex**	Providing only large footrope or midwater trawl gear is used to land any groundfish species during the entire limit period, then large footrope trawl trip limits apply. If small footrope gear[7/] is used at any time in any area (North ~~or South~~ of 40°10' N. lat., shoreward or seaward of RCA) during the entire limit period, then small footrope trawl limits apply.					
4	Sablefish						
5	large footrope or midwater trawl gear	9,300 lb/ 2 months		16,000 lb/ 2 months	**15,000 lb/ 2 months**		11,000 lb/ 2 months
6	small footrope gear[7/]	2,000 lb/ 2 months		10,000 lb/ 2 months			5,000 lb/ 2 months
7	Longspine thornyhead						
8	large footrope or midwater trawl gear	15,000 lb/ 2 months		18,000 lb/ 2 months			
9	small footrope gear[7/]	1,000 lb/ 2 months					
10	Shortspine thornyhead						
11	large footrope or midwater trawl gear	3,150 lb/ 2 months		4,500 lb/ 2 months	**4,100 lb/ 2 months**		
12	small footrope gear[7/]	1,000 lb/ 2 months		3,000 lb/ 2 months			1,000 lb/ 2 months
13	Dover sole						
14	large footrope or midwater trawl gear	67,500 lb/ 2 months		32,000 lb/ 2 months	**31,000 lb/ 2 months**		50,000 lb/ 2 months
15	small footrope gear[7/]	10,000 lb/ 2 months		27,000 lb/ 2 months			18,000 lb/ 2 months
16	**Flatfish**	Providing only large footrope or midwater trawl gear is used to land any groundfish species during the entire limit period, then large footrope trawl trip limits apply. If small footrope gear[7/] is used at any time in any area (North ~~or South~~ of 40o10' N. lat., shoreward or seaward of RCA) during the entire limit period, then small footrope trawl limits apply.					
17	All other flatfish, Petrale sole, & Rex sole						
18	large footrope or midwater trawl gear for All other flatfish[4/] & Rex sole	100,000 lb/ 2 months			**All other flatfish, rex sole, and petrale sole: 100,000 lb/ 2 months, no more than 30,000 lb/ 2 months of which may be petrale sole.**		100,000 lb/ 2 months
19	large footrope or midwater trawl gear for Petrale sole	Not limited	100,000 lb/ 2 months				Not limited
20	small footrope gear[7/]	30,000 lb/ 2 months, no more than 10,000 lb/ 2 months of which may be petrale sole.		80,000 lb/ 2 months, no more than 30,000 lb/ 2 months of which may be petrale sole.	**80,000 lb/ 2 months, no more than 26,000 lb/ 2 months of which may be petrale sole.**		70,000 lb/ 2 months, no more than 20,000 lb/ 2 months of which may be petrale sole.
21	Arrowtooth flounder						
22	large footrope or midwater trawl gear	Not limited	150,000 lb/ 2 months				Not limited
23	small footrope gear[7/]	4,000 lb/ 2 months	11,000 lb/ 2 months				8,000 lb/ 2 months

Table 3 (North). Continued

24	**Whiting**[5/]	Before the primary whiting season: 20,000 lb/trip -- During the primary season: mid-water trawl permitted in the RCA. See IV.B.(3)(b) for season and trip limit details. -- After the primary whiting season: 10,000 lb/trip					
25	**Minor shelf rockfish**[3/] **& Widow rockfish**						
26	large footrope trawl	CLOSED[6/]			**300 lb/2 months**		
27	midwater trawl for Widow rockfish	Before the primary whiting season: CLOSED[6/] -- During primary whiting season: In trips of at least 10,000 lb of whiting, combined widow and yellowtail limit of 500 lb/ trip, cumulative widow limit of 1,500 lb/ month. Mid water trawl permitted in the RCA. See IV.B.(3)(b) for primary whiting season and trip limit details. -- After the primary whiting season: CLOSED[6/]					~~12,000 lb/ 2 months~~ **CLOSED6/**
28	midwater for Minor shelf rockfish or small footrope trawl[7/] for minor shelf & widow	300 lb/ month		1,000 lb/ month, no more than 200 lb/ month of which may be yelloweye rockfish			300 lb/ month
29	**Canary rockfish**						
30	large footrope trawl	CLOSED[6/]					
31	midwater or small footrope trawl[7/]	100 lb/ month		300 lb/ month		100 lb/ month	
32	**Yellowtail**						
33	large footrope trawl	CLOSED[6/]					
34	midwater trawl	Before the primary whiting season: CLOSED[6/] -- During primary whiting season: In trips of at least 10,000 lb of whiting: combined widow and yellowtail limit of 500 lb/ trip, cumulative yellowtail limit of 2,000 lb/ month. Mid-water trawl permitted in the RCA. See IV.B.(3)(b) for primary whiting season and trip limit details. -- After the primary whiting season: CLOSED[6/]					~~18,000 lb/ 2 months~~ **CLOSED6/**
35	small footrope trawl[7/]	In landings without flatfish, 1,000 lb/ month. As flatfish bycatch, per trip limit is the sum of 33% (by weight) of all flatfish except arrowtooth flounder, plus 10% (by weight) of arrowtooth flounder. Total yellowtail landings not to exceed 10,000 lb/ 2 months, no more than 1,000 lb/ month of which may be landed without flatfish.					
36	**Minor nearshore rockfish**						
37	large footrope trawl	CLOSED[6/]					
38	midwater or small footrope trawl[7/]	300 lb/ month					
39	**Lingcod**[8/]						
40	large footrope trawl	CLOSED[6/]			**500 lb/ 2 months**		
41	midwater or small footrope trawl[7/]	800 lb/ 2 months		1,000 lb/ 2 months		800 lb/ 2 months	
42	**Other Fish**[9/]	Not limited					

1/ Gear requirements and prohibitions are explained above. See IV. A.(14).

2/ "North" means 40°10' N. lat. to the U.S.-Canada border. 40°10' N. lat. is about 20 nm south of Cape Mendocino, CA.

3/ Bocaccio and chilipepper are included in the trip limits for minor shelf rockfish and splitnose rockfish is included in the trip limits for minor slope rockfish.

4/ "Other" flatfish means all flatfish at 50 CFR 660.302 except those in this Table 3 with species specific management measures, including trip limits.

5/ The whiting "per trip" limit in the Eureka area shoreward of 100 fm is 10,000 lb/ trip all year. Outside Eureka area, the 20,000 lb/ trip limit applies. See IV. B.(3).

6/ Closed means that it is prohibited to take and retain, possess, or land the designated species in the time or area indicated. See IV. A.(7).

7/ Small footrope trawl means a bottom trawl net with a footrope no larger than 8 inches (20 cm) in diameter.

8/ The minimum size limit for lingcod is 24 inches (61 cm) total length.

9/ Other fish are defined at 50 CFR 660.302, as those groundfish species or species groups for which there is no trip limit, size limit, quota, or harvest guideline.

10/ The "Rockfish Conservation Area" is a gear and/or sector specific closed area generally described by depth contours but specifically defined by lat/long coordinates set out at IV. A.(17)(f), that may vary seasonally.

11/ The "modified 200 fm" line is modified to exclude certain petrale sole areas from the RCA.

To convert pounds to kilograms, divide by 2.20462, the number of pounds in one kilogram.

Table 3 (South). 2004 Trip Limits and Gear Requirements[1/] for Limited Entry Trawl Gear South of 40°10' N. Latitude[2/]

Other Limits and Requirements Apply -- Read Sections IV. A. and B. NMFS Actions before using this table 062004

		JAN-FEB	MAR-APR	MAY-JUN	JUL-AUG	SEP-OCT	NOV-DEC
	Rockfish Conservation Area[10/] (RCA):						
	40°10' - 34°27' N. lat.	75 fm - 150 fm (additional closure between the shoreline and 10 fm around the Farallon Islands)		100 fm - 150 fm (additional closure between the shoreline and 10 fm around the Farallon Islands)		75 fm - 150 fm (additional closure between the shoreline and 10 fm around the Farallon Islands)	
	South of 34°27' N. lat.	75 fm - 150 fm along the mainland coast; shoreline - 150 fm around islands		100 fm - 150 fm along the mainland coast; shoreline - 150 fm around islands		75 fm - 150 fm along the mainland coast; shoreline - 150 fm around islands	
	Small footrope or midwater trawl gear is required shoreward of the RCA; all trawl gear (large footrope, midwater trawl, and small footrope gear) is permitted seaward of the RCA.						
	A vessel may have more than one type of limited entry bottom trawl gear on board, but the most restrictive trip limit associated with the gear on board applies for that trip and will count toward the cumulative trip limit for that gear. A vessel that is trawling within the RCA (or other closed area) with trawl gear authorized for use within the RCA (or other closed area) may not have any other type of trawl gear on board. **See IV.A.(14)(iv) for details.**						
1	**Minor slope rockfish[3/]**						
2	40°10' - 38° N. lat.	7,000 lb/ 2 months		50,000 lb/ 2 months			
3	South of 38° N. lat.	40,000 lb/ 2 months					
4	**Splitnose**						
5	40°10' - 38° N. lat.	7,000 lb/ 2 months		50,000 lb/ 2 months			
6	South of 38° N. lat.	40,000 lb/ 2 months					
7	**DTS complex**	If fishing North of 40°10' N. lat. at any time during the cumulative limit period, differential trip limits based on footrope size and crossover provisions will apply during the entire limit period. See Table 3 (North) and Section A. (12) for more details					
8	Sablefish	11,250 lb/ 2 months		14,500 lb/ 2 months	**13,000 lb/ 2 months**		
9	Longspine thornyhead	15,000 lb / 2 months		18,000 lb / 2 months			
10	Shortspine thornyhead	3,000 lb/ 2 months		4,500 lb/ 2 months	**4,100 lb/ 2 months**		
11	Dover sole	39,000 lb/ 2 months		49,000 lb/ 2 months	**48,000 lb/ 2 months**		49,000 lb/ 2 months
12	**Flatfish**	If fishing North of 40°10' N. lat. at any time during the cumulative limit period, differential trip limits based on footrope size and crossover provisions will apply during the entire limit period. See Table 3 (North) and Section A. (12) for more details					
13	All other flatfish[4/] & Rex sole	100,000 lb/ 2 months	All other flatfish plus petrale & rex sole: 100,000 lb/ 2 months, no more than 20,000 lb/ 2 months of which may be petrale sole	All other flatfish plus petrale & rex sole: 120,000 lb/ 2 months, no more than 20,000 lb/ 2 months of which may be petrale sole			120,000 lb/ 2 months
14	Petrale sole	No limit					No limit
15	Arrowtooth flounder	No limit	10,000 lb/ 2 months				No limit
16	**Whiting[5/]**	Before the primary whiting season: 20,000 lb/trip -- During the primary whiting season: mid-water trawl permitted in the RCA. See IV.B.(3)(b) for season and trip limit details. -- After the primary whiting season: 10,000 lb/trip					
17	**Minor shelf rockfish, Widow, and Chilipepper rockfish[3/]**	Providing only large footrope trawl gear is used to land any groundfish species during the entire limit period, then large footrope limit applies.					
18	**large footrope or midwater trawl for Minor shelf rockfish**	300 lb/ month					
19	**large footrope or midwater trawl for Chilipepper rockfish**	2,000 lb/ 2 months		12,000 lb/ 2 months		8,000 lb/ 2 months	
20	large footrope or midwater trawl for Widow rockfish	CLOSED[6/]					
21	**small footrope trawl[7/] for minor shelf, widow & chilipepper**	300 lb/ month					
22	**Bocaccio**	Providing only large footrope trawl gear is used to land any groundfish species during the entire limit period, then large footrope limit applies.					
23	**large footrope or midwater trawl**	100 lb/month			**300 lb/ 2 month**		
24	small footrope trawl[7/]	CLOSED[6/]					

Table 3 (South). Continued

25	**Canary rockfish**			
26	**large footrope or midwater trawl**	CLOSED[6/]		
27	small footrope trawl[7/]	100 lb/ month	300 lb/ month	100 lb/ month
28	**Cowcod**	CLOSED[6/]		
29	**Minor nearshore rockfish**			
30	**large footrope or midwater trawl**	CLOSED[6/]		
31	small footrope trawl[7/]	300 lb/ month		
32	**Lingcod[8/]**			
33	**large footrope or midwater trawl**	CLOSED6/		**500 lb/ 2 months**
34	small footrope trawl[7/]	800 lb/ 2 months	1,000 lb/ 2 months	800 lb/ 2 months
35	**Other Fish[9/]**	Not limited		

1/ Gear requirements and prohibitions are explained above. See IV. A.(14).

2/ "South" means 40°10' N. lat. to the U.S.-Mexico border. 40°10' N. lat. is about 20 nm south of Cape Mendocino, CA.

3/ Yellowtail is included in the trip limits for minor shelf rockfish and POP is included in the trip limits for minor slope rockfish.

4/ "Other" flatfish means all flatfish at 50 CFR 660.302 except those in this Table 3 with species specific management measures, including trip limits.

5/ The whiting "per trip" limit in the Eureka area shoreward of 100 fm is 10,000 lb/ trip all year. Outside Eureka area, the 20,000 lb/ trip limit applies. See IV. B.(3).

6/ Closed means that it is prohibited to take and retain, possess, or land the designated species in the time or area indicated. See IV. A.(7).

7/ Small footrope trawl means a bottom trawl net with a footrope no larger than 8 inches (20 cm) in diameter.

8/ The minimum size limit for lingcod is 24 inches (61 cm) total length.

9/ Other fish are defined at 50 CFR 660.302, as those groundfish species or species groups for which there is no trip limit, size limit, quota, or harvest guideline.

10/ The "Rockfish Conservation Area" is a gear and/or sector specific closed area generally described by depth contours but specifically defined by lat./long. coordinates set out at IV. A.(17)(f), that may vary seasonally.

To convert pounds to kilograms, divide by 2.20462, the number of pounds in one kilogram.

Table 4 (North). 2004 Trip Limits for Limited Entry Fixed Gear North of 40°10' N. Latitude[1/]

Other Limits and Requirements Apply -- Read Sections IV. A. and B. NMFS Actions before using this table 062004

	JAN-FEB	MAR-APR	MAY-JUN	JUL-AUG	SEP-OCT	NOV-DEC
Rockfish Conservation Area[8/] (RCA):						
North of 46°16' N. lat.	shoreline - 100 fm					
46°16' N. lat. - 40°10' N. lat.	30 fm - 100 fm					
1 **Minor slope rockfish[4/]**	4,000 lb/ 2 months					
2 **Pacific ocean perch**	1,800 lb/ 2 months					
3 **Sablefish**	300 lb/ day, or 1 landing per week of up to 900 lb, not to exceed 3,600 lb/ 2 months			**300 lb/ day, or 1 landing per week of up to 800 lb, not to exceed 3,200 lb/ 2 months**		
4 **Longspine thornyhead**	10,000 lb/ 2 months					
5 **Shortspine thornyhead**	2,100 lb/ 2 months					
6 **Dover sole**	5,000 lb/ month					
7 **Arrowtooth flounder**						
8 **Petrale sole**						
9 **Rex sole**						
10 **All other flatfish[2/]**						
11 **Whiting[3/]**	10,000 lb/ trip					
12 **Minor shelf rockfish, widow, and yellowtail rockfish[4/]**	200 lb/ month					
13 **Canary rockfish**	CLOSED[5/]					
14 **Yelloweye rockfish**	CLOSED[5/]					
15 **Minor nearshore rockfish**	5,000 lb/ 2 months, no more than 1,200 lb of which may be species other than black or blue rockfish[6/]					
16 **Lingcod[7/]**	CLOSED[5/]		400 lb/ month			CLOSED[5/]
17 **Other fish[9/]**	Not limited					

1/ "North" means 40°10' N. lat. to the U.S.-Canada border. 40°10' N. lat. is about 20 nm south of Cape Mendocino, CA.

2/ "Other flatfish" means all flatfish at 50 CFR 660.302 except those in this Table 4 with species specific management measures, including trip limits.

3/ The whiting "per trip" limit in the Eureka area shoreward of 100 fm is 10,000 lb/ trip all year. Outside Eureka area, the 20,000 lb/ trip limit applies. See IV. B.(3).

4/ Bocaccio and chilipepper are included in the trip limits for minor shelf rockfish and splitnose rockfish is included in the trip limits for minor slope rockfish.

5/ Closed means that it is prohibited to take and retain, possess, or land the designated species in the time or area indicated. See IV. A.(7).

6/ For black rockfish north of Cape Alava (48°09'30" N. lat.), and between Destruction Island (47°40'00" N. lat.) and Leadbetter Point (46°38'10" N. lat.), there is an additional limit of 100 lb or 30 percent by weight of all fish on board, whichever is greater, per vessel, per fishing trip.

7/ The minimum size limit for lingcod is 24 inches (61 cm) total length.

8/ The "Rockfish Conservation Area" is a gear and/or sector specific closed area generally described by depth contours but specifically defined by lat./long. coordinates set out at IV. A.(17)(f), that may vary seasonally.

9/ Other fish are defined at 50 CFR 660.302, as those groundfish species or species groups for which there is no trip limit, size limit, quota, or harvest guideline.

To convert pounds to kilograms, divide by 2.20462, the number of pounds in one kilogram.

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Table 4 (South). 2004 Trip Limits for Limited Entry Fixed Gear South of 40°10' N. Latitude[1/]

Other Limits and Requirements Apply -- Read Sections IV. A. and B. NMFS Actions before using this table 062004

	JAN-FEB	MAR-APR	MAY-JUN	JUL-AUG	SEP-OCT	NOV-DEC
Rockfish Conservation Area[7/] (RCA):						
40°10' - 34°27' N. lat.	30 fm - 150 fm (also applies around islands, there is an additional closure between the shoreline and 10 fm around the Farallon Islands)		20 fm - 150 fm (also applies around islands, there is an additional closure between the shoreline and 10 fm around the Farallon Islands)		30 fm - 150 fm (also applies around islands, there is an additional closure between the shoreline and 10 fm around the Farallon Islands)	
South of 34°27' N. lat.	60 fm - 150 fm (also applies around islands)					
1 **Minor slope rockfish[4/]**						
2 40°10' - 38° N. lat.	7,000 lb/ 2 months		50,000 lb/ 2 months			
3 South of 38° N. lat.	40,000 lb/ 2 months					
4 **Splitnose**						
5 40°10' - 38° N. lat.	7,000 lb/ 2 months		50,000 lb/ 2 months			
6 South of 38° N. lat.	40,000 lb/ 2 months					
7 **Sablefish**						
8 40°10' - 36° N. lat.	300 lb/ day, or 1 landing per week of up to 900 lb, not to exceed 3,600 lb/ 2 months			**300 lb/ day, or 1 landing per week of up to 800 lb, not to exceed 3,200 lb/ 2 months**		
9 South of 36° N. lat.	350 lb/ day, or 1 landing per week of up to 1,050 lb					
10 **Longspine thornyhead**	10,000 lb/ 2 months					
11 **Shortspine thornyhead**	2,000 lb/ 2 months					
12 **Dover sole**	5,000 lb/ month When fishing for Pacific sanddabs, vessels using hook-and-line gear with no more than 12 hooks per line, using hooks no larger than "Number 2" hooks, which measure 11 mm (0.44 inches) point to shank, and up to 1 lb (0.45 kg) of weight per line are not subject to the RCAs.					
13 **Arrowtooth flounder**						
14 **Petrale sole**						
15 **Rex sole**						
16 **All other flatfish[2/]**						
17 **Whiting[3/]**	10,000 lb/ trip					
18 **Minor shelf rockfish, widow, and yellowtail rockfish[4/]**						
19 40°10' - 34°27' N. lat.	300 lb/ 2 months	CLOSED[5/]	200 lb/ 2 months		300 lb/ 2 months	
20 South of 34°27' N. lat.	CLOSED[5/]	2,000 lb/ 2 months				
21 **Chilipepper rockfish**	2,000 lb/ 2 months, this opportunity only available seaward of the nontrawl RCA					
22 **Canary rockfish**	CLOSED[5/]					
23 **Yelloweye rockfish**	CLOSED[5/]					
24 **Cowcod**	CLOSED[5/]					
25 **Bocaccio**						
26 40°10' - 34°27' N. lat.	200 lb/ 2 months	CLOSED[5/]	100 lb/ 2 months	**300 lb/ 2 months**	~~200 lb/ 2 months~~ **300 lb/ 2 months**	
27 South of 34°27' N. lat.	CLOSED[5/]	300 lb/ 2 months				
28 **Minor nearshore rockfish**						
29 Shallow nearshore						
30 40°10' - 34°27' N. lat.	300 lb/ 2 months	CLOSED[5/]	500 lb/ 2 months	600 lb/ 2 months	500 lb/ 2 months	300 lb/ 2 months
31 South of 34°27' N. lat.	CLOSED[5/]	300 lb/ 2 months				
32 Deeper nearshore						
33 40°10' - 34°27' N. lat.	500 lb/ 2 months	CLOSED[5/]	500 lb/ 2 months		400 lb/month	500 lb/ 2 months
34 South of 34°27' N. lat.	CLOSED[5/]	500 lb/ 2 months	600 lb/ 2 months			400 lb/ 2 months
35 California scorpionfish	CLOSED[5/]	300 lb/ 2 months		400 lb/ 2 months		300 lb/ 2 months

Table 4 (South). Continued

36 **Lingcod**[6]	CLOSED[5]	400 lb/ month, when nearshore open	CLOSED[5]
37 **Other fish**[8]	Not limited		

[1] "South" means 40°10' N. lat. to the U.S.-Mexico border. 40°10' N. lat. is about 20 nm south of Cape Mendocino, CA.

[2] "Other flatfish" means all flatfish at 50 CFR 660.302 except those in this Table 4 with species specific management measures, including trip limits.

[3] The whiting "per trip" limit in the Eureka area shoreward of 100 fm is 10,000 lb/ trip all year. Outside Eureka area, the 20,000 lb/ trip limit applies. See IV. B.(3).

[4] POP is included in the trip limits for minor slope rockfish.

[5] Closed means that it is prohibited to take and retain, possess, or land the designated species in the time or area indicated. See IV. A.(7).

[6] The minimum size limit for lingcod is 24 inches (61 cm) total length.

[7] The "Rockfish Conservation Area" is a gear and/or sector specific closed area generally described by depth contours but specifically defined by lat/long coordinates set out at IV. A.(17)(f) that may vary seasonally.

[8] Other fish are defined at 50 CFR 660.302, as those groundfish species or species groups for which there is no trip limit, size limit, quota, or harvest guideline.

To convert pounds to kilograms, divide by 2.20462, the number of pounds in one kilogram.

Exhibit C.3.c
Supplemental Public Comment
June 2004

Dear Sir/Ma'am

I would like to express my displeasure in the Black Rock Fish closure for Northern California during the months of May and September through December. This fishery is the main staple for recreational fishermen in Northern California. It's not clear to me why this regulation was enacted. According to the information on the World Wide Web (June 1, 2004) at http://www.pcouncil.org/groundfish/gfins.html#recreational, the prohibition of Black Rock Fish is to help Canary Rock fish. According to CDFG, the regulation was enacted because the anticipated harvest for 2004 is expected to be 3 times the amount allotted.

I disagree that the expected take being 3 times the amount allotted is a problem. First, the expected take is derived from the previous years catch, and has little to do with the next years take. The previous years catch (2003) was high because of an exceptional season indicating that the population of Black Rockfish was high. Under normal circumstances, a population is determined by the available resources to that population, not predatory pressure. An increase in the number of Black Rockfish caught is an indicative of a healthy population. Therefore if the take is high, then the conclusion is the population is high. If the Black Rockfish take is small, then there is reason to believe the population is small and regulations restricting the take should be enacted.

If the prohibition of Black Rock Fish is in response to Canary Rock Fish, I disagree with it even more. It makes no sense to prohibit the take of a very productive and desired species to protect one that is not very common within this area. Limiting, or prohibiting the take of Canary Rock Fish is an adequate strategy for protecting them.

This closure hurts California economically and socially while it does nothing to protect California's environment. I encourage legislation that would immediately reverse this regulation.

Charles Hayler
1102 Fritz Rd.
McKinleyville, CA 95519

Exhibit C.4
Situation Summary
June 2004

GROUNDFISH ESSENTIAL FISH HABITAT ENVIRONMENTAL IMPACT STATEMENT ANALYTICAL FRAMEWORK—FISHING GEAR IMPACT MODEL COMPONENT

Situation: Since early 2003 National Marine Fisheries Service (NMFS) has been developing a comprehensive risk assessment methodology to support the development of an environmental impact statement (EIS) evaluating: (1) the designation of essential fish habitat (EFH) for species in the Pacific Coast Groundfish Fishery Management Plan (FMP) and (2) measures to mitigate impacts to EFH. The major component of the methodology is an analytical framework, which consists of several components organized within a geographic information system (GIS). At the April 2004 meeting, the Council reviewed and approved for use the EFH designation component of the analytical framework. The second component of the analytical framework is the fishing impacts model, which provides a quantitative assessment of the biological impacts to EFH caused by bottom trawl fishing gear. (Exhibit C.4.b, Attachment 1, describes this fishing impacts model component. Exhibit C.4.b, Attachment 2, which is in electronic format on CD-ROM, contains the appendices to this document.) In conjunction with other information, this model can be used to evaluate different mitigation measures, which may be proposed in the EIS, to reduce impacts to EFH.

The Groundfish and Economics Subcommittees of the Scientific and Statistical Committee (SSC) met May 24-25, 2004, in Seattle to review the fishing impacts model component of the analytical framework. They have reported their recommendations to the full SSC. Based on the Subcommitte report, the SSC will advise the Council as to a decision to use the fishing impacts model component to evaluate the alternatives that will be included in the EFH EIS. During this agendum the EFH EIS project team will also report to the Council on the current status of the impact model.

At the April meeting the Council also authorized the Ad Hoc Groundfish FMP EIS Oversight Committee to develop alternatives for the EFH EIS. Two meetings have been tentatively scheduled, one in July and one in August. During these meetings the Oversight Committee will develop EFH designation alternatives and impact mitigation alternatives, including options to designate habitat areas of particular concern (HAPCs). At the September 2004 meeting, the Council would then review and approve their use as the preliminary range of alternatives to be evaluated in the EFH EIS. The Council is scheduled to identify preferred alternatives at the November 2004 meeting, to conform to the current court-mandated schedule, which requires release of a draft EIS for public comment in early 2005 (Exhibit C.4.b, Attachment 3).

Council Action:

Consider approval of the fishing gear impact component of the analytical framework and establish the meeting schedule for the Ad Hoc Groundfish FMP EIS Oversight Committee.

Reference Materials:

1. Exhibit C.4.b, Attachment 1: EFH Impacts Assessment for the Pacific Groundfish FMP.
2. Exhibit C.4.b, Attachment 2: Appendices to the EFH Impacts Assessment (electronic copy on CD-ROM).
3. Exhibit C.4.b, Attachment 3: EFH Timeline (Revised May 2004).

Agenda Order:

a. Agendum Overview	Kit Dahl
b. NMFS Report	Steve Copps
c. SSC Report	Kevin Hill
d. Reports and Comments of Advisory Bodies	
e. Public Comment	
f. **Council Action:** Approve use of the Fishing Gear Impact Component of the Analytical Framework and Establish the Meeting Schedule for the Ad Hoc Groundfish FMP EIS Oversight Committee.	

PFMC
06/01/04

Exhibit C.4.b
Attachment 1
June 2004

Version for Pacific Council June 2004 Meeting Briefing Book

Pacific Coast Groundfish EFH

EFH Impacts Assessment for the Pacific Groundfish FMP

Prepared for

Pacific States Marine Fisheries Commission

By

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Table of Contents

List of Tables

List of Figures

1 INTRODUCTION

NOAA Fisheries is developing an Environmental Impact Statement (EIS) that responds to a court directive and settlement agreement to complete new NEPA analyses for Amendment 11 to the Pacific Coast Groundfish FMP.A decision-making process for the EIS has been designed for policy to flow from assessment. A rigorous assessment of groundfish habitat on the west coast has been undertaken to set the stage for policy development. The EIS and the Council process will be the vehicles for developing policy in response to the assessment. This careful division of the scientific assessment from policy is pictured in the decision-making framework for the Pacific Coast Groundfish Essential Fish Habitat Environmental Impact Statement (Figure 1).

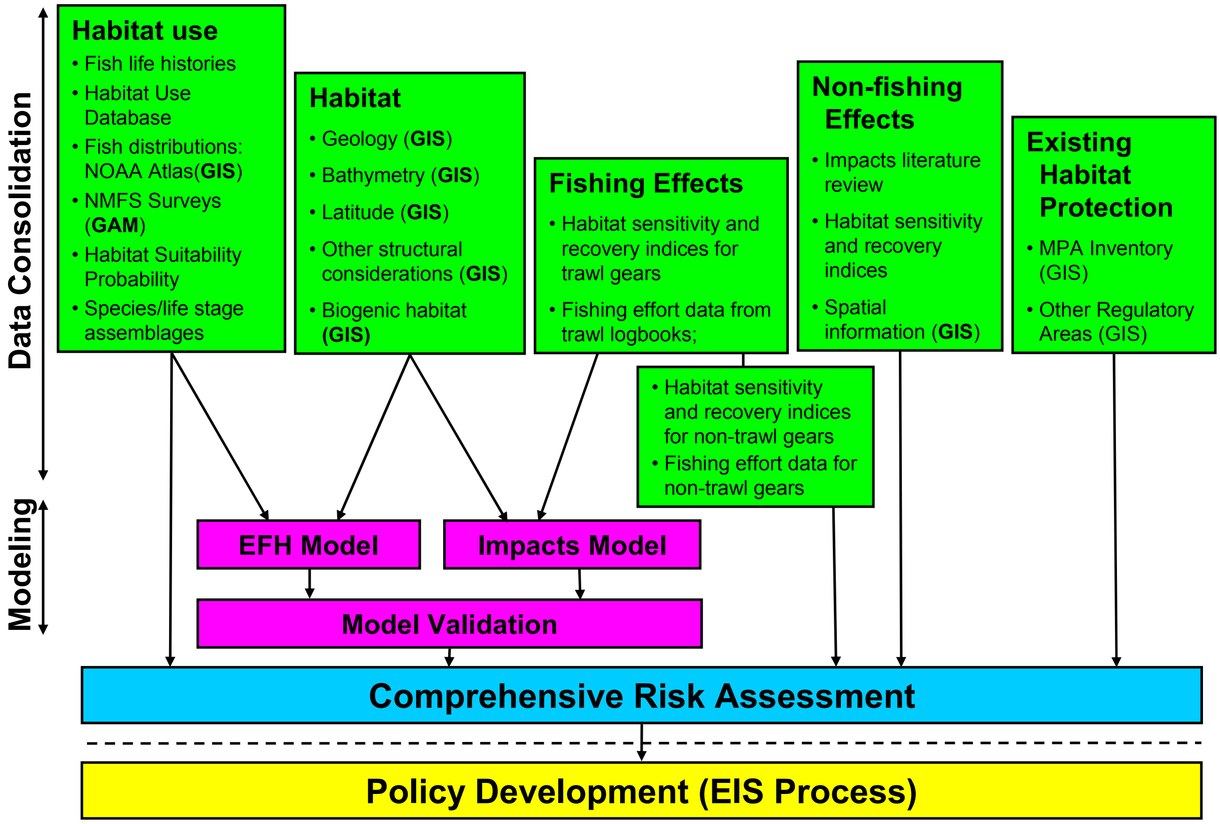

Figure 1. Revised decision-making framework for the assessment stage of the Pacific Coast Groundfish EFH EIS showing data inputs and separation of the assessment and policy components

Two models are depicted in Figure 1: the EFH Model and the Impacts Model. Together these represent the analytical framework that is being developed to support preparation of the EIS and, more specifically, the development of management alternatives by the Council and NMFS. While these components are clearly integrated, it is both pragmatic and practical, in terms of the Council's schedule of meetings, to address them initially one at a time, due to the complex and wide ranging scope of the issues they address. The first step in the process is the identification and description of EFH. A document and presentation providing the details of the analysis that will lead to the development of alternatives for EFH for the Groundfish FMP was given to the Council at its April 2004 meeting.

The second step, presented in this report, is an assessment of the risk to EFH from both fishing and non-fishing activities, that will assist the Council in the development of alternatives to prevent, mitigate, or minimize, to the extent practicable, the adverse effects of fishing and fishing gear on EFH. We note that the Impacts Model forms only part of this process. In a previous version of the decision-making framework, it was envisioned that all of the data elements from the data consolidation phase might feed into the Impacts Model. However, in practice this has proved to be not possible at this stage, for reasons that are made evident in this document.

The primary purpose of this document is to present the first completed version of the Impacts Model. But in view of the need to develop a comprehensive risk assessment that incorporates all available relevant information, it also provides details of the other data elements in Figure 1. The “comprehensive risk assessment” will, of necessity, be a part quantitative and part qualitative procedure that will feed into the policy development stage. It is hoped that in the future it will be possible to gather the necessary data and information to allow further development of the Impacts Model so that it can integrate these other data sources into an overarching quantitative model for the risk analysis, a possibility that is discussed further in Section 4.2.

The results of the data consolidation phase for the Impacts Model are discussed in Chapter 2. The Impacts Model and the comprehensive risk assessment are described in Chapters 3 and 4.

2 MAJOR DATA SOURCES

To consolidate the available data and set the stage for the risk assessment that will underpin the EIS process, NOAA Fisheries in cooperation with the Pacific States Marine Fisheries Commission (PSMFC) has implemented a multi-faceted project as follows:

1. Development of a GIS database that will display habitat types in comparison with known groundfish distribution/abundance and fishing effort;
2. Conduct of a literature review and development of a database on groundfish habitat associations;
3. Conduct of a literature review on fishing gear impacts to habitat;
4. Conduct of a literature review on non-fishing impacts to habitat; and
5. Collection and analysis of information on fishing effort.

As shown in Figure 2 (the decisionmaking framework), we have organized the various GIS and other databases that have been compiled for this project into five major categories:

- West Coast fish habitat
- Use of habitat by groundfish
- Effects of fishing on groundfish habitat
- Non-fishing activities that affect groundfish habitat
- Existing habitat protection measures

Within all of these categories, GIS is a pivotal tool in compiling, analyzing and presenting data. The first two also form the backbone of the EFH Model and were described in the report of that model presented to the Council. In this report we provide a brief summary of the data collection and processing procedures in the first two categories, and a more detailed presentation of the last three. For more detail on the first two, the reader is referred to the Council's April 2004 Briefing Book[1].

2.1 GIS deployment in the EFH process

This project has launched a major GIS effort to synthesize and generate spatial information previously unavailable at the Pacific Coast scale. Whether creating new GIS data (i.e. groundfish fishing regulations) or mining existing data and using it in innovative ways (i.e. invertebrate data from trawl surveys) this EFH process has been the driving force behind compiling disparate biological, regulatory, and catch data into a single GIS. Upon completion, this GIS is designed to seamlessly interact with the Bayesian Belief Network model and will be an invaluable tool for data visualization and regulatory decision making.

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[1] Identification of Essential Fish Habitat for the Pacific Groundfish FMP, Exhibit C6 in the April 2004 Briefing Book, available at www.pcouncil.org.

2.1.1 Challenges Encountered While Compiling EFH GIS

Compiling comprehensive datasets covering the range of West Coast Groundfish has proven to be an enormously complex and time-consuming task. Listed below are the issues and constraints encountered repeatedly while developing the EFH GIS data layers.

- Locating Quality Data
  Every GIS undertaking of this magnitude faces longstanding challenges to data sharing and integration. Compiling a GIS for a 822,000 square km study area requires navigating a complex web of federal, state and local agencies in an effort to locate the best available data. Ideally, data sets sought out for inclusion were comprehensive for the west coast where possible, already in GIS format, free, readily available, and redistributable. However, more often than not, meeting all these criteria proved impossible. Balancing cost and time requirements to meet the EIS schedule, it is important to note the data incorporated does not always represent the best data, but the best data available to the project in the timeframe dictated.

- Uniting Disparate Data Sets
  Reconciling data from disparate sources into a unified, coherent database presents a multitude of technical challenges, requiring decisions about seemingly arcane, yet critical, details. Almost all EFH data was available only as geographic subsets to the study area. Ideally, these data would be "stitched" together at their edges using straightforward GIS commands. In practice, however, combining these geographic subsets into one comprehensive GIS layer required additional processing including:

    1. modifying attribute definitions to make them identical,
    2. eliminating overlapping areas by determining which subset has priority,
    3. filling in data gaps between subsets,
    4. understanding and reconciling different source scales and spatial extents,
    5. validating coding,
    6. updating coding as new information is provided, and
    7. projecting data to a common west coast projection.

  During these procedures, the goal has been to remain as consistent as possible with the intent of the source data while also creating comprehensive data coverage for the area of interest. To facilitate this process, automated procedures were used in lieu of more time-consuming manual editing procedures.

- Scale and Detail Exceed Software Capacity
  The large spatial extent of this project combined with the need for highly detailed GIS data has resulted in the creation of GIS datasets that exceed the capacity of essential software algorithms. To address this issue, alternative processing procedures were required to process and recompile these datasets into usable a format.

2.1.2 GIS, Modeling, and Management

The scale, scope, and complexity of this project have repeatedly pushed the limits of standard GIS technologies and existing spatial data, requiring the team to utilize innovative tools and multiple programming languages to develop the best possible GIS on which to base the EFH and Impact models. Relying on their expertise in the marine sciences, the team developed the spatial framework upon which these models are based. The result is a system that easily moves baseline data into the modeling process, facilitates model validation through results visualization, and displays the model outputs. In addition, the GIS will allow for the mapping of management alternatives to allow decision makers and the public to identify preferred alternatives.

2.2 West Coast Fish Habitat

2.2.1 Benthic habitat

Benthic habitat is characterized primarily on the basis of the physical substrate. Marine geology experts have developed GIS data delineating bottom-types and physiographic features associated with groundfish habitats. Benthic habitat data for Washington and Oregon were developed by the Active Tectonics and Seafloor Mapping Lab, College of Oceanic and Atmospheric Sciences at Oregon State University. Data for California were developed by the Center for Habitat Studies at Moss Landing Marine Laboratories. TerraLogic GIS, Inc. was responsible for merging and cleaning these two data sources to create a seamless west coast coverage. All lithologic and physiographic features were classified according to a deep-water benthic habitat classification system developed by Greene *et al*. (1999).

Information on the distribution of biogenic structures and other organisms, which may form an essential, and potentially sensitive, component of habitat is less readily available, but is included to the extent possible at this stage. Biological organisms may play a critical role in determining groundfish habitat use and preference. Structure forming invertebrates, for example, such as sponges, anemones and cold water corals, can be an important and component of fish habitat. An example within the US EEZ is the Oculina Bank on the Atlantic coast of Florida. On the West Coast, however, assessment of the significance of associations between structure forming invertebrates and groundfish species is limited by available literature.

GIS data have been compiled for several essential biological habitat components, specifically canopy kelp, seagrass, and benthic invertebrates. Limited information is available to spatially delineate these biological habitats coastwide. However, because these habitats are so important, the project team felt that incomplete coverage was preferable to leaving these data out of the GIS.

Estuaries are known to be important areas for some groundfish species, such as kelp greenling, starry flounder and cabezon. However, estuarine seafloor types were generally not mapped by the marine geologists during the initial data consolidation phase of the project. They are included as a separate mapped category of their own for inclusion in modeling efforts. The "habitat map" for the west coast is shown in Figure 2.

2.2.2 Pelagic Habitat

There are a number of species and life stages in the Groundfish FMP that occur in the water column, but do not have any association with benthic substrate. While the water column is likely to be much less sensitive to fishing impacts than benthic substrate it is still necessary to identify EFH for these components of the groundfish assemblage. There may, for example be non-fishing impacts such as pollution that may have adverse effects. However, mapping EFH in the pelagic zone is even more difficult and less exact than for the seabed. The features of the water column that are likely to be of importance include biological, physical and chemical oceanographic processes that are hard to map. Frontal boundaries, temperature regimes and biological productivity all vary on seasonal and inter-annual scales that make identification of a static two dimensional designation of a boundary such as is required for EFH problematic. We have not attempted to map these features in the GIS in the same way as for the benthic substrate at this stage. EFH for species and life stages residing in the water column is mapped instead on the basis of latitudinal and depth ranges reported in the literature.

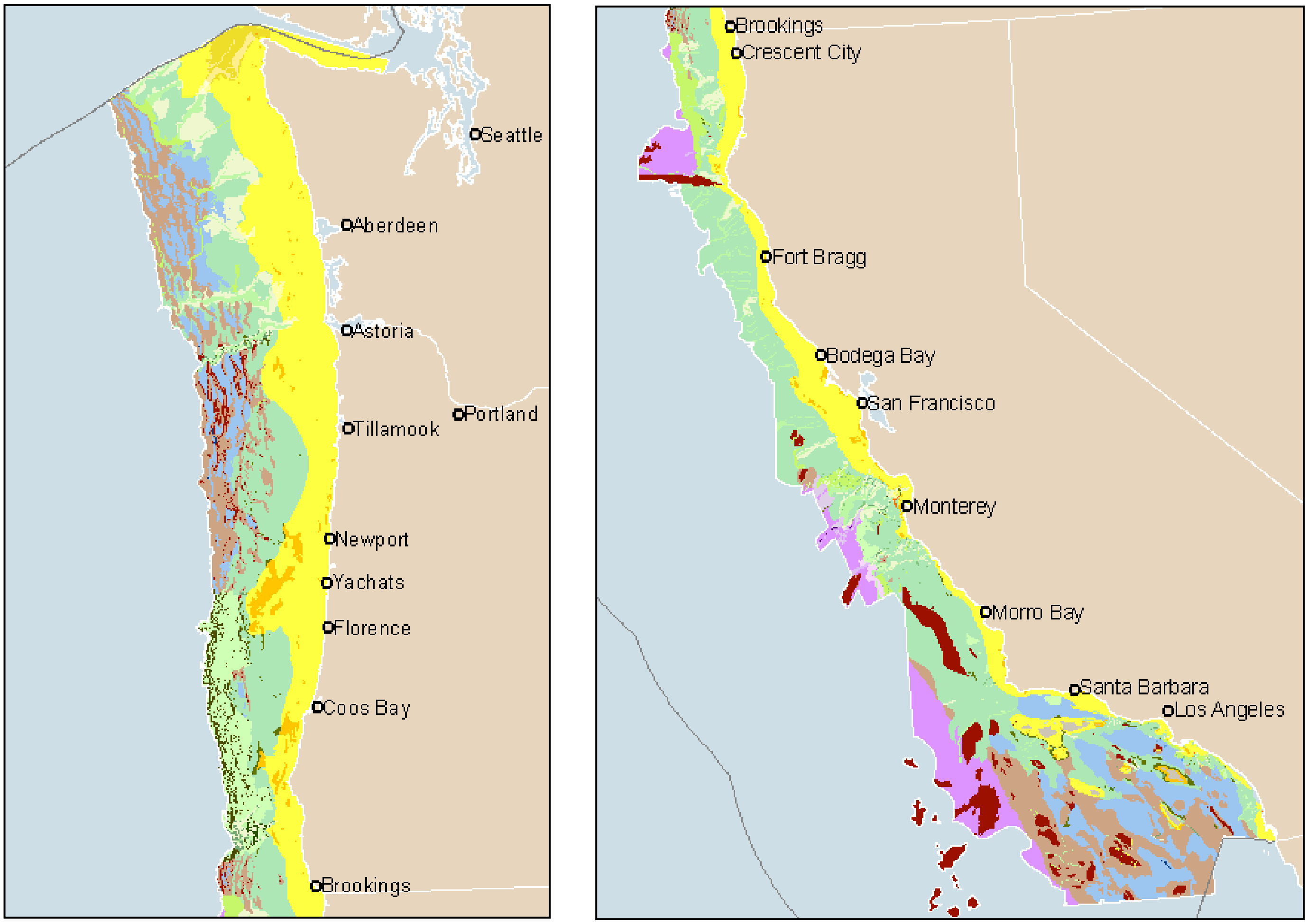

Figure 2. Thirty five (35) unique benthic types off the coasts of Washington, Oregon and California. Graphics created by TerraLogic GIS Inc. from data provided by MLML (CA) and OSU (OR, WA).

2.3 Effects of Fishing on Groundfish Habitat

2.3.1 Fishing gears

The PSMFC prepared a document that describes the fishing gears used on the west coast of the United States (excluding Alaska) and which components of those gears might affect structural habitat features (Appendix 1). This gear description is one part of a ‘fishing gear impact analysis' that requires an understanding of the gears used, how gear affects habitat, the amount and distribution of fishing effort, and the sensitivity and resiliency of various habitat types.

The fishing gears report describes the types of fishing gear used on the west coast in potential groundfish essential fish habitat and the parts of the gear that might impact structural habitat features. It includes gear used by fishermen targeting groundfish as well as gear used to target other species.

Many different types of fishing gear are used to capture groundfish in commercial, tribal, and recreational fisheries. Groundfish are caught with trawl nets, gillnets, longline, troll, jig, rod and reel, vertical hook and line, pots (also called traps), and other gear (e.g. spears, throw nets). The groundfish commercial fishery is made up of "limited entry" and "open access" fisheries, with most of the commercial groundfish catch being taken under the limited entry program. There is also a tribal groundfish fishery and a recreational groundfish fishery. Table 1 summarizes the gear used by each of these sectors

Most fishing gear used to target non-groundfish species (such as salmon, shrimp, prawns, scallops, crabs, sea urchins, sea cucumbers, California halibut, Pacific halibut, herring, market squid, tunas, and other coastal pelagic and highly migratory species) is similar to gear used to target groundfish. These gears include trawls, trolls, traps or pots, longlines, hook and line, jig, set net, trammel nets. Other gear that may be used includes seine nets, brush weirs, and mechanical collecting methods used to harvest kelp and sea urchins.

Gear types in the PACFIN database are listed on the PSMFC web site[2]. A copy of this list is provided in Appendix 2 for ease of reference. Gears used for salmon net pen aquaculture and Washington and California kelp harvest are not included in the analysis of the effects of fishing gears, but are described under the non-fishing effects section of the EFH environmental impact statement. A list of authorized gear types for the west coast is at 50CFR 660.322[3]:

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[2] www.psmfc.org/pacfin/gr.lst

[3] http://a257.g.akamaitech.net/7/257/2422/14mar20010800/edocket.access.gpo.gov/cfr_2002/octqtr/50cfr660.322.htm.

Table 1. Gear Types Used in the West Coast Groundfish Fisheries[4] [5].

	Trawl and Other Net	Longline, Pot, Hook and Line	Other
Limited Entry Fishery (commercial)	Bottom Trawl Mid-water trawl Whiting trawl Scottish Seine	Pot Longline	
Open Access Fishery Directed Fishery (commercial)	Set Gillnet Sculpin Trawl	Pot Longline Vertical hook/line Rod/Reel Troll/dinglebar Jig Drifted (fly gear) Stick	
Open Access Fishery Incidental Fishery (commercial)	Exempted trawl (pink shrimp, spot and ridgeback prawn, CA halibut, sea cucumber) setnet driftnet purse seine (round haul net)	Pot (Dungeness crab, CA sheephead, spot prawn) longline rod/reel troll	dive (spear) dive (with hook and line) poke pole
Tribal	as above	As above	as above
Recreational	dip net, throw net (within 3 miles)	Hook and Line methods Pots (within 3 miles) (from shore, private boat, commercial passenger vessel	dive (spear)

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[4] Adapted from Goen and Hastie, 2002.

[5] Most fishing gears used to target non-groundfish species (such as salmon, shrimp, prawns, scallops, crabs,,sea urchins, sea cucumbers, California and Pacific Halibut, herring, market squid, tunas, and other coastal pelagic and highly migratory species) are similar to those used to target groundfish. These gears include trawls, trolls, traps or pots, longlines, hook and line, jig, set net, trammel nets. Other gear that may be used includes seine nets, brush weirs, and mechanical collecting methods used to harvest kelp and sea urchins.

2.3.2 Fishing gear impacts: habitat sensitivity and recovery

At its meeting on February 19-20, 2003, the Technical Review Committee reviewed the proposed risk assessment framework and recommended that PSMFC contract for development of an index of fishing gear impacts by gear type that will serve as an input into the overall risk assessment. The Committee suggested that, while several literature review and indices exist that may be utilized for this project, there is no clear direction on how that information should be applied to the west coast. As justification for the recommendation, the committee cited the general lack of west coast specific studies and the need to determine specifically how to make inferences from studies that occurred in other parts of the world. Appendix 3 presents the results of this analysis.

Presently there is very little quantitative information describing the relationship between habitat type, structure and function and the productivity of managed fish species. Hence impacts on habitat that cause adverse effects are hard to quantify. For purposes of the analysis, adverse effects of fishing gear were defined consistent with NOAA Fisheries EFH Final Rule and include "direct or indirect physical, chemical, or biological alterations of the waters or substrate and loss of, or injury to, benthic organisms, prey species and their habitat, and other ecosystem components, if such modifications reduce the quality and/or quantity of EFH" (50 CFR part 600.810).

The evaluation of impacts is made on the basis of notional indices of sensitivity of habitats to the action of fishing gears and time taken for the habitat to recover to a pre-impacted state: the Sensitivity Index and the Recovery Index. These indices were constructed based on available literature, much of which reports on the results of studies conducted on benthic habitats outside the west coast region. Information on the effects on pelagic habitats has not been pursued to date. Appendix 3 presents the indices and provides background to the interpretive decisions made in their construction.

Development of the indices was accomplished in three phases, each building upon the preceding phase. Phase 1 consisted of identification of the habitat types and gear types to be used in the analysis, and defining levels of sensitivity and recovery.

The Sensitivity Index is matrix of fishing gears and habitats, with each cell scored using a four level (0, 1, 2, 3: see table below) measure of the expected effect resulting from the potential interaction of the gear with the habitat. The sensitivity level may be based on an actual effect measured in a specific location, or inferences from experimental evidence, but when used in the Impacts Model, it is regarded as a predicted effect. When and where a specific interaction between gear and habitat has actually occurred depends on the fishing effort data (see Section 2.3.3) and it is the combination of the fishing effort data and the sensitivity that determines the predicted impact.

Sensitivity Level	Sensitivity Description
0	No detectable adverse impacts on seabed; i.e. no significant differences between impact and control areas in any metrics.
1	Minor impacts such as shallow furrows on bottom; small differences between impact and control sites, <25% in most measured metrics.
2	Substantial changes such as deep furrows on bottom; differences between impact and control sites 25 to 50% in most metrics measured.
3	Major changes in bottom structure such as re-arranged boulders; large losses of many organisms with differences between impact and control sites >50% in most measured metrics.

This predicted impact, however, is not static; fishing effort is variable over time, and impacted habitats may recover between impact events. When a habitat is subjected to an impact, the way in which it supports and benefits the groundfish that associate with it is changed. A combination of physical, chemical and biological processes subsequent to the impact may then bring about a process of recovery of that habitat towards its pre-impacted state. However, exactly what is meant by a pre-impacted state is rather difficult to define, given the limited information on how specific habitats support specific life states of specific species. Nevertheless, there are studies in the literature that describe and have attempted to measure this process. Relevant studies are reviewed in Appendix 3 and have been used to develop the Recovery Index. This is measured in time and is used in the model to allow habitat potentially to recover to its pre-impacted function, at some assumed rate, if it is not subjected to a further impact.

Phase 2 was a detailed review of the global literature (using major recent reviews), culminating in construction of tables that summarize on a study-by-study basis the sensitivity levels and recovery times by gear type and habitat type. Phase 3 was the construction of the sensitivity and recovery matrices themselves.

Approximately 47 different habitat types were used in this analysis. Approximately 30 gear types are used in west coast fisheries but studies sufficient to develop meaningful sensitivity and recovery indices have been done on only five major categories: dredges, bottom trawls, nets, pots & traps, and hook & line. Hence, the final sensitivity and recovery matrices consisted of five columns and 47 rows. Because there is a wide range of sensitivity metrics in the literature, all studies were standardized to a scale of 0 (no impacts) to 3 (major impacts), and all recoveries were reported as time in years taken directly from the literature.

Using the literature summary tables from Phase 2, statistics were calculated for sensitivity levels and recovery times for various combinations of gear and habitat types. In the final draft index (Phase 3), ranges representing the mean + or - one standard error were determined for each gear-by-habitat combination for which empirical data were available. For others, ranges were derived using the empirical ranges combined with the relative rankings by gear and habitat types given above.

The present analysis corroborated previous assessments of the relative impacts of major gear types, arranged from most damaging to least: dredges, trawls, nets, pots & traps, hook & line, as well as the following ranking from most sensitive to least for major habitat types: biogenic, hard bottom, soft bottom. Recovery times ranged mainly from 0 to 5 years, and the overall trends by gear and habitat types were similar to the trends for sensitivity levels.

2.3.3 Fishing effort

2.3.3.1 Commercial trawl logbooks

West coast commercial trawling effort has been recorded in logbooks and provided to state fisheries managers since the 1980s and earlier. These logbook entries include the starting point of the trawl, either by latitude/longitude or by logbook block number, the tow duration, the gear used, and the estimated weight of the catch for several species or species groups. PSMFC created and maintains a comprehensive database (PACFIN) for commercial fishing data, which includes west coast trawl logbook data starting in 1987. Commonly, the commercial trawling data are summarized geographically by logbook blocks (Figure 3), which are primarily 10-minute latitude/longitude cells. Trawl logbook data from PACFIN are available on a tow-by-tow basis for 1987-2002. (At the time of data development, 2003 data were not yet complete in the database).

The data can be summarized in a multitude of ways, both temporally and spatially. The specific logbook data summaries developed as input for the Impacts Model are described in Section 3.2.2. The logbook data are coastwide, however, prior to 1997, position data for trawls off California were provided by logbook block only, not by precise haul location. In addition, prior to 1998, the date specification was limited to year, rather than full date. This removes the potential to analyze seasonal patterns of effort. Finally, only a small subset of the PACFIN gear types are included in the logbook data – these gear types are: groundfish trawl, midwater trawl, roller trawl, flatfish trawl, and other trawl. The breakdown of gear types in the PACFIN database is shown in Table 2.

Table 2. Use of different gear types recorded in the PACFIN database (1987-2002)

Gear type	Number of tows (percent of tows)
groundfish trawl	363709 (54.4%)
flatfish trawl	138856 (20.8%)
roller trawl	126478 (18.9%)
midwater trawl	33157 (5.0%)
other trawl	3674 (0.5%)
no gear given	2173 (0.3%)

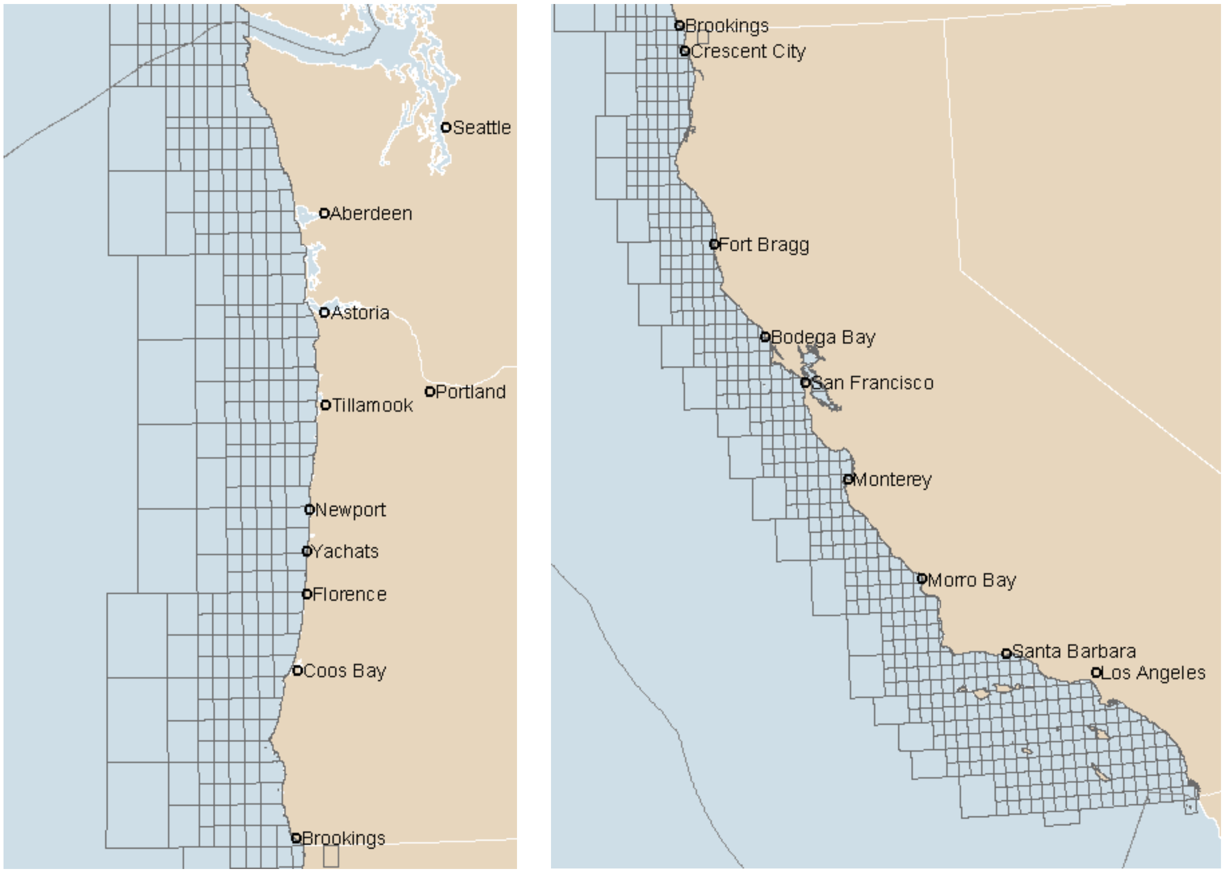

Figure 3 Trawl logbook blocks in the PACFIN database.

2.3.3.2 Non-trawl commercial effort data in PACFIN

Effort data for the non-trawl commercial fishery (hook and line, longline, pot/trap) are also available per vessel (fake id), recorded by port-based fish tickets. Data available in the PACFIN database include year and port where catch was landed, type of gear used, vessel length, species landed, prices and revenues, and International North Pacific Fisheries Commission (INPFC) area. Eight of these regions exist, each covering areas of thousands of square miles.

As part of a larger project[6], Ecotrust, Inc. has developed a predictive model to further resolve this information to levels consistent with the commercial trawl data (Ecotrust 2003). Using this predictive model, catch in pounds and revenue in dollars are assigned to a specific 9 km block. The catch and revenue are also summarized by 9 km block for the following gear groups: hook and line, longline, pot and trap, trawl, and other gear. GIS data resulting from this model were provided for two years, 2000 and 1997.

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[6] Groundfish Fleet Restructuring Information and Analysis (GFR) Project (see www.ecotrust.org/gfr).

2.3.3.3 Data from fishermen's focus groups

Another project, initiated as part of the EFH risk analysis, sought to collect fishing effort information retroactively directly from fishermen through focus groups. The data collected covered current and historical fishing areas that they defined and fishing intensity for groundfish trawl and fixed gear fisheries within those areas. Due to funding constraints it was not possible to take the project beyond the pilot phase, the results of which are presented in Appendix 4. The methodology for collecting this type of information was tested on a single NOAA nautical chart, number 18520, covering the area offshore of Oregon between the Columbia River and Yaquina Bay. Focus group participants drew polygons on the chart indicating known fishing areas for three eras: 1986-1999, 2000-2002, and 2003. In addition, they provided information on fishing intensity, including average number of boats in a polygon per day, as well as some indication of typical "units" of fishing, (such as average tows per boat and average tows per hour), which varied by gear type. Participants were generally quite comfortable drawing the boundary lines on the maps, but not very comfortable with the intensity information they provided. After the focus group sessions, the data were converted to GIS format using a 'heads-up' digitizing approach.

2.3.3.4 Using the commercial fishing effort data

All three sources of commercial fishing effort data have their strengths and weaknesses. The logbook data are extensive, both spatially and temporally, and are acknowledged to be the most comprehensive source of information on trawl effort currently available (SSC Groundfish Sub-committee review of Impacts Model, February 2004[7]). However, these data only includes information on trawl gear. The Ecotrust model and the focus group project both provide information on fixed gear. However, the Ecotrust model is predictive and quantifies revenue and catch, rather than effort. The focus group information is limited in spatial extent to a small section of the coast.

Appendix 5 provides a first order of comparison and validation of the three data sets described above. The focus group information was compared both to trawl logbook data and the Ecotrust model for spatial coincidence and consistency in estimates of the area impacted by fishing. Intensity measures were not compared at this stage – fishing effort was compared as a simple presence/absence variable.

The focus group polygons for bottom trawl fishing showed good spatial consistency with trawl logbook data, particularly when overlaid with the trawl set point locations. Unfortunately, the spatial coincidence and the consistency of fishing area estimates between focus group and Ecotrust results was fairly low for fixed gear types. Based on a review of this analysis, the SSC Groundfish Subcommittee recommended against using the Ecotrust model output in the impacts model[8] . In addition, the SSC review endorsed the use of the focus group approach for collecting

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[7] Exhibit C.6.c, Attachment 1, Briefing Book for April 2004 Council meeting.

[8] Exhibit C.6.c, Attachment 1, Briefing Book for April 2004 Council meeting.

coastwide fixed gear information. However, because the focus group information is limited to a small portion of the coast, it has not been included in the current version of the impacts model.

2.3.3.5 Recreational fishery

The recreational fishery sector comprises the commercial passenger fishing vessel (CPFV) fleet (charters), private fishing vessels, and other miscellaneous fishing activities.

The Marine Recreational Fishery Statistics Survey (MRFSS) is a nationwide survey conducted since 1979, (with the exception of 1990-2) that collects information on all elements of the recreational fishery. Information is elicited through telephone surveys and port interviews, and is collected on mode of fishing (e.g. charter, pier), catch information, distance from shore, and catch reference area. The questionnaire also makes provision for information on gear type use (see http://www.psmfc.org/recfin/). As expected, with a questionnaire of this nature, spatial resolution of the catch reference area is relatively poor. It has therefore not been possible to incorporate these data into the Impacts Model at this stage.

The California Department of Fish and Game also collects species information on CPFV fishing that is apparently available at a 10nm by 10nm resolution from 1936 through 1997.

2.4 Effects of Non-Fishing activities on Groundfish Habitat

2.4.1 Description of non-fishing impacts

In 2003, NOAA Fisheries prepared a detailed description of non-fishing impacts to essential fish habitat and recommended conservation measures (Appendix 6). The document is organized by activities that may potentially impact EFH occurring in four discreet ecosystems: upland, riverine, estuarine, and coastal/marine systems.

Non-fishing activities have the potential to adversely affect the quantity or quality of EFH designated areas in riverine, estuarine, and marine systems. Broad categories of such activities include, but are not limited to, mining, dredging, fill, impoundment, discharge, water diversions, thermal additions, actions that contribute to non-point source pollution and sedimentation, introduction of potentially hazardous materials, introduction of exotic species, and the conversion of aquatic habitat that may eliminate, diminish, or disrupt the functions of EFH. For each activity, known and potential adverse impacts to EFH are described in the review document. The descriptions explain the mechanisms or processes that may cause the adverse effects and how these may affect habitat function. The review also provides proactive conservation measures designed to minimize or avoid the adverse effects of these non-fishing gear activities on Pacific Coast EFH.

2.4.2 Spatial data on non-fishing impacts

An initial survey of available non-fishing impact spatial data undertaken in the fall of 2003. Although the DEIS for the Gulf of Mexico EFH Project was used as a model, the 2003 Draft document 'Non-Fishing Impacts to Essential Fish Habitat and Recommended Conservation Measures' and a phone conversation between TerraLogic, MRAG Americas and the NMFS Project Manager served to focus efforts for the west coast. A list of individuals to contact was generated during this conversation and served as the starting point for the collection effort.

To date, over 70 individuals at NMFS, USEPA, USACOE, MMS, USGS, Washington DNR, Washington DOE, Oregon DEQ, California Fish and Game as well as several private and non-profit organizations have been contacted (Appendix 3). The individuals on this list were identified during the calling effort with each phone call generating additional names to contact. The survey followed the resulting path. The list of collected west coast non-fishing impact data includes dredge disposal sites, shoreline hardening, marinas, land use land cover, oil and gas lease locations, Pacific cable information, etc. (Table 3)

In addition to the collection of available data, this process has yielded the added benefit of identifying numerous data gaps relevant to non-fishing impacts. While the generation of these various data sets is well beyond the scope and scale of this effort, it is hoped that this work will lead to additional initiatives that will start to tackle these gaps.

The greatest challenge to this data collection effort has been the lack of centralized spatial data storage at the Agency level. Although many individuals were contacted, identifying the right individual is critical or a potentially useful dataset may be overlooked. In addition, data incorporating non-fishing impacts often reside with the states. If data are located in Oregon, equivalent data must be located for Washington and California. If available, data developed independently by state agencies are often collected at different scales or degrees of accuracy. Stitching together these disparate data into a unified, coherent database will require reconciling data sets to make them usable in a coast wide database. This reconciliation of data will be possible for some data sets and impossible for others.

Due to the nature of the available data (varied spatial scales, lack of completeness, etc.) and the large data gaps identified, non-fishing impacts are not incorporated into the Impacts Model at this time. In essence, there is presently no common currency in which to express the impacts of both fishing and non-fishing activities and thereby consider their effects on a comparable scale. However, this collection of the best available data provides important information for the comprehensive risk assessment and hence policy development. While some of the data are not currently in a GIS format they can be converted if time and resources allow. Once the data all reside in a GIS, they can be used for data visualization and simple overlay analysis with other data sets as well as model output. This process will enable decision makers to take into account non-fishing impacts into the policy process to the extent that the available data allow.

Table 3. West coast non-fishing impact data located to date

	Data Collected	Geographic Extent	Limitations
Upland			
Agricultural/Nursery Runoff	USGS LULC (1993)	WA, OR, CA	NOTE: 2003 Coastal Land Use/Land Cover is currently available for California but will not be available for Oregon and Washington until late summer/early fall 2004.
Silviculture/Timber Harvest	USGS LULC (1993)	WA, OR, CA	
Pesticide Application	USGS LULC (1993)	WA, OR, CA	
Urban/Suburban Development	USGS LULC (1993)	WA, OR, CA	
Road Building and Maintenance			
Riverine			
Mineral Mining			
Sand and Gravel Mining			
Organic Debris Removal			
Inorganic Debris Removal			
Dam Operation	Dam Locations	WA, OR, CA	Point data.
Commercial and Domestic Water Use			
Estuarine			
Dredging			
Disposal of Dredged Material	USACE	WA	Grays Harbor only.
Fill Material			
Vessel Operations/ Transportation/Navigation			
Introduction of Exotic Species			
Pile Driving			
Pile Removal			
Overwater Structures	Marinas	WA ,CA	Point Locations

	Data Collected	Geographic Extent	Limitations
Flood Control/Shoreline Protection	Shoreline Hardening	WA, CA	Washington shoreline segments are based on geologic features and then assigned an attribute indicating percent hardening. Do not delineate exact extent of hardened shoreline.
Water Control Structures			
Log Transfer Facilities/ In-Water Log Storage			
Utility Line/Cables/Pipeline Installation	Cable Locations	OR, CA	
Commercial Utilization of Habitat	Aquaculture	WA, OR, CA	Data contain areas that are approved/certified for harvest, but do not show actual active aquaculture areas.
Coastal and Marine			
Point Source Discharge			
Fish Processing Waste - Shoreside and Vessel Operation			
Water Intake Structure/ Discharge Plumes	water intake	CA	
Oil/Gas Exploration/ Development/Production	lease locations	CA	
Habitat Restoration/ Enhancement			
Marine Mining			
Persistent Organic Pollutants			

3 MODELING THE STATUS OF FISH HABITAT

3.1 Introduction

3.1.1 The purpose of the model

The EFH Final Rule provides regulations and guidance on the implementation of the EFH provisions of the M-S Act. It includes information on the types of information that can be used for describing and identifying EFH, designating HAPCs, and mitigating fishing impacts on EFH.

The guidelines advocate using information in a risk-averse fashion to ensure adequate protection of habitat for all species in the management units.

In this study, we develop a modeling approach for assessing the status of fish habitat and the risks to habitat function posed by fishing activities in the area covered by the Pacific Coast Groundfish FMP. The model is required to provide a scientific method for assessing Pacific coast groundfish habitat and developing management alternatives for designation EFH and management scenarios that are designed to mitigate specific risks to habitat and ecosystem function.

Bayesian Belief Networks were chosen as a suitable analytical tool [9]. The models have been designed to take advantage of the GIS data and literature reviews developed by NOAA Fisheries. It is recognized that this assessment is occurring in a data-poor environment and therefore must be expressed in terms of probabilities rather than hard numbers. In these situations, the models have been structured to express limitations on each component of the assessment in conjunction with a best estimate in answer to fundamental questions of habitat function. Presentations of the methodology were made to the TRC of the Pacific Fishery Management Council. Proper adjustments to the methodology were made based on input of the TRC.

The methodology was implemented with the goal of answering the questions listed below for Pacific coast groundfish, to the extent possible. Limitations on answering these questions were encountered, particularly in regards to the availability of data for model parameterization.

Hence, further work will involve developing an initial suite of alternatives for EFH designation and management measures in consultation with NOAA Fisheries as well as an analysis of the projected effects of alternatives on groundfish habitat.

- What areas could qualify as essential pursuant to section 303(a)(7) of the Magnuson Act?
- Given past inputs (anthropogenic and environmental), what is the probability that the condition of Pacific coast groundfish habitat has been degraded to an extent that function has been impaired?
- Given foreseeable inputs (anthropogenic and environmental) and regulatory regimes, how are trends in Pacific coast groundfish habitat expected to respond? What areas are at risk of impaired function and of particular concern?
- How might trends in habitat function be affected by altering anthropogenic inputs and regulatory regimes?
- What types of fisheries management alternatives could be applied to mitigate the effects of fishing on habitat? What are the likely impacts to habitat of specific fisheries management alternatives?
- What are the scientific limitations of assessing habitat?

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[9] The background to this decision and a basic introduction to Bayesian Belief Networks is described in the document Identification of Essential Fish Habitat for the Pacific Groundfish FMP, Exhibit C6 in the April 2004 Briefing Book, available at www.pcouncil.org.

The data analysis undertaken to address these questions has included spatial and temporal analysis of the distribution of habitat types, distribution of fish species, habitat use by fish, sensitivities of habitat to perturbations, and the dynamics of fishing effort.

The results of the analysis to identify EFH that culminated in the development and implementation of the EFH Model is described in the document Identification of Essential Fish Habitat for the Pacific Groundfish FMP, Exhibit C6 in the April 2004 Briefing Book, available at www.pcouncil.org. The remainder of this report describes the development and implementation of the Impacts Model.

3.1.2 Guidelines for thresholds

The EFH Final Rule (50 CFR 600.815(a)(2)(ii)) establishes a threshold for determining which fishing activities warrant analysis to prevent, mitigate, or minimize to the extent practicable the adverse effects of fishing on EFH:

> “Councils must act to prevent, mitigate, or minimize any adverse effects from fishing, to the extent practicable, if there is evidence that a fishing activity adversely affects EFH in a manner that is more than minimal and not temporary in nature, based on the evaluation conducted pursuant to paragraph (a)(2)(i) of this section and/or the cumulative impacts analysis conducted pursuant to paragraph (a)(5) of this section.”

As discussed in the preamble to the EFH Final Rule at 67 FR 2354, management action is warranted to regulate fishing activities that reduce the capacity of EFH to support managed species, not fishing activities that result in inconsequential changes to the habitat. The “minimal and temporary” standard in the regulations, therefore, is meant to help determine which fishing activities, individually and cumulatively, cause inconsequential effects to EFH.

In this context, temporary effects are those that are limited in duration and that allow the particular environment to recover without measurable impact. The following types of factors should be considered when determining if an impact is temporary:

- The duration of the impact;
- The frequency of the impact.

Minimal effects are those that may result in relatively small changes in the affected environment and insignificant changes in ecological functions. Whether an impact is minimal will depend on a number of factors:

- The intensity of the impact at the specific site being affected;
- The spatial extent of the impact relative to the availability of the habitat type affected;
- The sensitivity/vulnerability of the habitat to the impact;
- The habitat functions that may be altered by the impact (e.g., shelter from predators)
- The timing of the impact relative to when the species or life stages need the habitat.

3.2 Effects of data on model specification

A Bayesian Network model for examining fishing impacts has been developed. This model provides a framework for the quantitative consideration of habitat status and the effects over time of different management regimes based on the available data. These data are, in essence, the sensitivity and recovery matrices (Section 2.3.2 and Appendix 3) and the fishing effort data (Section 2.3.3).

3.2.1 Sensitivity and Recovery Indices

The sensitivity index provides a relative measure of the effects of fishing gears on habitats. There is no quantitative link to habitat utility for managed species. For example if a habitat/gear combination is allocated sensitivity level 2, to what extent is its utility reduced by a single contact, and/or subsequent contacts and how long will it take for that piece of habitat to recover from a single and/or multiple contacts? In addition, in a spatial sense, is it possible for some fraction of a habitat area to be impacted and to remain in an impacted state without significantly affecting the utility of the whole area as habitat for managed species?

Additional work needs to be undertaken to investigate in detail how the sensitivity index can best be used to evaluate impacts on a scale that has some relevance in an absolute sense to the status of the habitat, in terms of its functionality for managed species. If these types of questions could be addressed, the utility of the impacts model for the management process would be substantially enhanced.

3.2.2 Fishing effort data

At the core of an analysis of the actual effects of fishing gear on specific areas of habitat is the need to understand where and when the gear comes into contact with the habitat. This requires detailed data on fishing locations and tracks of mobile gears on a haul by haul basis. Fishing effort could then be allocated, in terms of area effected, by individual habitat polygon. This would enable estimation of the impact of each gear to each unique habitat type. Knowledge of the footprint of the gear would begin to provide a common measure of fishing effort that would allow consideration of the cumulative effects of different gears operating in the same location.

However, in reality, there is a large degree of uncertainty in the spatial component of the fishing effort data. In the case of the fixed gears, this uncertainty is so great that it has not been possible to develop an Impacts Model that would, with any reliability, predict even relative impacts between different locations. The trawl logbook data provide set points on a haul by haul basis, but not end points, and certainly not actual trawl tracks. While this is still far from ideal, we have been able to develop a quantitative model for bottom trawls that will assist the Council in making decisions about possible management alternatives to prevent, mitigate, or minimize to the extent practicable the adverse effects of fishing on EFH. The remainder of this section therefore refers to the Impacts Model developed for bottom trawl gear.

Ideally, the trawl effort would be summarized by habitat polygons in order to estimate the impact to each unique habitat type. This is theoretically possible using trawl set points, but due to the lack of information about the actual trawl track, there remains a large degree of spatial uncertainty about the location of each tow. For those tows starting in a particular polygon, a portion of them will end outside, and some fraction of those tows would take place outside of that polygon, in a neighboring polygon. The converse is also true, that some trawls starting outside the polygon will end inside. The importance of this effect will depend on a number of factors. These include polygon size, relative to the length of a tow and habitat type of the polygon and its neighbors, relative to the habitat type that the fishermen are trying to fish on. Due to the uncertainty created by these factors and the large variability in the size of the habitat polygons, it was decided that rather than allocating fishing effort to habitat polygons, a regular grid of fishing effort would be a more robust way to deal with the positional uncertainty of the fishing effort data.

The grid size needed to be a balance between being large enough to essentially ignore the effects of tans-boundary tows[10], but small enough to give output at a scale appropriate for informing management decisions that might include area based measures. The grid size was initially chosen to be two times the length of an average tow. An average trawl tow length of 11.8 km was calculated from trawl set and haul point data provided by Marlene Bellman for several study sites off Oregon (Appendix 8). This would give a grid with square cells of side 23.6km, or 12.74 nautical miles. We also considered that a grid delineated by lines of latitude/longitude would be most consistent with convention for reporting fisheries spatial data, despite the fact that a latitude/longitude grid cell is not square and cell size changes with latitude[11]. Using these criteria, a 15-minute latitude/longitude grid was initially chosen as the preferred size. However, this grid is larger than the 10-minute generally used to summarize logbook data (Figure 3), and causes difficulty when summarizing historical logbook data because the edge of the 15-minute grid is exactly at the center point of many of the trawl logbook blocks. We therefore relaxed the average tow length criterion and selected the 10-minute latitude/longitude grid for trawl effort data summaries. A 10-minute grid cell is approximately 18.5 km in the north/south direction, and 12.2 km in the east/west direction at 49 degrees N. latitude and 15.7 km km in the east/west direction at 32 degrees N. latitude.

A 10-minute latitude/longitude grid was developed for the entire West Coast EEZ, and then subset to include only grid cells that overlap with existing GIS habitat layers, given we are interested in the interactions between bottom trawls and benthic habitat. The trawl set points were overlayed with the l0-minute grid to assign a grid cell to each data row. Trawl effort data summaries included the total number of tows and total duration by month for each grid cell for the five years for which there is complete date information, i.e. 1998-2002. Midwater trawls were excluded from the summary assuming that they do not impact bottom habitat. The monthly

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[10] In essence this means that we are assuming that the effects of tows starting inside the grid and ending outside are balanced by the effects of tows starting outside and ending inside.

[11] Cell sizes increase in size as you go from north to south in the study area.

time step allows for seasonal analysis in the impacts model. In addition, the same data were summarized for the full logbook time series, 1987-2002, by year.

In order to provide habitat-specific information for the sensitivity and recovery elements of the impacts model, the merged EFH habitat data were overlayed with the grid cells. For each grid cell, we calculated the area occupied by each benthic habitat type and the total area of the grid cell, to provide the proportion of each cell occupied by each habitat type.

For cells along the edge of the habitat information, there were two types of special cases. First, the deepwater case is where we know there is potential fish habitat outside of the mapped area, but we do not have mapped habitat information. In this case, all of the trawl start points in the cell and the area of the entire cell was used for calculating effective fishing effort. Second is the shoreward case, where we know that the area outside of the mapped habitat area is upland, and therefore not an area where either fishing effort or EFH would occur. In this case, the area to which the fishing effort is applied is only the area of that grid cell that comprises potential EFH. An additional GIS overlay of the shoreline with the grid cells was performed in order to provide a list of cells along the shoreward edge of the habitat data.

3.2.3 Non-fishing impacts

There is information available on non fishing impacts, but the spatial and temporal resolution of these data presently preclude their quantitative incorporation into the Impacts Model in any meaningful way. Different types of impacts can be overlaid in the GIS to show their spatial overlap, but it is not possible at present to develop any quantitative evaluation of the relative importance and/or cumulative effects of fishing and non fishing impacts on EFH at this time.

3.3 Impact function

We seek a mathematical representation of the impact of fishing effort on a given portion of seabed. Impact is measured on a scale 0 to 1 and can be thought of as proportion impacted, with 0 representing a pristine state and 1 totally functionally destroyed.

A family of functions with suitable properties is provided by

$$f(x) = \frac{1-(1-s)^x}{1+(1-s)^x}$$

where x is fishing effort measured on an appropriate scale (see below), and s is sensitivity measured on a scale $0 < s < 1$[12]. This function is a version of the generalized logistic function and can be written

$$f(x) = \frac{1-e^{-\beta x}}{1+e^{-\beta x}} = \tanh\frac{\beta x}{2}$$

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[12] This is a simple conversion from the four point scale described in Section 2.3.2.

where $\beta = -\log(1-s)$ (so that $\beta > 0$).

It has the following properties, which make it suitable as a basis for modelling impact:

(a) $0 \le f(x) \le 1$

(b) $f(0) = 0$ and $\lim_{x \to \infty} f(x) = 1$

(c) $\lim_{x \to \infty} f'(x) = 0$ and $f'(0) = \frac{\beta}{2} = -\frac{1}{2}\log(1-s)$

Note that property (c) implies that the slope of the impact function for zero effort increases with sensitivity. In other words, the impact on pristine habitat increases more rapidly for greater sensitivity, as required.

3.3.1 Measurement scale for fishing effort

For a given area, the basic measure of fishing effort for ground-trawls is estimated from logbook data as the total duration of all tows that start in the area during the period under consideration.

This measure suffers from a potential upward bias resulting from the inclusion of tows which start in the area but end outside it. A partial correction for this error is automatically provided by the exclusion of tows which start in neighboring areas. The extent of the bias also clearly depends on the magnitude of the area, smaller areas tending to produce greater errors. An area which is roughly a square of with width equal to twice the mean tow length should produce a minimal error. This can be achieved by choosing units of the order of 15 minutes of latitude and longitude. This choice would result in a fairly low resolution grid for representing maps of fishing impacts. In the event, a 10 minute cell size was adopted, mainly for practical reasons (See Section 3.2.2).

The distribution of total duration (Figure 4) suggests that a log-scale may result in greater discriminating power. To allow for zero effort, log (*duration* + 1) was used.

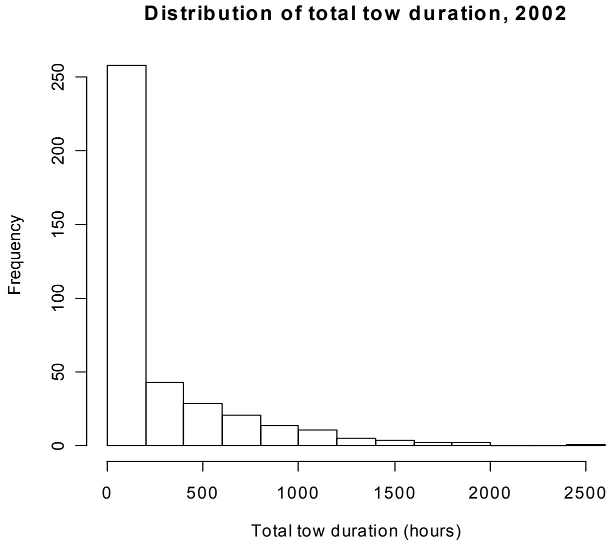


Figure 4. Distribution of total tow duration, 2002

3.3.2 Modeling the relative impacts of fishing effort

There appears to be no sound empirical basis to relate a given quantum of fishing effort to a measurable impact on the habitat. Consequently, the aim of the present modeling exercise was limited to representing *relative* impacts. To allow some flexibility in calibrating impact with effort, a tuning constant k has been included in the scaling of effort, so the variable x in the impact function is effectively

$$x = \frac{1}{k}\log_{10}\left(duration + 1\right)$$

A suitable value of this constant will depend on the range of values of the total duration, and hence on the period being modeled. For a period of one year, values in the range 0.1 to 0.5 seem reasonable. **Error! Reference source not found.** shows a family of impact functions for various sensitivity levels with the tuning constant fixed at $k = 0.25$. Figure 6 shows the same plot for a range of values.

Choosing the Tuning Constant

Suppose we are to compare n cells (or times).

Data: total durations $d_1, \ldots, d_n$

CEE values are $x_i = \frac{1}{k}\log_{10}\left(d_i + 1\right)$

First set ymax = 0.95, say.

smin = lowest sensitivity among the n cells to be compared.

Calculate $x_{\max} = \frac{\log\left[\left(1 - y_{\max}\right)/\left(1 + y_{\max}\right)\right]}{\log\left(1 - s_{\min}\right)}$

Choose the scale factor k so that

$$x_{\max} = \frac{1}{k}\log_{10}\left(d_{\max} + 1\right)$$

so that

$$k = \frac{\log_{10}\left(d_{\max} + 1\right)}{x_{\max}}$$

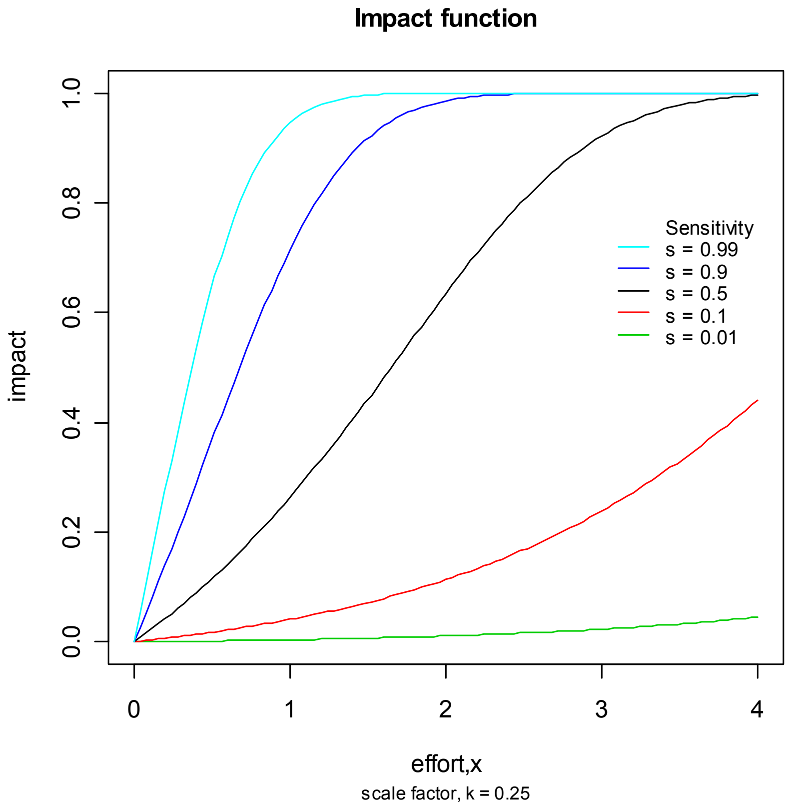
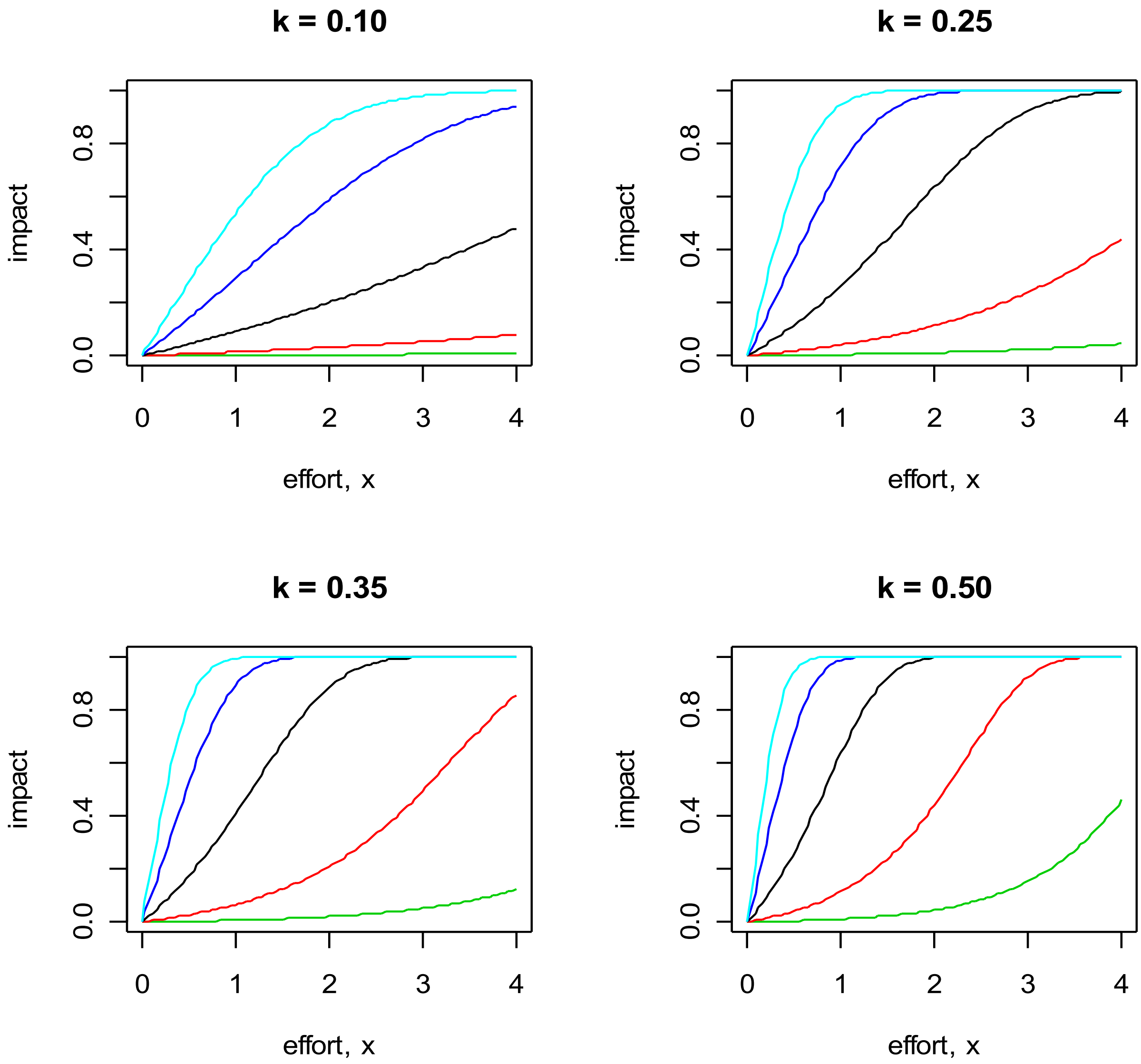


Figure 5. A family of impact functions for various sensitivity levels with the tuning constant fixed at *k* = 0.25



k = 0.10

k = 0.25

k = 0.35

k = 0.50

Figure 6. Figure 5 plotted for various levels of the tuning constant *k.*

3.3.3 Cumulative effects of fishing impacts and recovery

A convenient paradigm for concurrently modeling the cumulative effects of recurrent fishing activity and recovery is to imagine translations up and down the x scale, described above as $x = \frac{1}{k}\log_{10}\left(duration + 1\right)$. A recovery event moves down this scale, while extra fishing effort moves up. We can think of this x-scale as an indirect measure of impact, in the sense that in any time period, additions to x occur when there is new fishing effort; reductions on the x-scale correspond to recovery. Modeling in discrete time, we measure the net impact by first locating the appropriate position on the x-scale by adding new effort and accounting for recovery during the preceding time period. Only then do we calculate the actual impact from the function $f\left(x\right) = \frac{1-\left(1-s\right)^x}{1+\left(1-s\right)^x}$, where s is the sensitivity score ($0 < s < 1$). Thus the x-scale is a kind of proxy measure for impact - the scale on which we do out accounting for new fishing and recovery. We can call it the *cumulative equivalent effort (CEE).*

To account for recovery on the CEE scale, we need a maximum value from which to recover. This function is an idealized mathematical model and the limiting value of 1 (meaning the area is totally functionally destroyed) is attained only as effort $\rightarrow \infty$. We therefore define a notional maximum value $x_{\max}$ of CEE to be that value of x for which impact is some high impact value I^*, say 0.9 or 0.95: $f\left(x_{\max}\right) = I^*$. Inverting the impact function,

$$x_{\max} = \frac{\log\left[(1-I^*)/(1+I^*)\right]}{\log\left(1-s\right)}$$

When CEE is $x = 0$, the impact is zero, i.e. $f\left(0\right) = 0$. If r represents the mean recovery time (in years) for a given habitat type, we take this to mean that on the CEE scale, it takes r years to move from $x_{\max}$ back down to 0. In the event that the current impact, as measured on the CEE scale is some other value $x < x_{\max}$, then the recovery in one year is $\Delta x = \frac{1}{r}x_{\max}$, or in a period T years is $\Delta x = \frac{T}{r}x_{\max}$. (Note that T may be fractional, say half a year.) If it happens that $x - \Delta x < 0$ then we truncate at zero. If the current period is t and we are modeling impact every successive T years, we write the current cumulative net CEE as $x^{(t)}$, and denote the new fishing effort (on the x-scale) during the period t-T to t as $e^{(t-T,t)}$. We then have the recurrence relation

$$x^{(t)} = \max\left(x^{(t-T)} - \frac{T}{r}x_{\max}, 0\right) + e^{(t-T,t)}.$$

This relationship forms the kernel of a dynamic Bayesian network in which the actual impact at time t is estimated by substituting the above value $x^{(t)}$ of CEE into the impact function $f\left(x\right) = \frac{1-\left(1-s\right)^x}{1+\left(1-s\right)^x}$.

3.4 The Bayesian Network Model for Impacts (Version 1)

A diagram of the Bayesian Network is given in Figure 7. For clarity, this shows only four time periods, but in principle any number of periods can be added to the model, provided they follow each other successively in time, such that the start of period t+1 immediately follows the end of period t. The model is for bottom trawl gears only, a separate version being required for each gear type.

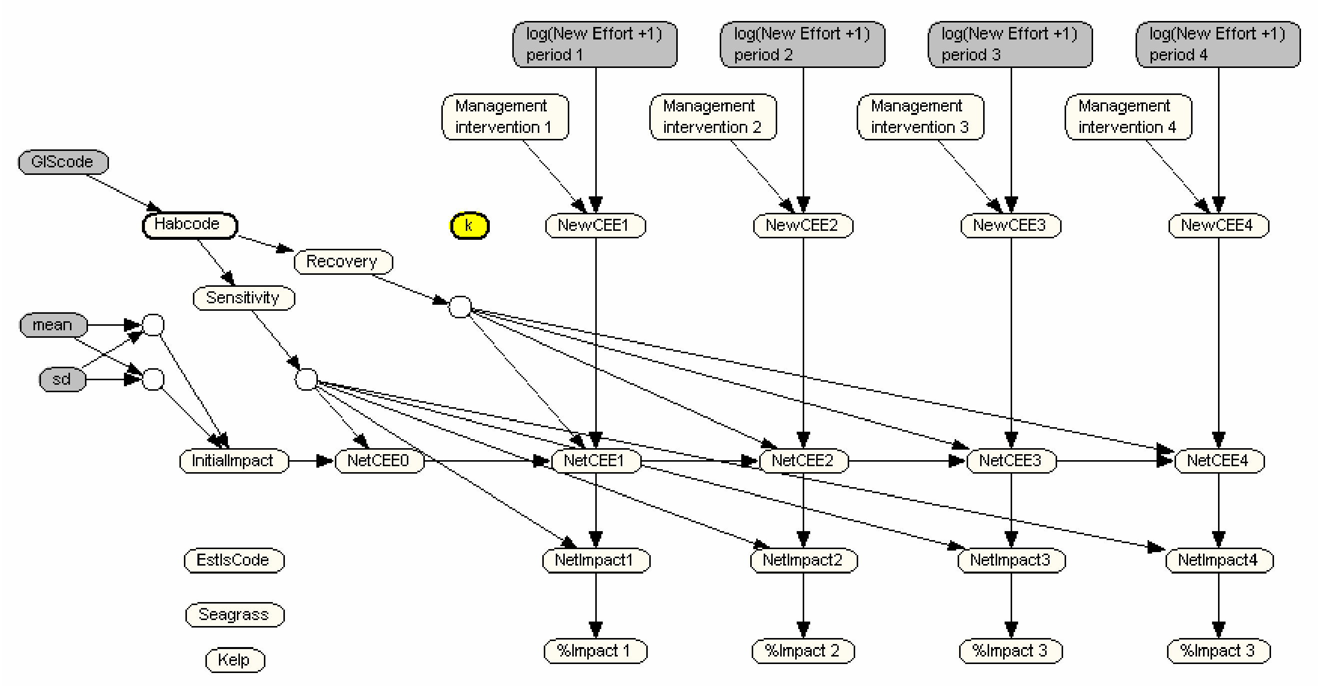


Figure 7. Bayesian Network to estimate impact of fishing gear - bottom trawls version

The node labeled “GIScode” contains the habitat descriptor codes as used in the GIS. These are mapped onto the appropriate corresponding codes, in node “Habcode”, that are used in the sensitivity and recovery indices. Sensitivity and recovery values, as given for each combination of gear type and habitat in Appendix 3, are re-scaled to 0-1, as required by the impact function. These values are assumed constant over time.

Initial impact is modeled by a beta distribution to represent prior uncertainty in knowledge of the initial state of the habitat. This information can be entered either by specifying the two parameter values for the standard beta distribution, or by specifying the mean and variance. As an alternative to a probability distribution, an actual value can be entered. The initial impact value is converted to the CEE scale by the inverse of the impact function.

New effort for each period is entered as log(duration + 1) in the top node. This is modified by any management intervention and rescaled to the CEE scale. Net CEE is computed by accounting for recovery from the previous CEE. Net CEE is then converted to the impact scale and finally summarized in the % Impact node, by its expected value.

The entire process is replicated for each time period, resulting in a dynamic Bayesian network. Note that the time interval between successive periods is arbitrary; a feature which enables the modeling of seasonal effects.

4 RESULTS

4.1 Comprehensive risk assessment

As described in Section 1, the Impacts Model forms only part of the input into the decision-making process. Other elements of the data consolidation work that has been undertaken as part of this project can be used as part of a comprehensive risk assessment, so that impacts alternatives can be developed that are not specifically tied to or informed by the Impacts Model.

For example, although the model itself uses only effort data from the trawl logbook, sensitivity and recovery indices have been developed for the full range of fishing gears used on the west coast, to the extent that these are supported by the literature. The Council could, if it desired, consider management actions for these gears based solely on the information presented in Appendix 3. Some gear/habitat interactions may be identified as sufficiently undesirable, based solely on this information, that the Council does not need a detailed quantitative risk analysis to consider taking action. It would clearly be more desirable to be in a position to implement the Impacts Model for all gears, and to look at cumulative impacts on a single quantitative scale, but for reasons explained in this report, this is not presently possible. This should not, however, preclude using information outside of the model to develop management alternatives.

Given the major constraint to the incorporation of non-trawl gears into the model is effort data, one possible alternative approach would be to run the model using assumed distributions of fishing effort for these gears to illustrate potential effects of time and area measures. This option has not been explored to date.

In a similar vein, there are habitat types in the sensitivity and recovery matrices that are not mapped in the GIS. In particular, there are certain types of highly vulnerable biogenic habitats that are mapped either incompletely (e.g. seagrasses and kelp) or not at all (e.g. corals and sponges). Because the model has an explicit spatial component, it is not possible to use it to explore the consequences of alternatives relating to habitat types that are not mapped in the GIS. Indeed, it may not even be possible to develop the alternatives themselves, if it is not possible to identify where the habitats occur. However, the Council may be able to consider alternatives that, for example, prohibit certain gears from operating in areas of particular habitat types, such as corals, to the extent that these are known. As information becomes available on the distribution of those habitats and they can be mapped, such alternatives would come into effect.

Perhaps one of the most important outputs of the research effort to date has been to identify clearly where data are lacking for the development of a comprehensive risk assessment. In this regard, mapping of vulnerable biogenic habitats is clearly one research activity that should be given a high priority.

Although only some of the available data sets have been integrated into the Impacts Model, all the data that have been compiled to date can be accessed and visualized in the GIS environment. This enables geo-referenced overlays of information from different sources to identify areas of habitat that may be particularly in need of protection. For example, output from the impacts model can be overlayed with Habitat Suitability Probability (HSP) polygons produced by the

EFH model for a particular species or group of species to look for areas of importance to that species that are at particularly high risk from fishing impacts. In addition, the data that are available for non-fishing impacts can be visualized together with these other layers. Existing marine managed areas, such as sanctuaries or federal fishing regulation areas (Section 5.2), can also be overlayed to look for existing protections. Multiple layers can be viewed together as needed to assess both risks and protections for areas of interest. In addition, multiple layers of information can be combined to create new spatial boundaries as needed.

4.2 Using the Impacts Model

4.2.1 What the Impacts Model (Version 1) can do

The Impacts Model provides a quantitative assessment of the biological impacts to EFH caused by bottom trawls. The model is dynamic and treats fishing impacts both spatially and temporally. It is intended to be used to investigate relative changes over time and space in the status of EFH resulting from different management regimes or different intensities of gear use. These management regimes may either be in the past, in which case the model is used to investigate existing impacts and the current relative status of EFH, or they are alternative strategies for future management, in which case the model is used to investigate the potential change to habitat status resulting from management interventions.

4.2.1.1 Answering the questions posed at the start of the project

At the start of the proof of concept phase of this project, six questions were posed that the analysis would be designed to address, to the extent practicable. These six questions are set out below, with a brief appraisal of the extent to which it has been possible to address them.

- What areas could qualify as essential pursuant to section 303(a)(7) of the Magnuson Act?

  This question is addressed through the implementation of the EFH Model, which was presented to the Council at its April 2004 meeting: Identification of Essential Fish Habitat for the Pacific Groundfish FMP, Exhibit C6 in the April 2004 Briefing Book, available at www.pcouncil.org

- Given past inputs (anthropogenic and environmental), what is the probability that the condition of Pacific coast groundfish habitat has been degraded to an extent that function has been impaired?

  It is not currently possible to provide a quantitative assessment of this probability due to the lack of a quantitative link between habitat condition and function for west coast groundfish habitats. The model does, however, provide trajectories of the cumulative impact of trawls on the condition of Pacific coast groundfish habitat, based on the available sensitivity, recovery and fishing effort data and an assumed value of the tuning constant k. It also provides a spatial comparison of impact levels within a given scenario, such that if degradation of habitat has occurred, we can see where it is most likely to have taken place.

The model can also be used to demonstrate relative expected changes in fishing gear impacts that result from specific management interventions such as gear modifications, or area closures. However, due to the shape of the impacts function (this is non-linear), and uncertainties regarding the value of k it is difficult to be categorical about the magnitude of these changes. As the net cumulative equivalent effort increases, so the impacts function tends towards an asymptote. What this is saying is that an area that is heavily fished over a period of time will eventually reach a stage at which subsequent fishing will make very little marginal difference to the condition of the habitat; an intuitively sensible feature of the model. The corollary of this is that for areas that have reached this level of impact, a modest decrease in effort is likely to yield very little benefit in terms of a reduction in impact.

However, there are several problems in interpreting these results. Firstly, while it seems obvious that the habitat will have been altered to some degree at the level of impact where the curve flattens out, we cannot tell at this stage to what degree the functionality of habitat has actually been impaired by this impact. Areas that have been regularly fished over along period of time and continue to yield reasonable catch per unit effort, suggest that it is possible for an area to reach this level of impact, but remain functionally productive. However, there is no available experimental evidence to support and/or explain this in a biological sense. Secondly, because impacts are modeled relatively, while we can tell if an area is more or less impacted, we cannot tell categorically whether a particular area is close to its asymptote or not. Depending on the selection of the value of k, a given level of effort will place us on different parts of the impacts function curve (Figure 6). It is, however, possible to develop some objective criteria for setting k (Section 3.3.2)

- Given foreseeable inputs (anthropogenic and environmental) and regulatory regimes, how are trends in Pacific coast groundfish habitat expected to respond? What areas are at risk of impaired function and of particular concern?

  The habitat map (Figure 2) and trawl logbook data provide the basis, through the application of the Impacts Model, for a spatial and temporal assessment of risk to habitat from bottom trawls (see for example Section 4.2.3). Other fishing gears and non-fishing inputs are not available at sufficient spatial resolution to be used in the model at present. In addition, there is presently no common metric with which to measure the relative and cumulative impacts of different inputs. Data on inputs that are not incorporated in the model are presented in the best available format (e.g. GIS layer maps or descriptions) so that they can be used in a qualitative assessment of risk to support the development of impacts alternatives.

- How might trends in habitat function be affected by altering anthropogenic inputs and regulatory regimes?

  These effects will be examined using the model in the development and assessment of management alternatives to prevent, mitigate, or minimize adverse effects from fishing.

- What types of fisheries management alternatives could be applied to mitigate the effects of fishing on habitat? What are the likely impacts to habitat of specific fisheries management alternatives?

  These effects will be examined using the model in the development and assessment of management alternatives to prevent, mitigate, or minimize adverse effects from fishing.

- What are the scientific limitations of assessing habitat?

  The development of the Bayesian Network Model for fishing impacts has demonstrated a number of specific limitations in the information available to assess the status of habitat and the risks posed by various anthropogenic inputs. These limitations are discussed in 4.2.2.

4.2.1.2 Evaluating the consequences of alternatives

The main data inputs into the Impacts Model are fishing effort, habitat sensitivity and habitat recovery. Fishing effort is defined on a spatial and temporal scale, as described in Section 3.2.2. The sensitivity and recovery indices are defined as matrices of fishing gears and habitat types. Management measures that bring about changes in these input data can be evaluated in terms of changes in the model outputs.

Area or time measures can be mapped in the GIS, in terms of assumed future distributions of fishing effort. These scenarios can be fed into the model to show changes in the spatial distribution of expected impacts, and changes in time trajectories. At present there is no specific modeling of fishermen’s behavior in response to management interventions, but this could be done external to the model and the results analyzed in the same way. In a future iteration of the Impacts Model, it would be highly beneficial to develop an integrated capability that could look at such changes in behavior, and resulting changes in impacts.

Similarly, changes in gear configuration that reduce the impact that a fishing gear has on habitat would be manifested in terms of a change in the sensitivity and/or recovery scores for particular gear/habitat combinations. These changes can also be fed into the model and the results plotted as previously described.

The scale on which the effects of gear modifications can be considered is, however, relatively coarse at present. For example, in 1999 there was a management intervention that reduced the size of the footrope gear on bottom trawls. This had the effect of reducing fishermen’s capability to fish in hard bottom, high relief areas (to reduce catches of canary rockfish and lingcod), and hence had an influence on the spatial distribution of habitat impacts. For a given amount of effort, a trawl with a "small" footrope is also likely to cause less impact on a given habitat than one with a "large" footrope (See Appendix 1, page 13). However, the impacts literature review presented in Appendix 3 suggests that we are not yet able to show scientific evidence to support such a difference. In fact, the literature does not yet support subdivision of bottom trawl gears into the component types listed in Appendix 2, nor do the trawl logbook data currently distinguish between these different types of bottom trawl.

4.2.2 What the Impacts Model (Version 1) cannot do

Formulation of the Impacts Model and analysis of available data has been undertaken under constrained funding and timelines associated with a legal settlement (AOC vs. Daly). There are consequently several limitations to the utility of the model for supporting decision-making with respect to alternatives for mitigating impacts to EFH. First and foremost, the model currently treats only at part of the cost/benefit equation. It is being used to investigate, in a relative sense, past impacts on habitat caused by bottom trawl gear and the potential for recovery from those impacts under various management scenarios. It does not (and was not intended to) consider directly the economic consequences of management measures, and it therefore cannot be used by itself to investigate quantitatively notions of practicability.

With respect to impacts, the model cannot provide an assessment of the absolute status of groundfish habitat either prior to fishing, at the present day, or following possible management interventions in the future. We are not aware of an objective scale on which to measure this status, other than what has been used to develop the sensitivity index. There is no absolute quantitative link between an amount of fishing effort, an impact on habitat and a consequent change in the productivity of managed and other fish species. The metrics of fishing effort and non-fishing activities are not on comparable scales, and it is therefore not possible to demonstrate quantitatively either the relative importance of fishing and other anthropogenic activities in bringing about changes in habitat status, or the cumulative effects of multiple impacts.

One of the most significant constraints to the utility of the Impacts Model is the resolution of the fishing effort data. There are no reliable spatial data available for non-trawl gears, nor for recreational gears, for the whole west coast. There are also limitations in the trawl logbook data that have been used in this first version of the model. The logbook database contains information on the start position of each haul, and the duration of the haul. There is no information on the speed and direction of the tow, nor the estimated width of the ground gear. At this stage, it is therefore not possible to plot the footprint of the trawl gear in the GIS. Regarding speed and direction, the logbooks themselves do contain end position of tows, but these data have not been entered into the database. Regarding the width of the gear, it is possible to estimate this information for different gear types, but it is quite variable, depending on the specific rigging of the trawl, and the way in which it is fished.

The benefits of fishery management measures would need to be evaluated in the context of impacts arising from non-fishing activities that themselves may or may not be mitigated once identified.[13] However, the benefits of specific actions to protect or restore habitat are not all readily quantifiable in the same units as the costs. This is in part due to uncertainty in the direct effects of fishing gears and non-fishing impacts on habitat function and the lack of information on the relationships between habitat function and productivity. This uncertainty and lack of information is both a consequence of and exacerbated by the complexities of the ecological relationships and processes involved.

Habitats that make up EFH are subject to varying degrees of natural disturbance. The sensitivity and recovery matrices developed for the Impacts model categorize habitat types using the methodology adopted for the GIS. This distinguishes implicitly, to some extent, between habitats in high and low energy environments (e.g. shelf, slope, basin floor), but this distinction is limited. Currently there is no explicit accounting for natural disturbance in the evaluation of the significance of fishing impacts in terms of effects on the utility of EFH for managed species.

4.2.3 Maps and graphs produced by the Impacts Model

See following page

4.2.4 Validation of model results

See report of the SSC Groundfish Sub-committee meeting

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[13] The Council and NMFS cannot take direct action to mitigate impacts on EFH other than those caused by fishing in federal waters. For impacts arising from non-fishing activities, the EFH mandate makes provision for a written, public consultation process between NMFS and the agency responsible for the non-fishing activity. Such a consultation exercise may result in action by that agency to modify the non-fishing activity, in which case the economic consequences of such modification may need to be considered in an integrated model to evaluate practicability.

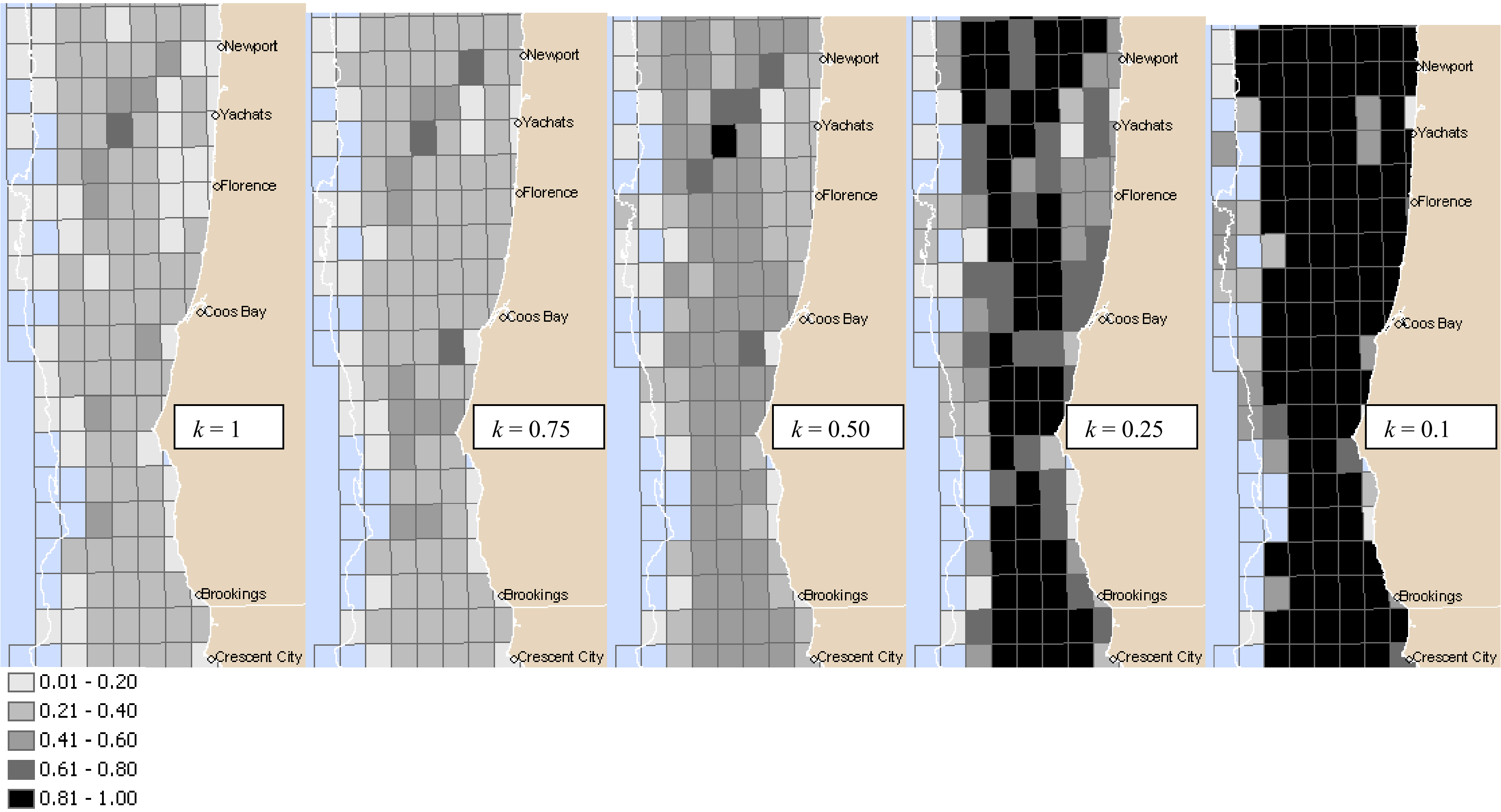

Figure 8 Example maps depicting net cumulative impact from bottom trawls for various levels of the tuning constant *k*

5 POTENTIAL FISHING IMPACTS ALTERNATIVES

5.1 Previous Council actions

When the Council is considering the development of management alternatives for fishing impacts, it should explore in detail any previous and existing measures that have been considered and/or implemented that may have actually or potentially served to prevent, mitigate, or minimize the adverse effects of fishing on EFH, whether by design or not. The EIS should include a section that describes these previous actions in detail.

5.2 Existing spatial habitat protection measures

The groundfish EFH project has served as a catalyst to compile information on existing spatial habitat protection measures not previously available on a coast wide scale. This is a twofold effort: the first involved compiling boundaries of marine managed areas and the second is developing a GIS coverage depicting existing federal regulations including identifying areas that are closed to some or all fishing gears for some or all of the time. These boundaries are not explicitly included in the impacts model because we have information about actual fishing effort, and therefore any areas closed to fishing would be reflected in the location of fishing effort.

GIS data delineating Federal marine managed areas have been acquired from the Marine Protected Area (MPA) Center's Marine Managed Areas Inventory [14]. These areas include National Parks, National Wildlife Refuges, National Marine Fisheries Service Areas (Pacific Whiting Salmon Conservation Zones, only), National Marine Sanctuaries, and National Estuarine Research Reserves (Figure 9). Although the MMA Inventory provides information regarding habitat protection, the types of protection identified in the inventory are extremely generalized and may not contain all the information necessary for EFH purposes. Additional information about the type of habitat protection afforded at each of these sites has been researched by Fran Recht of PSMFC and is presented in Appendix 9.

Compilation of GIS data layers for marine protected areas in state waters was not completed for this phase of the project. The MPA center is currently compiling this information, and we did not want to duplicate their efforts. Data for Oregon have been completed in the MMA inventory, and data collection for Washington and California is in process. If the need for protected areas information in state waters becomes a high priority during the EFH policy development and EIS process, this information could be compiled.

As for fishing regulations, GIS data delineating existing and historic federal fishing conservation areas have been created from coordinates published in the Federal Register and on the Groundfish Management website of the NMFS, Northwest Regional Office[15]. Guidance for the interpretation of the regulations has been provided by Yvonne DeReynier and Carrie Nordeen at NMFS, Northwest Regional Office. Polygons delineating Rockfish Conservation Areas,

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[14] http://www.mpa.gov/inventory/inventory.html

[15] http://www.nwr.noaa.gov/1sustfsh/groundfish/gConservAreas/

Yelloweye Rockfish Conservation Area, Cowcod Conservation Area, and Darkblotched Rockfish Conservation Area from 2001 to the present time have been developed (Figure 10). In addition, boundaries for statewide closures to trawling in Washington and California have been delineated. Spatial boundaries for other state-specific fishery regulations have not been collected due to time and resource constraints. Also, due to the rate of change of the Rockfish Conservation Area boundaries (approximately every two months), we have currently compiled RCA boundaries only through August 2003. Because these boundaries were not explicitly included in the Impacts model, as described above, they were given a lower priority for scarce project resources. The additional boundaries could easily be compiled as needed, and it is expected that current RCA boundaries will be needed during the development of EIS alternatives. Specific descriptions of the fishing regulations in these areas is provided in Appendix 10

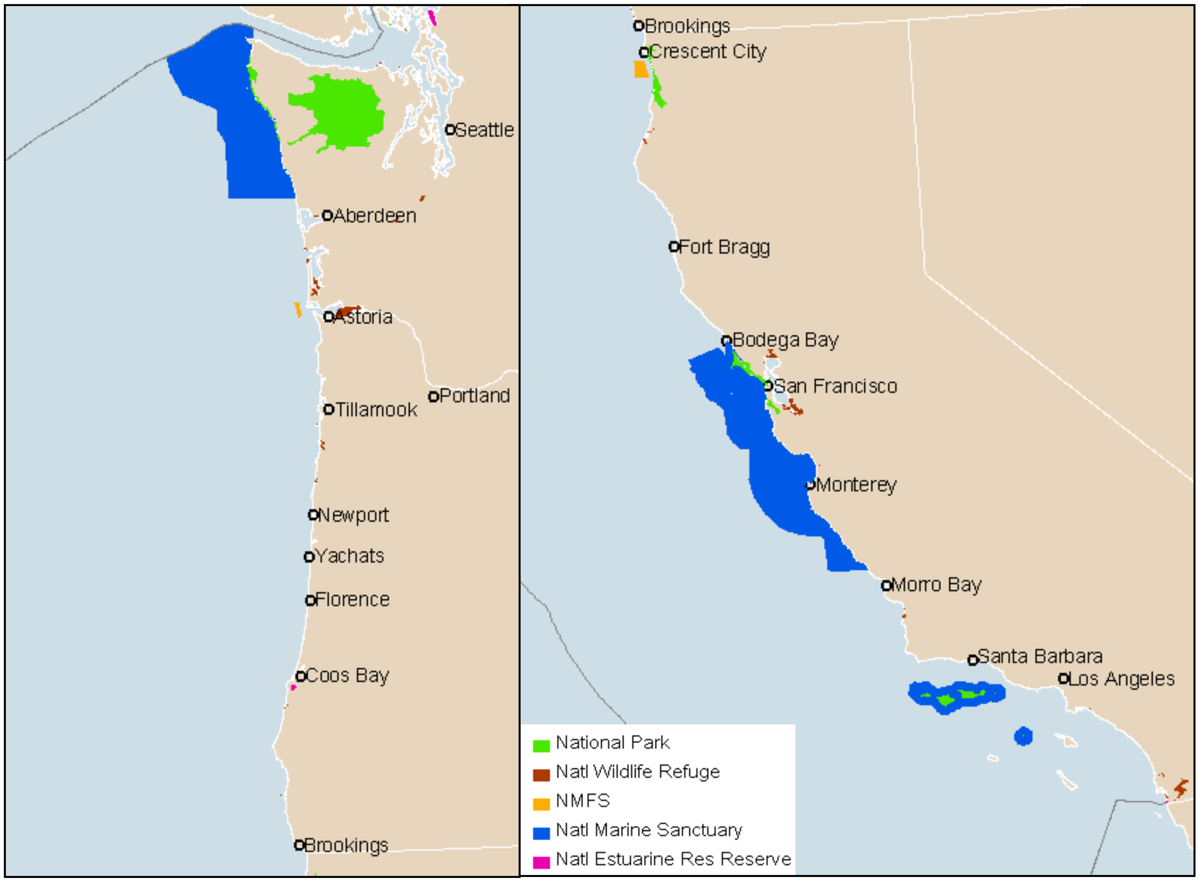

Figure 9. Federally managed areas on the west coast of the U.S.

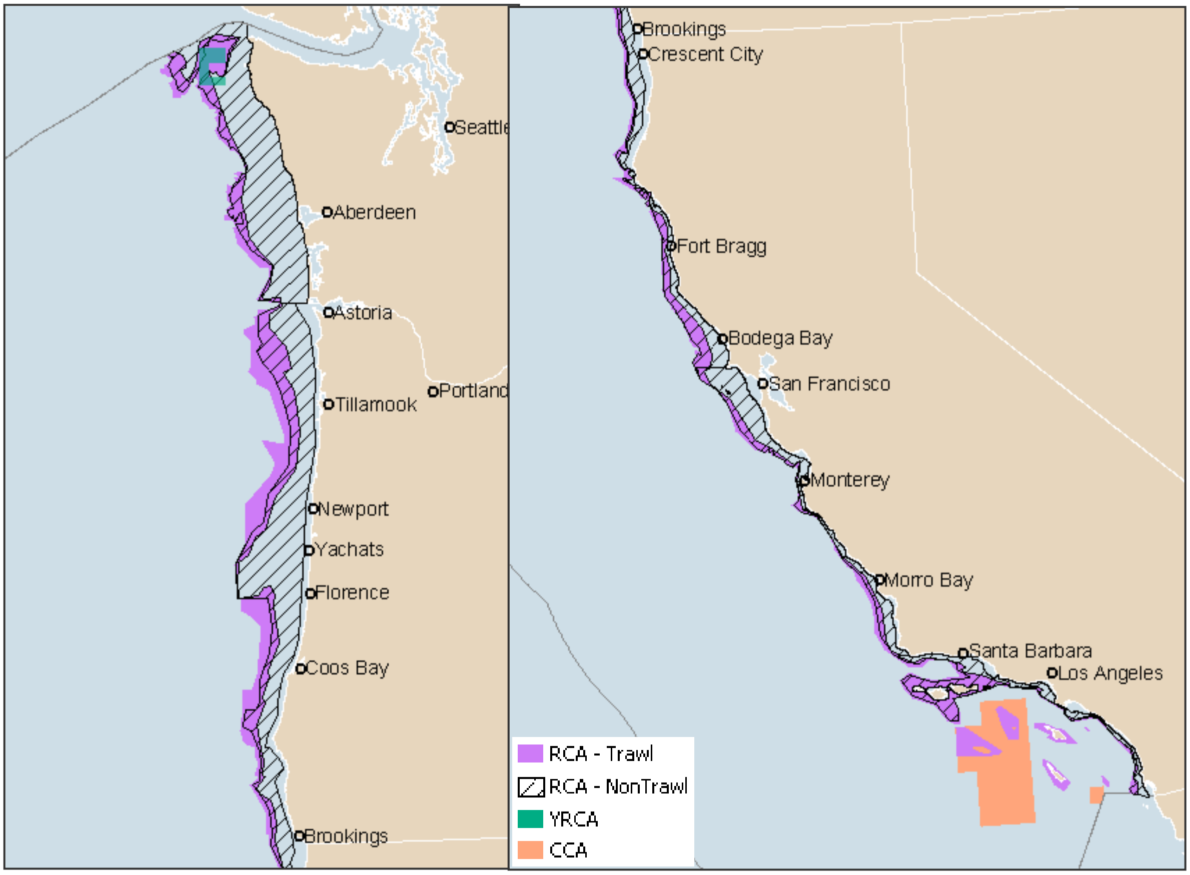

Figure 10. Polygons delineating Sample Rockfish Conservation Areas (RCA trawl and non-trawl), the Yelloweye Rockfish Conservation Area (YRCA), and the Cowcod Conservation Area (CCA).

5.3 Potential further Council actions

This section describes the types of actions that were considered when developing the range of fishing impacts alternatives to prevent, mitigate, or minimize potential adverse impacts by a gear on a habitat. Many different actions are possible for each gear, and the actions considered in developing the alternatives fell generally under five concepts: no action, gear modifications, time/area management, reduce fishing effort and full prohibition of the activity causing the impact. These concepts are described in more detail in Table 4 .

Table 4. Concepts that can be applied in the development of management alternatives to prevent, mitigate, or minimize the adverse effects of fishing on EFH

Concept	Description
No action	No action alternatives are required by NEPA in part to provide a baseline for the consequences analysis, against which the consequences of all the other alternatives can be compared. Under this concept, no new measures for preventing, minimizing or mitigating adverse effects of fishing on EFH would be introduced. Adopt this concept as the fishing impacts alternative would require a determination that existing management measures adequately minimize, mitigate, or prevent potential adverse fishing impacts for all gears in all FMPs, to the degree practicable using best available scientific information (see Section 2.5.2 for a more complete rationale for the Alternative).
Gear modifications	Under this concept, alternatives are developed for modifications to the design and/or use of specific fishing gears that have a high potential of preventing, minimizing, or mitigating the adverse fishing impacts they cause. Fishing gears to which habitats are sensitive are identified and several alternatives for gear modifications to reduce adverse impacts are proposed.
Time/area closures	Alternatives create specific closed areas and closed seasons to prevent, minimize, or mitigate adverse fishing impacts in particular areas and at particular times of the year (as appropriate).
Reduce effort	The M-S act restricts access limitation to programs designed to achieve optimum yield.
Gear prohibitions	This is the most restrictive approach to preventing, minimizing or mitigating adverse effects of fishing on EFH. Prohibition of gears on sensitive habitat could occur at two scales. First, prohibit the gear on only the habitats that the gear adversely impacts. This would require mapping of the habitats and drawing enforceable boundaries around the sensitive habitats. Second, prohibit gear throughout the EEZ. Such a prohibition would prevent a gear adversely affecting a habitat (to the extent it is enforced), but would also prevent use of the gear on habitats where it causes no adverse impact.

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Exhibit C.4.b
Attachment 2
June 2004

Appendices to
EFH Impacts Assessment for thePacific Groundfish FMP

- Appendix 1: Description of Fishing Gears Used on the U.S. West Coast (DRAFT 12/3/03)
- Appendix 2: Gear Types in the PacFIN Database
- Appendix 3: Pacific Coast Groundfish EFH; The Effects of Fishing Gears on Habitat: West Coast Perspective (DRAFT 5)
- Appendix 4: Pilot Project to Profile West Coast Fishing Effort Based on the Practical Experience of Fishermen
- Appendix 5: Fishing Effort GIS Data Assessment for Groundfish Essential Fish Habitat
- Appendix 6: Non-fishing Impacts to Essential Fish Habitat and Recommended Conservation Measures
- Appendix 7: Organizations contacted for information on non-fishing impacts to EFH
- Appendix 8: Evaluation of a US West Coast Groundfish Habitat Conservation Regulation via Analysis of Spatial and Temporal Patterns of Trawl Fishing Effort.
- Appendix 9: Marine Protected Areas and Fishing Activities on the U.S. West Coast
- Poster: Visualizing Spatial and Temporal Trends in West Coast Trawl Fishing Effort

Appendix 1
Description of Fishing Gears Used on the U.S. West Coast
DRAFT 12/3/03

Fran Recht, Pacific States Marine Fisheries Commission

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Description of Fishing Gears Used on the U.S. West Coast
DRAFT 12/3/03

Fran Recht, Pacific States Marine Fisheries Commission

I. Background

The Essential Fish Habitat (EFH) regulations of the Magnuson-Stevens Fishery Conservation and Management Act[1] require fishery management plans to evaluate the potential adverse effects of fishing on the essential fish habitat of the fish managed by the Pacific Fishery Management Council (Council), and minimize those effects to the extent practicable.

This document describes the gear used on the west coast of the United States (excluding Alaska) and what components of the gear might affect structural habitat features. This gear description is one part of a 'fishing gear impact analysis' that requires an understanding of the gears used, how gear affects habitat, the amount and distribution of fishing effort, and the sensitivity and resiliency of various habitat types.

It describes the types of fishing gear used on the west coast in potential groundfish essential fish habitat[2] and the parts of the gear that may impact structural habitat features. It includes gear used by fishermen fishing for groundfish as well as gear used to fish for other species. The list of gear types used on the west coast is found in Table X on page X and was taken from "Notice of the Continuing Effect of the List of Fisheries" published in the *Federal Register*[3].

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[1] 50 CFR 600.815(a)(2)(i)

[2] Groundfish is a general term referring to the fish that as adults, with a few exceptions, live on or near the bottom of the ocean. Groundfish essential fish habitat means those waters and substrate necessary for the spawning, breeding, feeding, or growth to maturity of these species. The Pacific Coast Groundfish fishery management plan includes 82 groundfish species which, depending on species, can be found from estuaries seaward to the 200 mile limit of U.S fishery management jurisdiction (EEZ). These species include 55 rockfish species, 12 flatfish species 6 roundfish species, 6 species of sharks and skates, and 3 other species. A list of these fish are found in Appendix X. The description of EFH for these species is found in Appendix X.

[3] Vol 67, No. 12, Thursday January 17, 2002; http://www.nmfs.noaa.gov/prot_res/PR2/Fisheries_Interactions/list_of_fisheries.html. This list of commercial fisheries includes salmon net pen aquaculture and Washington and California kelp harvest. These activities are not included in this fishery gear description, but are described under the non-fishing effects section of the EFH environmental impact statement. The list does not include ghost shrimp pumping nor the poke pole fishery which are briefly described in this document.

This document does not cover the following issues:

1. *Effects of fishing on habitat*. These effects are discussed in the NOAA literature review (Johnson, 2002) in Appendix X.
2. *Fishing effort or distribution*. These are covered in Section X and in Appendix X (risk assessment map)[4].
3. *Gear impact analysis*. The gear impact analysis is a part of the larger risk assessment for groundfish EFH, which deals with both fishing and non fishing effects on habitat as well as natural disturbances. The risk assessment is presented in Appendix X.
4. *Legal requirements for fishing gear*. Legal requirements for gear for Council-managed fisheries are found in the Code of the *Federal Register* 50 CFR 660. There are also gear requirements for state managed fisheries that are found in the regulations of each state.

It is important to note that fishing gear constantly changes in response to factors such as increases in vessel power and design, efforts to increase efficiency, targeting of new species, efforts to reduce the catch of non-targeted species and avoid certain types of habitat, and responses to regulations. While general attributes of gear can be described, innovative fishermen have made many variations in terms of how gear is rigged and handled, which can change gear performance and how gear effects habitat. For example, alterations in towing speed and scope ratios (which determines the angle at which the gear is towed behind the boat) can cause similar gears to have different effects (Rose et al. 2002).

Gear Used in the Groundfish Fishery

Many different types of fishing gear are used to capture groundfish in commercial, tribal, and recreational fisheries. Groundfish are caught with trawl nets, gillnets, longline, troll, jig, rod and reel, vertical hook and line, pots (also called traps) and other gear (e.g. spears, throw nets).

The groundfish commercial fishery is made up of "limited entry" and "open access" fisheries, with most of the commercial groundfish catch being taken under the limited entry program. There is also a tribal groundfish fishery and a recreational groundfish fishery. Table 2 (below) summarizes the gear used by each of these sectors

Limited entry program

The 'limited entry' program, established in 1994 reserves a portion of the total groundfish catch (quota) to vessels that have specific limited entry permits. This system was designed to control the capacity of the groundfish fishing fleet by limiting the number of fishing vessels, limiting the number of vessels using each of the three major gear types (trawl, pot, longline), and controlling increases in harvest capacity by limiting vessel length (PFMC, October 2002).

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[4] Information on the number of vessels by fishery, location, and vessel size has also been complied. See the Pacific Fishery Management Council's draft environmental impact statement for the 2003 Pacific Coast Groundfish Fishery (PFMC, 2002): http://www.pcouncil.org/groundfish/gfother/eis0103.html

The total number of limited entry permits in April 2002 were 499; with 269 of them being for vessels that are allowed to use only trawl gear; 194 that are allowed to use only longline gear; 27 allowed to use only pot gear, and 9 that have endorsements to use a combination of these gears. Included in these permits are 164 ‘fixed gear’ (pots and longline) permits that are ‘sablefish endorsed’, allowing vessels with these permits to fish for sablefish (black cod). Up to three sablefish permits can be used by one vessel (NOAA 2002). The trawl fishery harvests the most commercial groundfish under the limited entry program. Table 1 summarizes the limited entry permit count for 2002[5] by gear type, while Table 2 summarizes the gears used by fishery sector.

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[5] For a more detailed table with Tier 1,2, and 3 sablefish endorsement counts see http://www.nwr.noaa.gov/1sustfsh/permits/prmcount.htm

Table 1 2002 West Coast Groundfish Limited Entry Permit Count

Gear Endorsement	Non-Sablefish Endorsed	Sablefish Endorsed	Total Permits
Longline Gear Only (non sablefish endorsed)	63		63
Longline Gear Only (sablefish endorsed)		131	131
Pot Gear Only (sablefish endorsed)		27	27
Trawl Gear Only (non-sablefish endorsed)	269		269
Pot and Longline Gear (dual gear endorsement)		4	4
Trawl and Pot Gear (dual gear endorsement)		1	
Trawl and Longline Gear (dual gear endorsement)	3	1	4
Total Permits	335	164	499

Open Access Program (groundfish)

In contrast to the limited entry program, the open access program means that any fishermen can participate in the federally managed fishery without having to hold a permit (though states may add their own participation requirements). A portion of the total allowed groundfish catch is dedicated to the open access component of the fishery.

The open access groundfish fishery includes two sectors: vessels that target groundfish (the '**directed open access fishery**') and vessels that catch groundfish incidentally when fishing for other fish (the '**incidental open access fishery**'). Between 1995 -1998 there were 2723 unique fishing vessels in the **directed open access fishery** and 2024 unique vessels in the **incidental open access fishery**. Some of these vessels (1231) participated in both the directed and incidental open access fisheries. Between November 2000 and October 2001, 1341 vessels landed some groundfish in both directed and incidental open access fisheries (PFMC, October 2002).

The **directed open access fishery** includes both 'dead' fish fisheries and 'live' fish fisheries, which refer to the state of the fish when they are landed. Gear used in the open access fishery to target dead groundfish include vertical hook and line, rod/reel, pot, longline, troll/dinglebar, jig, sculpin trawl, setnet, and drifted (fly gear). The live fishery uses pot gear, rod/reel hook and line gear, and stick gear (Goen and Hastie, 2002).

The **incidental open access fishery** includes vessels where groundfish represent less than half of total revenue for a vessel landing some amount of groundfish. For example, the open access sector includes trawl vessels with gear that does not target on groundfish, called ‘exempted trawl gear’. These vessels target pink shrimp, ridgeback and spot prawns, California Halibut, and sea cucumbers and are allowed a take a limited amount of groundfish as bycatch. Other fisheries under this open access category include the Dungeness crab fishery, the California setnet and driftnet fisheries, the pot fishery for pink shrimp, the Pacific halibut fishery, the salmon troll fishery, and fisheries for coastal pelagic species and highly migratory species. Those fisheries employ pot, hook and line (rod/reel), longline, round haul (seine), setnet, driftnet, troll, and harpoon gear (Goen and Hastie, 2002). Table 2 below summarizes gear types used in the open access fishery and other groundfish fisheries.

Tribal fishery

Groundfish are also harvested by tribal fishers in Washington under regulations that are established annually by the tribes in consultation with the Pacific Fishery Management Council. Portions of the catch quota for whiting, sablefish and black rockfish are set aside for the tribal fishery. Participants in tribal commercial fisheries use similar gear and fishing strategies to those of non-tribal fishers in Washington (PFMC, October 2002).

Recreational Fishery

Groundfish are also harvested by marine sport anglers fishing from docks and piers, beaches, and from private or charter boats. Some groundfish are also harvested by recreational divers. Commercial passenger fishing vessels (charter boats) and private boats take the majority of the recreational harvest, consisting mainly of nearshore rockfish species and lingcod. Hook and line and spears are the only legal gear allowed for recreational fisheries outside of three miles. Inside three miles groundfish are also caught with dip nets, throw nets, or baited traps or pots. In 2001 there were a total of 404,000 angler trips on charter vessels and 448,000 trips on private vessels that either targeted groundfish or caught groundfish incidentally (PFMC, October 2002).

TABLE 2

Table 2 Gear Types Used in the West Coast Groundfish Fisheries [6]

	Trawl and Other Net	Longline, Pot, Hook and Line	Other
Limited Entry Fishery (commercial)	Bottom Trawl Mid-water trawl Whiting trawl Scottish Seine	Pot Longline	
Open Access Fishery **Directed** Fishery (commercial)	Set Gillnet Sculpin Trawl	Pot Longline Vertical hook/line Rod/Reel Troll/dinglebar Jig Drifted (fly gear) Stick	
Open Access Fishery **Incidental** Fishery (commercial)	Exempted trawl (pink shrimp, spot and ridgeback prawn, CA halibut, sea cucumber) setnet driftnet purse seine (round haul net)	Pot (Dungeness crab, CA sheephead, spot prawn) longline rod/reel troll	dive (spear) dive (with hook and line) poke pole
Tribal	as above	as above	as above
Recreational	dip net, throw net (within 3 miles)	Hook and Line methods Pots (within 3 miles) (from shore, private boat, commercial passenger vessel	dive (spear)

Gear Used In Non-Groundfish Fisheries

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[6] Adapted from Goen and Hastie, 2002

Most fishing gear used to target non-groundfish species (such as salmon, shrimp, prawns, scallops, crabs,,sea urchins, sea cucumbers, California and Pacific Halibut, herring, market squid, tunas, and other coastal pelagic and highly migratory species) is similar to those used to target groundfish. These gears include trawls, trolls, traps or pots, longlines, hook and line, jig, set net, trammel nets. Other gear that may be used includes seine nets, brush weirs, and mechanical collecting methods used to harvest kelp and sea urchins. This gear is described in section D, below.

II. Description of Gear Used in Commercial Fishing Operations

This section describes basic characteristics of commercial gear used in state and federal marine and estuarine waters off Washington, Oregon, and California[7]. The fishing gear descriptions below are organized under the broad categories of net gear, dredge gear, pot gear, gear that uses hooks and lines, and other gear.

A. Gear That Uses Nets

1. Trawl Gear

General Characteristics of Trawl Gear

Trawling involves the towing of a funnel shaped net or nets behind a fishing vessel [1]. This section of the document describes gear that use "doors" (see below) to spread the mouth of the net. Gear that doesn't use doors to open the net, for example beam trawls and Scottish seine gear, may also considered trawl gear, but is sufficiently different to be described separately in this document.

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[7] The books *Fisheries of the North Pacific* (Browning, 1980) and *Commercial Fishing Methods* (Sainsbury, 1996) provided much of the original information in these sections, though comments from fishermen, state and federal agency and PFMC staff, have helped refine and improve the descriptions. Additional information in this document came from *Marine Fisheries Ecology (*Jennings, 2001), *A Guide to Oregon's Commercial Fishing Vessels* (Austin, 1984), *California Marine Living Resources: A Status Report* (CDFG, 2001), National Marine Fisheries Service (Goen and Hastie, 2002), Pacific Fishery Management Council (October, 2002), the websites of the http://www.dfg.ca.govWashington Department of Fish and Wildlife and the California Seafood Council. Information was also drawn from a basic trawl training class given by Sara Skamser of Foulweather Trawl of Newport, Oregon; from gear descriptions developed by the North Pacific Fishery Management Council; and from state and federal regulations regarding gear design.

1Pair trawling, which involves towing a net held open between two boats, was common in the 1930s and 1940s, but is not currently practiced. Pair trawling could occur on the bottom or in the water column.

The trawl gear varies depending on the species sought and the size and horsepower of the boats used. Trawl gear may be fished on the bottom, near the bottom, or up in the water column to catch a large variety of species. These include deep water slope fish (the deep water complex of sablefish, dover sole, shortspine thornyheads and longspine thornyheads); shelf and slope rockfish, midwater rockfish (widow, yellowtail, chilipepper), shelf and slope flatfish, lingcod, skates, Pacific cod, Pacific whiting, spiny dogfish, pink shrimp, spot and ridgeback prawns, California halibut, sea cucumbers, sculpins and sea urchins.

The rigging, adjusting, and fishing of trawl gear are complex. Fishermen work to configure their gear to require the minimum horsepower while maintaining configuration of the net. Drag, lift, thrust and gravity are all considerations. Inefficiently rigged gear increases drag and fuel burn. A properly tuned set of door, sweeps and net should have very light contact with the bottom, should have low drag and therefore require less horsepower and fuel burn to fish (Larkin, 2003).

The mouth of trawl nets is spread horizontally in the water column by the use of two doors located one on each side of the net, forward and outward of the net. The doors, generally made of metal, are pushed apart and down by hydrodynamic forces and by their own weight, and some increase their spread by bottom friction. Fishermen choose trawl doors based on the horse power of their vessel, the type of fishery they are pursuing, bottom type and other factors. Doors are made by many different companies and may be rectangular, oval and flat or slightly V shaped. They can also be cambered (curved) and/or vented.

Fishermen, through trial and error, will tune the doors depending on conditions, bottom, and species sought, to get the proper angle of the gear. Fishermen will adjust the doors to control the angle of the forward end of the door, the amount of spread, and other factors. Doors can be adjusted on both the inside where the main towing wire attaches and the backside where the net system attaches.

Trawl nets can vary in size from small to very large, controlled by the horsepower of the vessel. The trawl net is wide at the mouth tapering to an intermediate piece attached to the codend, the bag that collects the fish. The mesh sizes for the net and cod-end are regulated to allow undersized species to escape during fishing.

Trawl nets are generally made of polyethylene (P.E.) or high-tensile polyethylene (H.T.P.E). Some older nets are made of nylon fibers. Most nets are constructed of 4mm or 5 mm twine and web. Some of the heavier nets may be made of 6mm twine and some small nets may be constructed of 3mm twine. A tougher netting is used around bottom contact areas (where wear occurs) and also around the headrope to protect the web from damage from the floats. Lighter netting is used on the top and the main body (belly) of the net. (Heavy web has traditionally been a double twine version of the body netting. For example, double 6 mm orange P.E. netting has been used for the guard mesh and single 5 mm orange P.E. netting for the body of the trawl.)

2Historically, this trawl gear was known as otter trawl gear , named after the otter doors (also called otter boards . These terms is no longer commonly used, but appears in the literature.

Some newer P.E. fibers (using new manufacturing processes) allow a smaller diameter twine to be used, resulting in nets that are easier to pull (increasing fuel efficiency).

Different net configurations and designs are used. To catch bottom-dwelling species, such as flat fish, the width of the mouth of the net is generally more important than the height, while for fish that swim higher in the water column, the height of the net opening is more important (Sainsbury, 1996).

The top of the mouth of the net is called the headrope (headline or floatline). The headrope usually overhangs the footrope to ensure that fish disturbed by the groundrope do not escape upwards, but are shepherded down into the cod-end at the back of the net. (midwater square net, no overhang, shrimp trawl roughly same) New headrope and trawl designs are now being tested by NMFS, state agencies, and the fishing community in order to minimize bycatch of rockfish in flatfish trawls.

The footrope or groundrope is directly attached to the lower leading edge of the mouth of the net. The purpose of the headrope and footropes are to provide a framework for the net, which the web is hung on (McMullen, 2003). It also has two conflicting functions of separating the target species from the seabed while raising the netting far enough above the seabed to prevent damage (Rose et. al, 2002). The footrope may be weighted with chain or may be rope-wrapped cable when used on a soft bottom. If the net is to be towed over rough bottoms (as for rockfish or spot prawns) or over soft sea beds that may contain boulders rubber disks or rubber rollers (also called bobbins) are attached to the footrope under the center and wing sections of the net, to allow the net to ride over obstacles. This protects the netting more effectively, but may inhibit fish from passing back into the net and allows more opportunities for escape under the net (Rose et. al. 2002).

Two or more riblines are used on bottom trawl nets and midwater trawl nets. The riblines go fore and aft in the net to provide strength to the net, help prevent security in event of a tear in the net, and prevent tears from going all the way around the net (McMullen, 2003). Shrimp nets don’t commonly use riblines.

Midwater and bottom fish trawl nets are attached by sets of bridles (upper and lower bridles) to the doors, or may be attached to mud gear which in turn is attached to the doors. (NOTE: shrimp bridles are often just a synthetic rope extension of the headrope and footrope). Bridles are made of wire rope (also called cable). They function to hold the net open as it is towed and help herd fish into the path of the trawl net. The fishermen select the length of these bridles, and their angle of attack is based on the herding characteristics of the target species. Flatfish trawls for example are fished with long bridles, while shrimp trawls usually have short bridles (Rose et. al 2002). Bridle length is also dependent on seabed type (Rose et. al 2002). On rough ground where there is a high risk of snagging on obstructions only short bridle lengths are possible.

A properly tuned set of door, sweeps and net should have very light contact with the bottom, should have low drag and therefore require less horsepower and fuel burn to fish (Larkin, 2003).

Most trawl vessels targeting fish on the west coast are stern trawlers, using one net that is set and retrieved off the stern of the vessel, though a few retrieve their nets over the side. Many stern trawl vessels on the west coast also have a sloping stern ramp to allow for ease of handling large catches of fish. Shrimp trawlers often use two nets towed from each side of the boat, these are called double riggers, with net retrieval being accomplished either over the side of the vessel or from the stern.

Weight of Fishing Gear Components in Water Versus Weight in Air

It should be noted when reviewing information about gear, that fishing gear (e.g. trawl doors, bobbins) weighs less in the water than it does in air. The effective weight of objects in water depends on the specific gravity of the materials. For example the weight of steel in air is decreased by about 14% by immersion. The weight of gear made of rubber components may be decreased by 87% and some netting materials, being lighter than water, will actually be buoyant (Rose et al., 2002).

Bottom Trawl Gear

A bottom trawl is a trawl in which the doors or the footrope of the net are in contact with the seabed. Additionally, any trawl that doesn’t meet the requirements for a mid-water trawl (including an unprotected footrope, no bobbins or rollers on the net) is also considered a bottom trawl. Bottom trawl nets may be used to target groundfish, flatfish or shrimp. The type and construction of net varies by the species.

Fish are herded into the path of the net by the noise and disturbance of the sea bed (mud clouds, etc.) and by the turbulence created by the doors, bridles, and mudgear (Sainsbury 1996). These cause fish to aggregate directly in front of the mouth of the net (Jennings et. al 2001). The footrope may be strung with rollers, disks, or bobbins to help it move over the seabed.

A bottom (fish) trawl is generally towed at one and a half to two and half knots on or above the ocean floor. The speed is dependent on the depth and the type of bottom being fished. For example, when fishing Dover sole in sand and mud the speed may be 1.8 knots, in deeper mud it may be 2.5 knots (Thompson, 2003).

Bottom Trawl Nets (for fish)

Flatfish and bottomfish nets

Flatfish and bottomfish bottom trawl nets are composed of a tapered top and bottom body of netting with the top panel extending forward of the bottom panel. This top panel is called the hood or overhang. The side wings are often cut back to minimize damage to the wings of the trawl and reduce drag. Large meshes are able to be used in the top of the trawl as the fish tend to follow the twine back into the net rather than pass through the mesh. The minimum mesh size is set by regulations, and must measure 4.5" between knots throughout the net and codend. However a larger mesh is often used in the forward upper part of the net.

Shrimp nets are technically a bottom trawl because of the contact of the doors with the bottom.

However these nets are sufficiently different to be described separately below.
Bottom trawl nets are not intended to drag along the bottom. Groundfish bottom trawl regulations restrict the amount, size, and attachment of the chafing gear (protective netting) that can be used on the cod-end. To help keep the cod-end off the bottom, nets are buoyed with plastic floats (sometimes aluminum floats) that are attached to the headrope of the net and codend to help the net stay buoyant. Keeping the net off the bottom helps avoid getting sand and mud in the catch (especially in flatfish trawls) to improve product quality and allows the net to rise over rocks. However, floats cause drag and decrease fuel efficiency, so there are many things to be considered (Larkin, 2003, Thompson 2003). Typically nets are designed to balance the floatation with the drag and decrease in fuel efficiency cause by the float.
Common net designs for shelf fisheries may have a total headrope length of about 85-95 feet (center and wings) (26-29 m) and footrope lengths of 50-110 feet (15-34 m).

The four seam Aberdeen trawl with a cut back wing, is commonly used for the deepwater commercial groundfish fleet throughout the west coast. The net opens to a height of about 15 feet (4.6 meters) and is used for black cod and thornyheads as well as Petrale or Dover sole. The footrope is composed of either 8 inch discs or 14 inch rockhopper gear, hung to chain. (Skamser 2002)

The two seam eastern trawl is used primarily for flat fish fishing in shallow waters and by lower horse powered vessels. It is a low rise net with a wide bottom and a full wing (Skamser 2002). The traditional bottom net design for flatfish, creates net mouth openings of 8 feet (2.4 m) in height or less (Sainsbury 1996). The footrope is now often a disc footrope hung to a cable. Older footropes are sometimes a cable wrapped with rope to which the web is directly attached.

New flatfish net designs are being tried in efforts to reduce bycatch of rockfish. In collaborative research projects fishermen, agency scientists, and gear manufacturers are designing and testing various net configurations including low rise trawl nets and nets with cut-back hoods.

Rockfish nets rigged with *bobbin*s have been used *to fish Dover sole in the deep water, round fish in shallow*er water. Prior to the small footrope regulation, nets used for fishing rockfish generally used r*oller gear* with 14 inch rollers. However, when fishing over very rough bottoms, 20 inch tire gear was also used (see below)..

Oregon, Washington, and California's groundfish fleet no longer uses the traditional, higher rising rockfish net (also called Atlantic Western ? or snapper trawl). A few boats in Alaska still use this net and NMFS uses this net for surveys (Skamser, 2003). This net, fished in areas of hard bottom, is used to catch higher swimming fish by creating a larger mouth opening, using a three bridle system and a four seam net. One design uses a net with a W cut shape into the end of the wings, with a third bridle from the doors attached to the inside of this W. This allows the pull of the tow to be directed to the bottom and center legs of the wings, while allowing the top leg of the bridle which is attached to the top of the wing to be lengthened allowing the W to open up and the headrope to rise. This net usually has large roller gear or tire gear on the footrope. (Sainsbury 1996, Skamser 2002). Tire gear are sections of tires greater than 14 inches that are fastened together in the center of the net with large bobbins on the outside of these tires. They are attached to the net with chains. This gear allows the net to get over very rough irregular bottom. The tire gear helps the net move over the bottom without snagging as do bobbins, but these are bigger and allow for fishing over tougher bottoms. This gear is no longer used for rockfish fishing.

The cod-end of the bottom trawl nets have two or four riblines made of synthetic rope that run down the length of the cod-end. Additionally the cod-end has expansion straps around the circumference of the cod-end to restrict the expansion of the netting and allow it to be hauled up the stern ramp. Protective pieces of synthetic rope called chafing gear (usually of P.E. fiber) is attached to the cod-end to protect it from abrasion.

Doors

Bottom trawl doors are generally made of steel and slide along the seabed. Removable steel shoes are often also used on steel bottom doors and can be replaced as they wear.

The doors are designed so that the friction of the doors along the bottom as well as hydrodynamic force cause the doors to spread apart (Sainsbury, 1996). The distance between the doors (the door spread) in shelf fisheries is generally 110 - 165 feet (34-50 m); the door spread in deep water fisheries is generally from 165- 650 feet (50-200 m);

The mud cloud generated by trawl doors is not due to the “plowing” of the sediment. The mud is generated from the turbulence created on the back side of the door, which sucks sediment in behind the door into eddies that are formed (Brown, 2003). Increasingly (see below), cambered doors are being used which reduces this mud cloud.

The all-steel “V” door is commonly used. This groundfish trawl door is a rectangular steel plate that has a shallow curve or bend along the middle of the length of the door (axis is horizontal for the bend). The V is shallow with a rise from the centerline to the outside of the door of about 8 inches (20 cm). When the vessel is towing the net, the apex of the V faces toward the boat. The main wire (the cable from the vessel that tows the doors) is attached to a heavy steel bracket (bail) on the doors at various angles chosen to get the desired towing angle (some doors do not use fixed or hinged bails, but use chains). This bracket is often hinged, allowing the main plate to swivel when an obstruction such as a large boulder is encountered. U bolts are welded onto steel plates which are set on the outside of the door close to the trailing edge of the door. Bridles or tail chains are secured between these U bolts on one end and attach to the mudgear on the other, which in turn are attached to the net.

V-doors are widely used on the west coast and are manufactured by different companies. For boats 400-600 horsepower, V doors such as those made by NorEastern Trawl Systems (NETS), are about 6 feet x 9 feet (1.8-2.7m) in size and weigh about 1300 pounds (590 kg) on deck (but less under water, see below). Boats under 400 HP will use doors about 5 x 7 feet in size (1.5-2.1 m). This door weighs about 950 pounds (431 kg) on deck. Vented V doors and high aspect doors used for both bottom and mid-water trawling (where the doors are long and narrow, with the bend in the middle of the long side) are also in used. In California and Washington, the trawl doors made by U.S.A. Jet Door are also popular. These doors are like the V door though overall surface area to height differs slightly. A door that measures about 5.8 x 9.1 feet (1.8m x 2.8 m) weighs about 2100 pounds on deck (953 kg). Also in use on the west coast is the Type 2 trawl door made by Thyboron, a vented V-door with a chain bail and removable magnesium shoes (Skamser, 2002).

Cambered doors, rather than the flatter V doors, are increasingly being used by fishermen on the West Coast, as they are more fuel efficient (Brown, 2003). These are doors with a constant curve along the vertical axis of the door, similar to that of an airplane wing, which increases hydrodynamic efficiency. The cambered door not only reduces the drag per spreading force ratio (increasing vessel efficiency), but also reduces the mud cloud generated by the door (Brown, 2003). Slotted doors also create very little turbulence behind the door and very little mud cloud.

Footrope

The footrope or groundrope is directly attached to the lower leading edge of the mouth of the net. The footrope may be weighted with chain or may be rope-wrapped cable when used on a soft bottom. If the net is to be towed over rough bottoms (as for rockfish or spot prawns) rubber disks or rubber rollers (bobbins) are attached to the footrope under the center and wing sections of the net, to allow the net to ride over obstacles. "Bunt" bobbins are heavily structured, hard rubber half spheres with a 2.5 inch (6.4 cm) hole running through it horizontally (to allow them to be strung onto 5/8 inch or 3/4 inch steel cable (1.6 -1.9 cm) or to 3/8 to 4/8 inch chain (0.95-1.3 cm). This cable or chain (carrying the bobbins) is then shackled onto the fishing line at each wing tip of the net and at intervals along the footrope length it is hung to the fishing line with chain toggles that are generally 18 inches (46 cm) in length. They do not roll as do the bobbins strung on the center of the net, but are dragged along the bottom. A common is 14 inch diameter, (36 cm) in diameter. These weigh about 25 pounds on deck (Skamser, 2003).

The bobbins on the center part of the net are designed to roll over the bottom and vary in size from 9 to 24 inches (23-61 cm), with 14 inch (36 cm) rollers being most commonly used. On deck a 14 inch roller weighs about 17 pounds. Bobbins on the center part of the net are spaced about two feet (.6 m) apart, those on the wings, about three feet (.9 m) apart. Spacers which are either cylindrical or round are made of various materials, commonly rubber. The rubber spacers in common use weigh about 3 pounds on deck and are elongated in shape. On cable footropes cable clamps are often used on each side of the bobbin. These clamps lock tightly onto the footrope and prevent the roller from slipping to the right or left (Browning 1980). Rockhopper gear (see rockfish gear) (also called "tire gear" or "western glider gear") has a 14 inch (36 cm) rubber disk every two feet (61 cm) with seven inch (18 cm) filler discs. The 14 inch disc has a hole near the top with another line (either chain or cable) running through it. This line is attached to the fishing line at two foot intervals (Skamser, 2003). In contrast to the bobbin footrope which is designed to roll, rockhopper gear is designed to pivot, swinging up and back under the net to lift the net over obstructions.

In November 1999, in order to keep trawlers from capturing canary rockfish and lingcod which associate with high relief rocky habitat on the continental shelf, the Pacific Fishery Management Council adopted a proposal, suggested by the fishing industry, that limits trawl footrope size (that is the size of the components on the footrope) to eight inches (20 cm). This rule prohibits vessels from delivering nearshore and shelf rockfish species and many flatfish species if they have footropes with rollers eight inches or larger. Though only preliminary research has been done, it is widely believed that this gear restriction has been very effective in keeping boats from being able to fish in this high relief habitat.

Bridles and Mud Gear

Trawl nets are attached by upper and lower bridles to the doors, or the bridles may be attached to mud gear which in turn is attached to the doors. Bridles are made of wire cable. They function to hold the net open as it is towed and help herd fish into the path of the trawl net. The bridles may be 20 fathoms (37m) or more in length (McMullen, 2003). On bottom trawl gear, parts of the bottom bridle are strung with a contiguous series of rubber disks (cookies, donuts) that are 1.5 inches to5 inches in diameter (3.8-12.7 cm) (generally about 4 inches in size). These disks protect the cables and increase their herding effectiveness. Additionally, mud gear (also called sweeps) help with herding. The cables of mudgear are also covered with disks, generally smaller than that on the bridles. The mudgear typically is 40 to 75 fathoms in length (73 to 137 m) (McMullen, 2003).

Flatfish trawls may be fished with long bridles, while trawls on rough ground, where there is a high risk of snagging on boulders or other obstructions, use short bridles.

Other Gear-Chains (*note: check again with Sarah if this is flatfish gear)*

Chain toggles may be attached directly to the footrope between the wing tips of flatfish trawls at intervals of about 20 inches (50.8 cm) and drops from it in loops up to about 18 inches deep (0.46 cm) to help stir up the fish and have them rise into the net.

Midwater Trawl Gear

Midwater trawls, also called pelagic or off-bottom trawls, are trawls where the doors may be in contact with the seabed (although they usually are not), while the footrope generally remains suspended above the seafloor, but may contact the bottom on occasion. Midwater trawls are generally towed above the ocean floor, although they may be used near the bottom. They are also generally towed faster than bottom trawls to stay with the schooling fish they target. Towing time varies from a few minutes to several hours. Depths trawled can range from 60- 4200 ft (20 to700 fathoms) at distances from the surf line to about 40 miles off shore. *(Note: check towing speeds, depths towed).*

Nets

Mid-water trawl nets require a large vertical as well as horizontal mouth opening to encompass schools of fish and give the net stability during operation. A midwater trawl net has very large meshes or parallel lines (ropes) in lieu of meshes in the front to allow it to open to its full width, decreasing in mesh size in the intermediate parts of the net and down into the codend of the net For example the mesh sizes in the front of a mid-water trawl may be 120' long. The wings of the net are very long and tall and additionally, to achieve the large opening, deep side panels in addition to the top and bottom belly panels commonly found in bottom nets are used (Skamser, 2003). A mid-water trawl net may be 900 feet or more in length (274 meters) and have footropes

300 feet -600 feet (91-183 m) in length along the center and wings (Skamser, 2003).

Net are usually rigged so that the towing forces are more evident in the headline and the net literally hangs from it (Sainsbury 1996). For mid-water trawl nets weights suspended from the lower bridle legs and footrope promote maximum vertical mouth opening. When fishing in the deep, an extension piece may be added to the lower part of the net to maintain a vertical square opening (Skamser, 2003). When fishing close to the bottom, an extension may be fitted to the top of the net, bringing the headrope forward of the footrope, as with bottom trawls to prevent the fish from swimming upward and over the top of the net (Sainsbury 1996).

The cod-end of the mid-water net generally has four riblines made of synthetic rope (or sometimes, in some codends for Pacific whiting, chain) that run down its length, and expansion straps around the circumference of the cod-end to restrict the expansion of the netting and allow it to be hauled up the stern ramp. Chafing gear (usually of P.E. fiber) is sometimes attached to the cod-end to protect it from abrasion on the stern ramp (or if the net touches the bottom).

Semi-pelagic or hybrid nets

These types of nets have not been commonly used in the Washington, Oregon, or California groundfish fleet, though some expermental nets of this type are being used for Pacific cod in Alaska (Skamser, 2003). Semi-pelagic or hybrid nets are able to be used for either midwater or bottom trawling applications (Sainsbury 1996). These nets fish on or near the sea bed for fish schooling anywhere up to 66 feet (20 m) above the bottom and have a large mouth opening which can open to that 66 foot height. A little confusing   This net can also be fished off-bottom for fish much higher in the water column These nets are relatively small so they are easily maneuvered. Some designs (such as the net made by NorEastern Trawl Systems) connects the doors only to the upper wings of the nets (which utilize rope or large meshes), with the footrope being kept down with weights. This type of net was designed to fish on the bottom and can operate well in shallower water. Other designs, such as those used by factory trawlers, use four *(or even six or eight? check this)* bridles attached to the headrope, side panels, and footrope, allowing a very large mouth opening, for example one that is 102 x 54 feet in size (31 x 16.5 m). This net also employs floats attached to the top edge of the side panels and a long roller gear footrope. It can be fished either on or just off the bottom.

Doors

Mid-water doors are usually made of steel, though some mid-water doors use aluminum alloy. When used in mid-water trawling, doors do not often come in contact with the ocean floor, but build up enough hydrodynamic force to spread the net by being pulled through the water at an angle. Mid-water doors are often taller than they are wide (with a height often twice the length) and are curved to increase spreading efficiency.

The door spread (distance between doors) in mid-water fisheries, the door spread may be 330-650 feet (100-200 m).

Footropes

The mid-water trawling regulations prohibit footrope protection at the trawl mouth, and nets must not have rollers, bobbins, tires, wheels, rubber discs or any similar devices. Sweeplines, including the bottom leg of the bridle must be bare. Additionally, for at least 20 feet (6.15 m) immediately behind the footrope or headrope, bare ropes or mesh of 16 inch (40.6 cm) minimum mesh size must completely encircle net.

Groundweights
Auxiliary weights are sometimes added to mid-water trawl gear to increase downward force at various points. Weight chains or small diameter weights are often attached to the footrope and are also used on the bottom bridles of the nets to help the net achieve its maximum opening size. Depending on the size and rigging arrangements these may range from 400 lbs (180 kg) for a 500 horsepower vessel up to 1100 lbs (500 kg) for a 1100 horsepower vessel. Other manufacturers, e.g. Gloria Trawl Company, make the bottom web with lead line for the same purpose, using 3/8th-7/16th braided rope (Skamser, 2003).

Shrimp and Prawn Trawl Gear

Shrimp trawls are a type of bottom trawl but have different configurations from other bottom trawl gear and so are described separately here. Most shrimp vessels on the west coast fish are double-rigged, using one net suspended from large outriggers on each side of the vessel, and two pairs of doors, one door on each side of the net. The nets are set and retrieved over the side of the vessel or up the stern. Hydraulic drums, winches, and booms are used to retrieve the gear.

Shrimp trawls are generally towed at one and a half to two and half knots just above the ocean floor, usually about 12 inches off the seabed (Thompson, 2003, McMullen, 2003).

Nets

Pink shrimp nets
The pink shrimp trawl fishery commonly uses a four seam net in a box trawl design. The net does not have a hood (that is there is no overhanging piece of the net in front of the headrope). It is a high-rise trawl, with the net opening being between 12 feet to 8 feet high (3.6-5.5 m). The footrope and headropes are of equal length (commonly 80 to 90 feet long (24-27 m) with about a 50-55 % rise ratio, that is the mouth of a net with these size components is about 45-50 feet wide when fishing).

Unlike other cod-ends, the cod-end of shrimp net is generally not constructed with riblines that run the length of the cod-end.

Spot prawn nets
The spot prawn trawl uses a short low design with a very strong footrope (that is, with large roller or tire gear). A description of this footrope is found above in the bottom trawl section.

Bycatch Reduction Devices *(check wording and requirements)* Some shrimp and spot trawls (pink shrimp trawls, spot prawns in California and Washington) are required to use a bycatch reduction device (BRD). Finfish excluders have been required in pink shrimp trawls in California since September 2001 and since July 1, 2002 in Oregon and Washington.

California rules allow fish eyes, soft panels, and Nordmore grates to be used. Fish eyes are football sized and shaped frames made of aluminum or steel that is inserted into a slit made in the top of the net about 80 inches up from the terminal end in front of the codend. Soft panels are panels of net with meshes larger than the mesh of the net (e.g. commonly with meshes about 4.5 inches in size) that are sewn into the top of the net. A Nordmore grate is a rectangular or round rigid grate with aluminum or plastic tubes secured at spacings no larger than two inches. This grate has to fully cover the inside of the codend in cross-section and is usually placed in the later part of the codend.

In Oregon and Washington, rules requiring BRDs have been implemented seasonally since July 2002 to allowed fishermen and agency scientists to refine the devices and test effectiveness (Hannah, 2002). In April, 2003 new rules defined what devices are legal. Nordmore grates are allows as well as soft panel devices, as long as the panels are made out of a single continuous piece of netting (that is, no “zippers” are allowed). Fish eye devices may no longer be used.

Testing in Oregon has shown that a modified Nordmore grate, is more effective and has less shrimp loss than either fish eyes or soft panel BRDs. The grate design is a circular or elliptical-shaped panel, rather than the typical rectangular one with narrower bar spacings of 1 1/4 inches (3.2 cm). It is typically made out of plastic. This system excludes rockfish, whiting and some smelt and slender sole, thereby simplifying the task of sorting the shrimp. Additionally, fishermen are experimenting with using a “down panel” of net, a tapered panel of small meshed net attached inside the trawl net and hanging down from the top of the net about half-way into the net body to force shrimp to the bottom of the codend, further decreasing shrimp loss in the BRD (Hannah 2002). West coast fishermen have also experimented with a very effective grate, sometimes called the “Logan Grate”, named after inventor Stan Logan, used in Canada’s west coast pink shrimp fisheries. This grate is circular, shaped like a barbeque grill, is made of aluminum tubing, and has the bar spacings as noted above (Skamser, 2003).

Other innovations, such as the one designed by Brad Pettinger in Oregon, include a hinged grate (in the middle of the longitudinal direction) to allow the device to be wrapped around the net reel without damage to the grate.

Doors

A single rigged shrimp vessel may use the same doors that are used by groundfish trawl vessels, while a double rigged shrimp vessel uses doors that are typically much larger than those used by groundfish trawlers. Shrimpers seek stable doors that can get down to the bottom fast. They are generally made of wood with a wide flat steel shoe (heavy plate) on the bottom. The weight of the door is spread over this wide shoe, reducing its pressure per square inch and allowing it to slide across the bottom (McMullen, 2003). The doors are rigged with short bridles to the net.

A typical shrimp door measures 9 foot by 9 foot (2.7 by 2.7 meters) in size (Brown, 2003), but can vary from 6 foot by 6 foot doors to those that are up to 10 foot long and 9 high (McMullen, 2003). A 7 foot by 7 foot door weighs about 950 pounds in air (McMullen, 2003)

In choosing doors, fishermen have to consider the trade-offs inherent in different gear. For example, while higher doors may catch more shrimp, there is a trade-off, as higher doors also requires a larger horizontal width to make them stable, which reduces the efficiency of the spreading force (Brown, 2003).

Footrope for the Pink Shrimp fishery

The footropes used in pink shrimp trawling are not protected with any rollers or bobbins or other gear and are generally rigged to run about 12-18 inches off the bottom (31-46 cm). That is, the footrope of shrimp nets is not designed to contact the bottom. A groundline with disks or bobbins that are two to five inches (5 cm-13 cm) in size may be suspended below the footrope by ladder chains that drags along the bottom and/or the net might have a tickler chain that runs slightly in front of the footrope (McMullen, 2003). The purpose of the disks or bobbins is to prevent the gear from digging into the soft bottom sediment (Brown, 2003). There are many considerations necessary when choosing gear. While smaller diameter disks or bobbins on the gear may fish better than larger diameter gear, larger diameter gear is better at keeping the gear from digging into the bottom. Smaller diameter disks may tend to dig in and could even stop the boat in soft sediment (Brown, 2003).)

Footrope for the Spot prawn fishery

The spot prawn trawl fishery uses large tire gear and rollers on the footrope. Use of this gear is being phased out (see below). In Oregon the footrope assembly consists of chain and roller gear up to 24 inches in diameter is connected to the net by dropper chains. In Washington, the rollers, bobbins, or discs on the footrope on spot prawn trawl nets must be between 8" and 28" in size, and must roll independently and freely. Additionally no tickler chains or any other gear that drags across the bottom in front of the mouth of the net may be used

The spot prawn trawl fishery in the states of Washington, Oregon, and California is in transition due to concerns about high groundfish bycatch levels, percentage of male prawns caught, and habitat impacts. In Washington spot prawn trawling was phased out in 2002 and closed in 2003, with fishermen allowed to transition to pot gear. Five trawlers held permits in 2002. In Oregon, six boats currently hold trawl permits. Phasing out the trawl gear and allowing these fishermen to transition to pot gear is currently being considered. In California the spot prawn trawl fishery was closed by the California Fish and Game Commission under an emergency closure rule in September 13th, 2002 for the duration of that season (through October 31, 2002). In 2003 the Commission will consider a variety of options for long term regulation changes.

Bridles

The bridles that link the doors to the net are short, usually about 15-22 feet in length in a double rigged shrimp trawl (McMullen, 2003). A single rigged shrimp bridle may be up to 100 ft. in length (MuMullen, 2003). Mud gear is not used.

Other Gear- Chains

Tickler chains or more commonly now, ladder chains with a 2.5 inch disc-covered belly section, are sometimes used in the shrimp trawl to drag along the muddy bottom to stir up the shrimp so they rise and enter the net.

Trawl Gear Components That Contact or Effect the Seabed

(The following information is excerpted with permission from Rose et al. 2002, except as noted in brackets)

Trawl gear has several components that contact or affect the seabed. Variations in the composition and design of these components influence their effects on benthic ecosystems.

Of the major components, trawl doors affect the smallest area of seabed, though trawl door marks are the most recognizable and frequently observed effect of trawls on the seabed. The doors travel across the seabed oriented at an angle to the direction of travel. The resulting track marks consist of the area of direct contact as well as a berm of sediment displaced toward the trawl centerline. These two swaths total a few meters in width. The design of the door significantly influences the degree of contact. The downward force exerted by the door on the seabed is influenced by the weight of door and the downward hydrodynamic forces generated by the door counteracted in part by the upward force from the cables attached to the towing vessel. The width of the door contact area with the seafloor is also a factor.

The traditional V door is designed and rigged to have only light contact with the seabed, especially on muddy grounds. The hinge on the door to which the main wire is attached is designed to swivel when an obstruction such a large boulder is encountered. The door's inefficient hydrodynamic shape creates vortices which suspend seabed materials. *(? Check original paper to check re vortices).* In some fisheries this sediment cloud helps herd the fish and is an important part of the capture system. Advances have been made in trawl door design to increase their hydrodynamic efficiency. Changes include doors with higher aspect ratios and doors with slotting and cambering. These doors tend to rely very little on seabed contact for their spreading force, have a smaller contact footprint and suspend less sediment.

The bridles [and mudgear] are cables that connect the trawl doors to the trawl net. The bottom bridle [and mudgear] may be in contact with the seabed for a part of their distance. The length of these components and their angle of attack is based on the herding characteristics of the target species. For example flatfish trawls may be fished with bridles [and mudgear] longer than 109 *(Check if copied correctly*) fathoms (200 m) while shrimp trawls usually have short bridles. Additionally, the length of bridle wire is also dependent on seabed type, with short bridles being used on rough ground where there is a high risk of snagging on boulders or other obstructions. Sometimes bridles are covered with hose or strung with a contiguous series of rubber disks (cookies) up to 15 cm diameter, to protect the cables and increase their herding effectiveness. When using long bridles [and mudgear], these components contact more seabed than any other trawl component. The force of contact of these sections with the seabed results from the weight of these bridles [and mudgear] (in water) per length. Unless chain is used or supplementary weights are added, the bridles [and mudgear] skim the surface of the seabed. Small-scale vertical features on soft substrates can be flattened by this action. Emergent structures and organisms can be vulnerable to penetration or undercutting by bridles, especially where the bridles have a small diameter. [However, it should be noted that on the west coast, few, if any fishermen fish bottom bridles with small diameters, most all are covered by three or four inch disks *(check to see if larger disks are used),* while mud gear disks are about two and a half to four inches McMullen, 2003]. The ease with which wires traveling across the seabed can be displaced upwards by these structures will be reduced as the tension in the wire increases.

[Note: mudgear 40-75 fathoms long and bridles of 17 fathoms are more typical on the west coast (Skamser, 2003, McMullen, 2003.) The typical contact distance may be 55 fathoms or less (100 m). Additionally, hose is no longer commonly used to protect the bridles (Larkin, 2003).]

Footropes, the components of the trawl attached directly to the lower, leading edge of the net, may also contact the seabed. [Though, for example, the footrope of shrimp nets does not, McMullen, 2003}. Footropes are constructed similarly to bridles, composed of cable or chain that may be covered with protective material (rubber disks, bobbins, etc.). The diameter of the protective gear is commonly larger than bridles (up to 1 m) and often varies along the length of the footrope, so only part of the footrope may be in direct contact with the seabed.

Footrope effects are related in part to its contact force and the area over which this force is distributed. The force exerted downward on the seabed from the footrope is dependent on the weight per unit length (which may vary along the length of the footrope)[3] and by the up-pull from the netting to which it is attached. Allowing footrope components to roll may reduce effects, but these rollers are generally only located in the center section of the footrope. In fact some footrope components are designed specifically so that the components do not roll. These components, e.g. rockhopper gear, are designed so that when they hit an obstacle they turn back under the belly of the net and lift the net over the obstruction. Large diameter footrope components can also produce vortexes in their wake, contributing to sediment suspension. This large diameter also makes a component less likely to undercut smaller emergent structures or organisms or to penetrate the substrate, but are more likely to run over these structures. When footrope components are eight inches or greater (20 cm), these larger diameter components are separated by lengths of smaller diameter components, creating spaces where some seafloor features are not directly contacted as the trawl passes. This may reduce effects on emergent structures and organisms.

On most trawls, the netting itself is not designed to directly contact the seabed and anything that protrudes far enough above the seabed to contact the netting has already been contacted by the footrope. The netting may retain objects and organisms that are undercut or suspended off the seabed by the passage of the footrope. If rocks enter a cod-end or the cod-end becomes loaded with dense fish (e.g. flatfish), the cod-end may be weighed down enough to drag on the seabed. [It should be noted that use of roller gear makes it uncommon for rocks to enter the cod-end. McMullen, 2003].

Auxiliary weights added to the lower corners of pelagic trawls may contact the seabed when these are fished near or on the seabed. The pressure that these weights exert on the seabed is the resultant of their weight in water and the upward forces exerted on them by other gear components.

2. Beam Trawls

The beam trawl is the oldest of all trawling types. The gear derives its name from the rigid beam (once made of wood, now of aluminum or steel) that is supported at each end by a vertical ‘sled’ structure called the trawl head. This beam is used to keep the mouth of the net open horizontally.

Beam trawl gear is no longer common due to the unwieldy nature of the long beam and their lower efficiency, but it is well suited for small boats fishing inshore areas and for inshore areas with steep slopes. For harvesting some bottom-dwelling species, beam trawls have some advantages over door trawls. The opening of the net remains constant in size during turns, effectiveness is less affected by soft muddy bottoms, there is less drag, and vessels having restricted warp capacity (the amount of net towing line) can fish deeper waters since only about half the warp (length) is needed as compared to gear where doors are used. The warp length/depth ratio is 3:1 (Rose et al. 2002).

Beam trawl gear was the only trawl gear allowed in California from 1952 to 1963 to harvest pink shrimp (Pandalus jordani), when trawls using doors were allowed to begin fishing. Currently in California, beam trawls are only used in San Francisco Bay, mainly for California bay shrimp (Crangon franciscorum) which is used as live bait for sturgeon and striped bass sport fishing and provides a small market for human consumption. There are currently 11 permits. Staghorn sculpin, yellowfin goby, and long jaw mudsucker may also be caught with a commercial bay shrimp permit.

Beam trawl gear is the only trawl gear currently being used for shrimp in Puget Sound. Tribal fishers may use trawl gear (with doors) to fish for shrimp, though this fishery has not been purused in the last couple of years (Cain, 2003). There are currently eight active permits (approximately five permits are used to fish pink shrimp in the Straits of Juan de Fuca and three for coonstripe shrimp in the San Juan Islands). These shrimp are used for human consumption, the pink shrimp being peeled for cocktail use, the coonstripe sold whole. Beam trawl gear is not used in Oregon.

Beam trawls use simple funnel shaped nets without wings that are made of polypropylene fibers. Net mesh sizes are set by regulation. On the west coast, one trawl is generally used at a time. Some vessels retrieve the net over the side, while others use a stern ramp. The horizontal opening of the net is set by the length of the beam. In Puget Sound, beam lengths up to 60 feet (18 m) are used for pink shrimp and up to 25 feet (7.6 m) for coonstripe shrimp, but this beam length will vary depending on vessel size. In San Francisco Bay the beam used is 20-25 feet wide (6-7.6 m).

The bottom of the net is attached to the beam which is supported on a fixed sled or skid called a trawl head (also called beam head). The sled, generally oval or triangular in shape, is made of heavy steel, the bottom of which is protected from wear by replaceable steel ‘shoes’ that are welded in place. To reduce wear of the plate, a ‘heel’ is welded to the aft end of the shoe. The skid lifts the net about four to six inches off the bottom (10-15 cm). The top of the net is buoyed with floats, so that the net mouth opening is about five feet wide (1.5 m).

When fishing on soft bottom, the beam trawl may be rigged (between the shoes) with tickler chains (also called mud ropes) to stir up the shellfish lying on or buried in the sand and mud. The number of chains varies depending on the target species and the bottom type. Small inshore vessels use shrimp beam trawls that are relatively light and rarely have more than one chain fitted between the shoes. This is sufficient in sandy bottoms to cause shrimp to flee into the water column and be caught in the net (Jennings et. al 2001). The addition of extra tickler chains has been shown to increase the bycatch of non-target organisms and flatfish that are buried more deeply by increasing bottom contact and penetration of the sediment.

The trawling wire (warp) from the vessel is attached to the towing bridle by a shackle. The towing bridle is formed of three or more chains, depending on the beam length, one from each shoe and the other from the beam, brought together at the shackle.

Towing speeds depend on the species being targeted. For pink shrimp, towing speeds are about two knots. For coonstripe shrimp towing speeds is about one knot. For California bay shrimp towing speeds are about one to two knots. Tows are generally short in duration for both the coonstripe and bay shrimp fishery and shellfish and fish are generally alive when caught.

Beam Trawl Gear Components That Contact or Effect the Seabed

(excerpted from Rose et al. 2002)

During beam trawl fishing, the sole plates on the trawl head and the tickler chains are in direct contact with the seabed. The sole plates generally contact the seabed at a slight angle. The pressure exerted by the trawl head on the seabed is strongly related to the towing speed. As the speed increased the lift on the gear increases and the resultant pressure force decreases. A less firm bottom contact, e.g. on softer grounds, can also be obtained by shortening the warp length. A shrimp beam trawl weighs (in air) several hundred kilograms.

Tickler chains also contact the bottom. Generally only one tickler chain is used when fishing shrimp. The pressure exerted by the tickler chain is substantially lower than that exerted by the trawl heads, though the area covered is greater. When the tickler chain is towed over the seabed, sediments are transported. Smaller particles will go into suspension and may be transported away by currents or resettle in the track of the trawl. Local variations in morphology such as ripples may be flatted out. The amount of penetration into the seabed depends on sediment type, with the greatest amount of penetration occurring on very fine to fine muddy sand. If more than one chain is used on the beam trawl, the added weight increases contact with the seabed and increases fluidization of the sediment as each chain passes, allowing following chains to penetrate deeper (Jennings et. al 2001).

3. Demersal Seines

Scottish seines, also know as a Scottish fly dragging seines, are considered demersal seines as they are nets that fish on the bottom and moves across the bottom when closing. On the west coast it is used in the nearshore and shelf areas to fish flatfish such as sand dabs. Petrale sole, English sole and chili pepper rockfish are also caught with this method. There is currently one fisherman in California who uses this method.

This fishing technique uses a single boat that surrounds an area of water with a very long seine ropes (warps) with a net in the center. In some ways this gear is similar to trawl gear in that it harvests bottom fish by herding the fish with gear (the seine ropes) that is in contact with the seabed. However, this gear does not use doors to spread the net; the net is spread by the two warps. Additionally, the net is similar to a trawl net except it of lighter construction and has a small, light footrope.

The seine ropes, used both for herding the fish and then for hauling the net from the seabed to the boat, are made of polypropylene rope with a lead core, enough to attain a negative buoyancy. It is about 2 miles (3.2 kilometers) in length with a shipping weight of about 1000 pounds (each 125 fathom (229 m) coil weighs about 180 lbs (82 kg) on deck, (16-20 coils are used per set). The net is a low rise net with the opening at the mouth is approximately 150 feet wide and 6 feet high. This low rise configuration better targets slow swimming flatfish that live on the bottom. The net's footrope (the leading lower edge of the net that comes in contact with the seabed) is approximately 150 feet (46 meters) in length and made of three-quarter inch synthetic fiber (polydacron). A grass (hemp) rope with approximately 80 to 100 pounds of seine leads is attached to the footrope to "tickle" the bottom front end of the net. Because of the small sized components on the footrope, for fishery management purposes it is considered a "small footrope trawl" and qualifies for a limited entry trawl permit (DeVore, 2002).

Because the long seine ropes are vulnerable to snagging, this gear is generally used only on relatively smooth seabed (Sainsbury, 1996). Where snags are encountered, the location is marked and avoided in subsequent tows. In California this gear is used on smooth 'green mud' bottom in areas with good upwelling, with the fishermen returning to the same grounds year after year. At the slow speeds of the tow, water pressure helps the rope to skim over the bottom, just touching the sediment and raising a small mud cloud (Fitz, 2002).

The gear is set with or against the wind and tide off either side of the boat. The gear is set out in a diamond shape, with the net bag affixed to the middle of the base of the diamond. To set the gear a flag with a radar reflector, a marker buoy (dhan buoy) and floatation buoys is fastened to the end of the first coil of the seine rope. The seine rope is set out from the coil or reel around a vertical roller set above the rail. After half to two thirds of the seine rope from one side of vessel is set out (between 8 to 10 coils of 125 fathoms each) a turn of about 60 degrees is made and the rest of the first half of the remaining warp is set out. The vessel then slows down to set the net. The net bag and codend is thrown clear of the mouth of the net as it is put off the vessel. The engine is put on full speed again and the vessel begins to set the second eight to ten coils of seine rope off the other side of the vessel turning back to the marker buoy.

The marker buoy is lifted aboard and the free ends of both warps placed through the rollers of the towing block. That is, both ends of the rope are hauled simultaneously as the boat moves forward at idle speed (approximately 550-600 rpm) (Fitz, 2002). The towing begins with the winch pulling in the warps at a very slow rate about 50ft/min (15m/min), gradually increasing to about 75 ft/min (Fits, 2002). As the gear is hauled, the seine rope which is moving slowly along the ocean floor creates a mud cloud which the fish avoid by moving to the center of the closing gear. The fish enter the net at the end of the set when the ropes close (which also closes the mouth of the net). At that point the gear is retrieved as rapidly as possible, with the hauling rate increasing to about 200-300 ft/min (60-90m/min)(Sainsbury 1996). When the net is along side the vessel it is brought aboard by a net reel or power block. A “set” takes approximately two hours from the time the gear is set out to the time it is completely back on board. Fish spend only ten minutes or less in the net during retrieval from the ocean floor to the boat and are alive when they reach the deck. (Fitz, 2002).

Demersal Seine Gear Components That Contact or Effect the Seabed

The lead-core seine ropes of the Scottish seine gear are in contact with the seabed over a length of several hundred meters (as compared to the 100 m or less for bottom trawls). When the gear is hauled the ropes connected to each end of the net are gradually closed. The rate of closure is relatively slow, possibly allowing more time for mobile animals to avoid the rope rather than being overrun. The lighter construction of the net and the lower speed of hauling generate lower tensions in these ropes than in trawl sweeps and bridles. This lower rigidity makes these ropes more able to conform to substrate features instead of cutting through them. Where the rope contacts the substrate, its forward movement displaces sediment as it moves. The amount of tension on the rope determines the amount of displacement and the force exerted on objects that the rope passes over (excerpted from Rose et al. 2002).

The impact of Scottish seine gear on the seabed is minimal because of the slow, gentle movement of the ropes from the initial setting of the gear to the final closing stages of the net. The net itself actually only moves across the seabed a relatively short distance and because the net is very light when compared to a trawl, there is very little disturbance to the seabed (Amos, 1985).

4. Round Haul (Seine) Gear

Purse seine, lampara, and drum seines (bait nets) are called round-haul gear. This gear captures fish by surrounding them in a wall of netting that is then closed off and hauled aboard. These round-haul nets, primarily purse seines, are used to catch market squid, sardines, herring, anchovy, mackerel, bonito, tuna, and salmon. Squid are fished in the Half Moon Bay to Monterey area and in southern California. Bonito and light-meat tunas such as yellowfin and skipjack are primarily caught in southern California. Other tunas caught in purse seine nets in California include northern bluefin and big eye. Round-haul fishermen also fish Pacific herring with purse seine nets in San Francisco Bay, California, Yaquina Bay, Newport and in Puget Sound, Washington. Purse seines are also used in the anchovy bait fishery in Washington coastal estuaries. An experimental purse seine fishery for sardines, regulated by the states of Oregon and Washington, is also being conducted off Oregon and Washington. A purse seine fishery for salmon is conducted in the Puget Sound. Purse seine gear is otherwise not legal gear in Washington.

In **purse seine fisheries** a net, usually made of nylon, is hung vertically, like a curtain, between a cork line at the top of the net and a heavy lead line at the bottom of the net. The vessel sets the net around a school of fish by traveling in a large circle around the fish, while a skiff holds the other end of the net while the vessel completes the circle. The lead line is about 10% shorter than the corkline, to allow for the easier pursing of the net. This design also prevents the corkline from sinking when the net is hauled (Browning, 1980). The net has a landing bag at the bottom (which has smaller meshes than the rest of the net). Rings (purse rings) are attached with bridles 1 fathom (1.8 meters) long to the lead line. A cable “purse line” is run through the rings of the net as the net is set off the vessel. When it is time to haul the net, the vessel crew closes or purses the bottom of the seine by pulling on the purse line with a hydraulic deck winch. This closes the net below the fish preventing escape, like closing a drawstring purse. The seine is retrieved by the vessel through a hydraulic power block attached to the vessel’s boom or rigging. The bag is then boomed aboard or the fish are dip brailed or pumped from the seine into the vessel’s hold.

In the California fishery for market squid, two vessels are utilized in the fishing operations. A light vessel is used to locate and concentrate a school of squid using strong lights to attract squid to the surface, while the second vessel catches the fish using a round haul net.

The seine used for salmon (the only salmon seine fishery occurs in Puget Sound) is a long, deep seine that cannot exceed 1800 feet (549 meters) in length along the cork line, and with purse seine and lead combined not exceeding 2200 feet (671 meters). Mesh sizes cannot be smaller than four inches (10.2 cm) except in the bag (bunt) of the net, which can have mesh of three and a half inches (8.9 cm). During the fall purse seine fishery for chum in some areas, the top 100 meshes below the cork line must have a five inch mesh to allow the escapement of immature king salmon. The depth of the seine depends on bottom conditions and water depth, but adding to or subtracting to the net is a time consuming task, and depth is not frequently changed. To offset the problem of the net snagging on the bottom, many salmon seines are built with a taper in one or both ends. This tapering narrows that part of the net and allows it to be fished in shallow water close to the beach with a minimum of fouling (Browning 1980).

The California seine fishery for mackerel and anchovy uses seines similar in size to the herring seines of Washington (Browning 1980) with mesh sizes appropriate to the species being fished.

(size of seine nets for herring and sardines?).

The **lampara net**, also called a bait net, was the forerunner of the purse seine net. It is a shorter and shallower net than the purse seine and can be set and hauled in less time and with less power and was used for species such as sardines, anchovies, and mackerels (Browning 1980). It was the prime net used for the sardines in Monterey Bay and San Pedro in the early 1900s. It has a cork line and a lead line but does not use purse line, purse ring bridles or purse rings   It has a large central bag of webbing (bunt) and short wings of larger mesh, hung so the leadline at the bottom of the net is pulled in advance of the corkline at the top. The net is set with one tow line secured to a buoy or to a skiff, the other to the fishing vessel itself. The set is made rapidly around a school of fish, with the haul quickly begun to keep the catch in the net. With both wings pulled simultaneously, the leadline closes, forming a floor through which the fish cannot escape and drawing the net into a scoop. The lampara is not commonly used anymore in California except for in the bait fishery for smelt and other species and to take white croaker, perch, and queenfish. (CDFG 2001). In Washington lampara gear is used to fish herring and is also sometimes used in the coastal anchovy bait fishery.

The **drum seine vessel** uses a 6ft. -8 ft. (1.8-2.4 m) hydraulic drum to set and retrieve a shorter, shallower, narrow purse seine net with cork and lead lines of equal or almost equal length, rather than the shorter leadline of the standard seine. The nets are generally 250-300 fathoms in length (457-549 m) and are about 18 fathoms (33 m) deep (Sainsbury 1996). It is used in California for bait fish fishing. (CHECK is it also used in the WA sockeye fishery?)

Beach seines or drag seines (Washington). These seine nets are used to catch salmon in Puget Sound and are also used to harvest smelt and perch. The long rectangular drag seine net, with its float line on the top and a lead line on the bottom to assure good contact with the bottom, are set by boat off the beach, river bank, or sandbars. Tow lines are fitted to both ends of the net as working lines.

One end of the net is fastened to a stake, anchored to the beach, or held onshore by people. The other end of the net is taken away from the shore by a boat ahead of migrating fish. The net is set in an arc around the fish, trapping the fish as that end of the net is then brought back again to shore and also fastened to the beach. The weighted part of the net sinks to the bottom while the top remains buoyant. The net is then hauled back in by manpower, power winches, tractors or four wheel drive vehicles from the end that was anchored to the beach last. As the net is hauled the weighted end of the net drags along the bottom trapping fish in its path. Nets can also be set with two boats each carrying half the net out off the beach and then simultaneously dropping the nets as the boat arcs each end back to shore. Nets can have a bunt or bag in the middle of the two wings, or be a straight wall of webbing.

Round-Haul Gear Components That Contact or Effect the Seabed

The leadlines of beach seine nets are designed to be in contact with the bottom and move across the bottom when being hauled. The leadlines of other round haul nets may be in contact with the bottom when fished in shallow water or close to shore (e.g. for salmon).

5. Gillnets and Trammel nets

Gillnets are flat, rectangular nets that hang vertically in the water from a buoyed cork line that is weighted with a lead line. The cork and lead lines and the nylon nets are much lighter than those used in seine netting, while the anchors used on set gillnets are often heavier or larger than those used with longlines (Rose et al. 2002). The nets are made of a lightweight multifilament nylon or monofilament strands with certain specific mesh sizes to select the catch   The size is selected so the heads of the desired fish go through the mesh, but their bodies do not. When the fish tries to escape they tend to become entangled in the net. The mesh size is set by regulation with the goal that undersized fish of the desired species can pass through the net without being caught. Therefore, mesh sizes vary considerably depending on species. For example the California swordfish fishery uses a minimum mesh size of 14 inches (36 cm) (more commonly 18 to 22 inches), while salmon fisheries may use a mesh size of five to seven inches (13-18 cm) depending on the salmon species.

The gillnet's webbing hangs fairly vertically in the water column, but it tends to bulge under current effects. Much slack is built into the net because the fish swimming into a taut section of webbing tend to bounce away from the net rather than become entangled in it. (Browning 1980) The percentage of slack built into the net depends on the shape and configuration of the fish. For example, salmon nets may have 40% slack, while swordfish nets need 45% slack, while California halibut need about 75% slack (West, 2003).

A **trammel net** is a gillnet made with two or more walls joined to a common float line. On the Columbia River for example trammel nets use three walls of webbing. The inner net hangs deeper than the outer webbing. When a fish hits the net it passes through the outer webbing, strikes the inner webbing with its smaller mesh and carries through to the larger webbing on the opposite side, trapping itself in the pocket formed by the intertwined webbing. Trammel nets were once in use for California Halibut but it is no longer used, having been replaced by monofilament nets that are not as easily fouled by kelp, sticks, and plastic trash.

Gillnets can either be fished as a set or anchor net **(setnet)** (where ends are anchored in place) or as a drift net **(driftnet)**, where the net drifts freely in the water, unattached to the ocean floor, though one end may also be tied off to a vessel which also drifts. Trammel nets are only fished as **setnets**.

The **setnet** is banned in Washington and Oregon except for small numbers of treaty set net fishermen on the Columbia River above Bonneville Dam and on certain smaller rivers of western Washington. This treaty fishery takes salmon, dogfish and true cod; lingcod and rockfish is caught as bycatch.

In California, setnets are only allowed outside of three miles. Setnets can be fished at all water depths depending on the behavior of the fish being pursued. For example white seabass can be pursued by setnets both when they reside near the bottom (during some parts of their life cycle) as well as when they are in the upper parts of the water column. There is a setnet fishery for bonito, flying fish, and white croaker (mesh sizes of 2.75- 3 inches, 7.0 cm-7.6 cm), fishery for white seabass (using minimum mesh sizes of six inches, 15.2 cm), and a fishery for barracuda with a 3.5" (8.9 cm) mesh size. In California setnets are also used for angel shark, California halibut, lingcod, mullet, and perch. While trammel nets are also allowed to be used in these fisheries, these nets are not currently known to be in use (West, 2003).

In nearshore California waters, outside of three miles, setnets for rockfish are also regulated by depth restrictions; however, they are currently not being used because of the strict limits for certain rockfish such as bocaccio (West, 2003). Additional regulations require the California halibut setnets to have breakaway panels strung between each section (gang) of net to assure mammals will be able to break through nets they encounter.

Setnets are held in place by anchors. The bottom of the net is held down by the use of leadlines that utilize about 100 pounds of weight per 100 fathoms of line.

Driftnets are banned in Washington ocean waters. Driftnets are prohibited in California coastal waters (inside three miles). Driftnets are used to catch salmon (and sturgeon) in Puget Sound**,** Grays Harbor, Willapa Bay, and on the lower Columbia River. They are also used in the Columbia River for shad and smelt. Driftnets are also used in Washington estuaries and inland waters for roe herring, sturgeon and smelt. Driftnets are used for common thresher shark and swordfish in California and Oregon in waters 50 to 100 miles offshore (80-161 kilometers). This fishery also takes shortfin mako shark and pelagic and bigeye thresher shark. Blue shark and striped marlin are occasionally caught but not sold. Driftnets also are used for white seabass, barracuda, yellowtail fishing in California in waters from three to ten miles offshore (4.8-16 kilometers).

Regulations also control the length of the gillnet. For examples, swordfish driftnets can be no longer than one nautical mile (1000 fathoms or 1.8 km) in length in California. In Washington salmon gillnets can be a maximum length of 300 fathoms (.55 km) in length. In Oregon the maximum length for Columbia River salmon gillnets is 250 fathoms (.46 km).

The driftnet can be fished at the surface or in midwater. The depth of the net in the water column is determined by the length of the tether lines (also called support lines) that are hung from each buoy (buoy ball). The net has a slight negative buoyancy and these tether lines allows the net to drop down through the water column to a desired depth. Additional negative buoyancy for the net is achieved by a small weighted lead line (typically 40 pounds of weight over a 100 fathom leadline, West, 2003). The swordfish fishery is required to be conducted with nets 36 feet below the surface (11m) to minimize marine mammal and seabird interactions. “Pingers” (plastic pieces that emanate a sound frequency that marine mammal sonar systems can pick up) are added to the tether and leadlines of swordfish gillnets at intervals of 25 fathoms (48 m) to further minimize marine mammal interactions.

Driftnets are deployed in various ways; from a stern-mounted reel and roller, from a box roller with no reel (with nets being folded on deck or into boxes), or from a bow mounted reel and roller. They are allowed to fish for a number of hours before retrieval, with the fish being removed from the net as the net is hauled back aboard the vessel. The gillnets fished for salmon are generally set close to the beach, setting the net in a similar procedure to that used by fishermen using a drum seine net. That is, the fishermen drops the float (with a light) close to the beach and motors offshore in a straight line, letting out the line for the float and then playing out the net off the vessel’s power reel. As the end of the cork line comes into sight on the reel, the fisherman brakes the reel and brings his vessel to a stop. In order to avoid fouling at least four to five fathoms (7 -9 meters) of tow line is then played out between the net and the boat. The net and vessel then drifts with the currents and are influenced by the tides. Drifts can last through one tidal cycle or less depending on current conditions and the amount of fish. Driftnets must be fished in “substantially a straight line”; encircling of fish is prohibited. To haul the net the procedure is reverse, hauling the towline and net in with the reel, while “picking” the fish from the net as it comes aboard.

Gillnet and Trammel Net Gear Components That Contact or Effect the Seabed (Excerpted from Rose et al. 2002)

The benthic effects of a set gillnet fishing operation occurs during the retrieval of the gear. At this point the nets and leadlines are more likely to snag bottom structures or the exposed sedentary benthos. The anchoring system can also affect bottom organisms and structure if they are dragged along the bottom before ascent. Lost nets can tear organisms from the seabed or overturn cobble and small boulders to which organisms may be attached if the are moved along the seabed by currents. Gillnets may be lost during bad weather or through interaction with mobile gears. Retrieval of gear lost to inclement weather is now high due to the increased use of GPS (global positioning systems), while gillnets lost to interactions with other gear is less likely to be retrieved. Once lost, gear may continue to fish. The extent of this ‘ghost fishing’ will be related to factors such as water depth, light levels, and water movements as well as vertical profile. A lost gillnet can provide a new surface for epibenthic organisms such as bryozoans to settle on and niches for fish and crabs. Although these organisms will help make the net visible to finfish, it can also provide a food source as certain organisms settle on the net or are caught in the net. This will commonly attract fish or other scavengers to eat those caught and the scavenger species can also get entangled. Overtime, especially in areas of high water flow, nets become bundled up, reducing their ability to entangle fish. In deep water, where fouling is very limited and currents slower, derelict nets may fish for longer periods.

Because nets are expensive and can easily become torn if they are snagged on hard or rough bottoms, the goal of setnetters is to avoid these areas, while setting their nets just off to the side and parallel to these areas, on mud or sandy bottoms. Similarly for fear of snagging, efforts are also made to avoid dragging the anchor on retrieval (West, 2003). A 1000 fathom long swordfish net, cut loose during a storm to avoid the sinking of a vessel, when retrieved 6 days later had already bunched up into a dense mass the size of a small house and was not catching fish (West, 2003).

6. Dip Net Fisheries

Dipnets have small nets attached to the end of a long shaft. They are used for harvesting salmon and lamprey eels? in tribal fisheries in the Columbia River. They are also used for harvesting herring and smelt. Herring is harvested using dip nets in bays and the ocean. Dip nets are used to harvest smelt in rivers.

7. Salmon Reef Net

Native Americans of the Puget Sound were using reef nets before white man arrived on the west coast and they continue to be used effectively today in a highly selective fishery by both Native American and other Puget Sound residents. The net is fished among the reefs, set out horizontally in the narrow passages the salmon must traverse to get into fresh water. Fish are guided by two 200 foot leads over the webbing into the bunt (bag) part of the net that collects the fish. Nets are 300 meshes long. Fishermen stationed on a low watch tower built atop a boat or raft watch the fish go into the net and determine the right time to pull the net up. The lead line of the net is raised and the fish are trapped in the bunt and can be brailed (removed with a large sized dip net) from it or the net can be lifted and the fish spilled into holding pens. As the fish do not gill or surround the salmon with a net the fish are kept in excellent shape and non-target salmon species can be released. Pictures of reef nets are available on the Washington Department of Fish and Wildlife website: www.wa.gov/wdfw/fish/regs/commregs/reefnet.htm.

B. Dredge Gear

1. New Bedford Style Dredge

The only dredges used on the west coast are used for the Weathervane Scallop fishery. This fishery uses large dredge gear known as the New Bedford style dredge, which scrapes up complete scallops in their shells from the seabed as the dredge is towed behind the vessel with a steel cable. Scallops are fished in waters up to 60 fathoms deep (109 m), usually in areas of firm sand or rocky bottom where scallops will not be bothered by silting (Browning 1980).

The dredge is composed of a low, rectangular heavy steel frame attached to a bag made of four inch (10 cm) heavy steel rings on the bottom and on the top of the rear end of the bag where the shells gather. Further forward on the top of the bag, the bag is generally polypropylene mesh (generally six inch (15 cm) stretched mesh). The bag is a constant width throughout its length, being held out at the rear by a steel bar called the clubstick.

The dredge frame is between seven and fifteen feet wide (2.1 - 4.6 m) and is attached by a triangular shaped frame to a single towing wire. An 11 foot (3.3m) dredge weighs approximately 1400 lb (636 kg) when empty (air weight) and up to 4000 lb (1818 kg) when full (Sainsbury, 1996). A 15 foot dredge weighs 2400 lbs (1089 kg) dry weight (bag and frame), with the frame alone weighing about 1900 lb (862 kg) (NPFMC, 2002).

Unlike other types of dredges, the New Bedford scallop dredge does not use a pressure plate to hold the bottom bar of the frame on the bottom nor does the lower bar have ‘teeth’ used to penetrate the substrate. The lower bar of the frame is suspended above the sediment by runners or ‘shoes’ on each side. These shoes are about four inches by nine inches in size (10 cm-23 cm). Tickler chains are strung along the frame and disturb the bottom (and the scallops) ahead of the chain footrope, encouraging the scallops to rise and enter the net. Over rocky bottoms, a chain matrix may be used. Some dredges are designed to produce a vortex behind a baffle to assist in raising the scallops off the seabed.

Both shoes and chain links wear from the abrasion of bottom contact and must be frequently replaced. Shoes are changed every four to five days because they bear most of the weight (NPFMC, 2002).

Vessels used for scallop harvesting are often converted double-rigged shrimpers that deploy the dredges one from each outrigger off the sides of the vessel. As scallops can swim quickly for short distances by expelling water fore and aft from its shell, towing speeds are generally faster than those used to harvest flatfish or bottom fish, about 4.3-4.8 knots. Tows last about an hour.

The dredge fishery for scallops developed in 1981 in Oregon, landing millions of pounds of scallops initially, but the resource was quickly depleted. Landings have averaged about 50,000 lbs annually in recent years (McCrae, 2002). Scallops are shucked either on board or at the processing plant. In Oregon, shells cannot be discarded into bays (Hettman, 2002)

(Info from other states? Shell discard requirements?)

Dredge Gear Components That Contact or Effect the Seabed

(Excerpted from Rose et al. 2002)

The effect of dredge gear on the seabed is dependent on the power and capability of the fishing vessel, the towing speed, the weight of the dredge and its size and design. The principal contact with the seabed is made by the shoes, tickler chains and footrope, with the lower edge of the frame only encountering higher sand waves and emergent structures. The chain bag also is pulled across the seabed. Hydraulic baffles may increase the suspension of sediment, while reducing the need for elements in direct contact with the bottom.

C. Gear that uses pots

1. Pot Gear

The words “pot” and “trap” are used interchangeably to mean baited boxes set on the ocean floor to catch various fish and shellfish. They can be circular, rectangular or conical in shape. The pots may be set out individually or fished in stings. On the west coast, live sablefish, Dungeness crab, spot prawns, rock, box, and hermit crabs, spider crabs, spiny lobster and finfish (California sheephead, cabezon, kelp and rock greenling, California scorpionfish, moray eels, and many species of rockfish) are caught in pots.

All pots contain entry ports and escape ports that allow undersized species to escape. Additionally, all pots used must have biodegradable escape panels or fasteners that prevent the pot from holding fish or crab if the pot is lost. All pots are marked at the surface. The markings are set by regulation. Pots fished in a line need to be marked at each terminal end, with a pole and flag, and sometimes, additionally, a light or radar reflector. Dungeness pots must be fished individually and each is marked by a buoy.

Dungeness crab
The pots used for the Dungeness crab fishery are circular, from three to four feet in diameter (.9-1.2 m), 1 foot high (.3 m) and weigh from 75 to 160 pounds (34-73 kg) (most 85-115 lbs) (Austin, 1984, Eder, 2003). The frames of most all west coast pots are made from three-quarter inch welded steel, wrapped with strips of used inner tube to protect the steel from corrosion. (A few fishermen use vinyl coated steel, fewer still use pots with stainless steel frames). Stainless steel wire is used to weave a three to four inch diameter mesh over the steel frame. A bait holder is secured to the inside of the pot. Bait is generally squid, mackerel, sardines and sometimes razor clams or herring. Sometimes additionally a mesh bag or stainless pin with bait is secured (hanging bait) so that the crab can access the bait. Each pot contains at least two escape rings in the upper part of the sides of the pot 4.25 inch (10.8 cm) ring and two rectangular or oval tunnels generally 8" x 4" (20.3 by 10.2 cm) (sometimes larger) on opposite sides of the pot to allow crabs to crawl in after the bait. Triggers close the tunnels so it is difficult for large crabs to escape. A ring on the upper half of the sides gives undersized crabs an escape route. Once the fresh bait is gone the traps hold very little or no attraction to crabs or most animals. An escape panel, mostly of 120 thread cotton, sometimes of iron or other biodegradable tie, will decay over time, keeping the pots from holding crabs if pots are lost.

Pots are baited and set out (pushed overboard by the crew) one at a time as the vessel follows a particular depth contour (depths fished generally range from 3 to 80 fathoms (5.5- 146.3 meters). (Occasionally outside of 100 fathoms or shallower than 3 fathoms). Because crabs prefer soft bottom habitat, they are mostly fished on open flats of mud or sand, sometimes habitat with some gravel, and sometimes are set close to rocky outcrops or other edges (Eder, 2003). A single line (generally 3/8th inch polypropylene) and bullet shaped buoy or buoys attached to each pot marks its position on the bottom. Typically 30-100 pots (but sometimes many more) are fished in a "string"(a series of individual pots consecutive along a fathom curve), and with several strings being deployed. These strings are usually set parallel to each other and approximately parallel to the beach. A common spacing is about 15 pots per mile (varying from 10-25 pots/mile).

Crab pots are left to fish from one to seven days, depending on fishing conditions. Pots are retrieved individually by snagging the buoy line with a hooked pole as the boat moves forward at about two knots, into the prevailing current, placing the line in the hydraulic power block (crab block) and lifting the pot onto the vessel. The pot is emptied, with the crabs sorted, the legal crabs put into seawater (either into a 'live tank' inserted into the hull, or into the flooded hull itself. The pot is re-baited and reset. The retrieval and re-setting of the pots is a rapid, coordinated art, with pots being retrieved at a rapid rate of about one to two minutes per pot, as the boat moves forward, with the re-baited pot being put back into the water just before the pick-up of the next pot is reached. The pot is generally reset in the same area, but if that area is not productive, the fishermen may pick up their pots and search around to set in another spot. (The new location may be chosen based on a history of knowledge of the area, information from other fishermen, information from the productivity of the fisherman's gear in other locations).

Crabs are alive when sold and are kept alive in the fishermen's hold by pumping seawater through the circulating seawater tanks, at about a 15 minute exchange rate. (In a very few ports, e.g. Port Orford and Trinidad, California, where crabs are sold daily, live crabs may be kept in dry containers (e.g. totes), instead of seawater tanks.)

Blackcod Fishery

The pots used for the blackcod pot fishery are highly selective for blackcod and are fished off a long-line in series (a set of pots) at various depths. They are generally fished in waters up to o 600 fathoms, though sometimes as deep as 760-800 fathoms. Up to 50 pots are attached to each groundline line. The groundline is usually ¾ inch polypropylene (ranging from 5/8" to 1 1/8"). Pots are spaced every 15 to 40 fathoms along the line, with 20 fathoms being average. An anchor weighs each end of the line. About 60 pounds (27 kg) of weight is used (varying from 50 to 80 pounds) and are often round weights wrapped in mesh bags. Surface buoys and flagpoles mark the location of the lines. Pots are set and retrieved using line haulers and hydraulic blocks and overhead hoists. The pots are large and either rectangular, trapezoidal, basket-shaped, or cylindrical in shape. They usually weigh less than 50 pounds, Pots are set and retrieved using line haulers and/or a drums.

The pots are either rectangular, trapezoidal or conical in shape. The most common, trapezoidal pots are approximately 6' x 2.5' in size and weigh about 55 pounds. The conical pots are usually about four to five foot bottom diameter and three foot high and weigh roughly the same as a trapezoidal pot. The bigger rectangular pots may be over 100 pounds in weight. The trapezoidal and conical pots have collapsible bottoms so more pots can be stacked on deck. Pots are usually baited with pacific whiting or sometimes whiting and squid. A single or, more commonly, a double tunnel system allows the fish to enter, but not easily escape. Pots are steel frame covered with mostly 3.5" nylon web (Eder, 2003), tunnels are of knotless nylon web. A panel of cotton webbing usually about nine inches square, but no less than eight inches (20.3 cm), is built into the pots to eliminate the retention of fish if they get lost. A 21 thread cotton webbing rots away in less than five months (Browning, 1980). Many sablefish pot fishermen are now using escape rings to allow the escape of smaller fish while the pot is fishing. This reduces the number of fish the fishermen have to handle and reduces fish mortality due to handling in the release of small fish (Hettman, 2002 personal communication).

Prawn fishery

Pots used for the prawn fishery (e.g. spot prawns, coonstripe) have a smaller mesh than other types of pots.

The coonstripe shrimp trap uses various trap configurations (CDFG, 2001), the most common being a rectangular trap covered in 1 3/8 inch mesh shrimp trawl webbing, with two circular openings. The traps are set in depths ranging from 15-30 fathoms in strings composed of between 20 and 30 traps per string. Fishermen will use 300 to 400 traps during the fishing season. The traps are baited with a variety of baits including herring, sardine, and mackerel. Each pot string is marked with a surface buoy on each end.

The mesh of spot prawn traps in California must be at least one inch by one inch (2.5 cm) in size and the number of traps per vessel is limited to 500 in the Southern California Bight and to 300 pots per vessel within northern California state waters during peak egg-bearing season. In Washington, there is also a maximum number of 500 pots per permit and pot size is limited to a maximum 153 inch (3.9 m) bottom perimeter and a maximum 24 inch (.6m) height. At least 50 percent of the net webbing or mesh on the pots must easily allow passage of a 7/8" diameter dowel. Each end of a pot string must be marked with a surface buoy on each end.

Other pot fisheries

Pots used for any **groundfish fishery** must have escape panels constructed with 21 thread or smaller untreated cotton twine that will result in at least an 8 inch diameter (20.3 cm) opening when the twine deteriorates. Pots are often rectangular or conical in shape and are generally constructed of twine meshes on a steel framework (Hettman, 2002). Finfish traps are used in nearshore waters off southern California are used to take California sheephead, cabezon, kelp and rock greenling, California scorpionfish, several species of rockfish and moral eel. They are also used in central and northern California for cabezon, greenling, and nearshore rockfish. At least one fisherman in Astoria, Oregon is using pots for cabezon, greenling, nearshore rockfish and wolf eel.

Hagfish pots are tubular traps with an inward tapering tunnel. One or more pots may be attached to a single line.

Spiny lobster traps (in southern California) and the central and southern California **red rock crab** traps use coated wire traps that are generally lighter than a Dungeness crab pot and are weighted with brick weights.

Pot Gear Components That Contact or Effect the Seabed

The effect of a pot on the seabed is related to its weight and structure as well as to how far and fast it moves along the seabed before ascending. The weight of the trap is increasingly countered by the lift from the hauling line as the pot comes off of the seabed (Rose et. al 2002).

For pots on a groundline with weights at each end, if the vessel isn't above the part of the gear being retrieved the gear groundline and weights or anchors can effect bottom organisms and structure if they are dragged along the bottom before ascent (Rose et. al, 2002). Fishermen however make a conscious effort to get right over the gear as they pull each pot, so as to lift the fewest number of pots off the bottom off the bottom at a time (Eder, 2003). This results in much less strain on the line, which can part, if pots are dragged Because black cod pots aren't always fished on the contour, they are sometimes placed on sloping ground. In these cases, pots will be pulled from the downhill, deeper end so that the pots don't drag along the hillside. This allows the pots to be picked up easier, minimizing strain on the gear and equipment, while taking better care of the bottom (Eder, 2003).

Lost pots can continue to fish after they are lost, though fouling reduces the fishing effectiveness of lost pots (Rose et. al. 2002). Additionally, biodegradable panels are required in all pots to provide escape routes to the fish if a pot is lost.

Dungeness pots are hauled in rapidly by the crab block, generally resulting in little disturbance. If there is a long scope (e.g. if have 30 fathoms of line in 10 fathoms of water), the gear will tend to drag more then if there is shorter scope. Because the boat is moving towards the pot as it picks up the gear, drag is minimized. If the crab pots are tacky (partially buried in sediment), it is especially important to get right over the pot to pick it up (Eder, 2003).

D. Hook and Line Gear

There is a variety of commercial fishing gear that uses hooks and lines in various configurations to catch finfish. These include longline, vertical hook and line, jigs, handlines, rod and reels, vertical and horizontal setlines, troll lines, cable gear and stick gear.

1. Longline Gear

This fishery involves the setting out of a horizontal line to which other lines (gangions) with baited hooks are attached. This horizontal line is secured between anchored lines and identified by floating surface buoys, bamboo poles and flags. The longline may be laid along or just above the ocean floor (a bottom longline) or may be fished in the water column (floating or pelagic longline).

Blackcod, Pacific halibut, groundfish, dogfish, and sturgeon (on the lower Columbia River) are targeted on the bottom longline. The longline also takes lingcod and rock fish.

Pelagic longline is used to target swordfish, shark and tunas. California and Washington do not allow the use of pelagic longline gear in waters off their coast (out to 200 miles). However these species caught with longline gear can be landed in their ports. California requires vessels to file an offshore fishing declaration to land longline-caught fish in their ports (Goen and Hastie 2002). Oregon allows fishing with pelagic longline gear under a Developmental Fisheries Program Permit (for swordfish and blue shark) outside of 25 miles, but currently there is no participation in this program.

To deploy the longline gear, the vessels sets the first anchor and then steams ahead, following a selected pathway (e.g., a depth contour, so that the other lines can be set parallel to the first) with the ground line poles and baited hooks being set off the stern of the boat usually down a chute. (Hooks are baited either by hand or by automatic baiting machines. Common baits are squid, herring, octopus, and cod.) Hooks of various sizes are attached to gangions of various lengths that are tied on or snapped onto the line at the desired interval. Hook size and spacing (ranging from 3-12 feet apart), depth, and soak time (fishing time) vary.

The number of groundlines set and the spacing of the 'strings' on each line is highly variable (Hettman, 2002, personal communication). Gear is hauled with a gurdy and roller complex, with fish being taken off the hooks as the groundline comes aboard, and skates being separated from each other and gangions removed for rebaiting.

Bottom Longlines

Bottom longline gear fits into two categories: gear that targets fish living directly on the bottom (halibut, cabezon, lingcod etc.) and gear that targets fish living very near the bottom (sablefish, rockfish etc.). Marking buoys, buoy lines and anchors are the same for both types of bottom longline. Additionally hook spacing and size, gangion size and length can also be the same. The difference in longlines for fish living directly on the bottom as opposed to fish living near the bottom comes between gangions and the groundline and in the composition of the groundline itself.

Common features of bottom longline gear

Buoys and Anchors

The longline is marked on both ends with a cane flagpole with a radar reflector and a flotation buoy.

Below the buoys the buoy line (30-50 fathoms longer than the water depth) travels from the surface down to the anchor on the bottom.

The anchor is usually 25-50 lbs. And has two or more legs extending from a main shank. A length of chain extends from the base of the anchor's legs along the main shank to a few inches past the attaching eye. This chain serves to dislodge the anchor from being hung up on rocky bottom. The chain is fixed securely to the legs end of the main shank of the anchor and is tied with a relatively weak 'string' to the eye end of the anchor. The lower end of the buoy line has an anchor gangion spliced into it. The anchor gangion is tied into the loose end of the anchor chain, a few links past the eye. If the anchor becomes stuck in rocky ocean bottom, the string 'weak link' breaks, and the pull from the buoy line is then transferred from the eye end of the anchor to the legs end of the anchor and the anchor is pulled out backwards (Pettis, 2002).

Gangions

Gangions for halibut are usually #72 thread braided nylon. Lighter material is used for smaller fish. The length of the halibut gangion varies from 30 inches and longer, based on the height of the vessel's railing, as the railman will want to have the gangion in hand before the fish is pulled from the water. Gangions can be either tied on "stuck" or snap-on. Gangion spacing with snap gear depends on the expected density of halibut in the area to be fished. A "hot spot" may have the gangions snapped on just far enough apart that the fish will not tangle each other, wheras a scouting set may be spaced 60 feet or more apart, though 9-15 feet would be standard. Gangion spacing on stuck gear is a blend of expected fish density, groundline lay (stiffness) and gear storage methods. For instance if the gear is to be coiled into wash tubs and the line is somewhat stiff, the hook spacing will be a multiple of the length of the line it takes to make a comfortable fit coil in the tub. With very soft lay line (i.e. line with 'no memory') the spacing would be based on expected fish density (Pettis, 2002).

Hooks

Nearly all modern longline operations use 'circle' hooks. These hooks are shaped somewhat like the clenched talon of a bird of prey in that the point of the hook circles back toward the shank and ends up pointing well below the eye of the hook. Hooks range from #16 halibut hooks, that are about three inches tall (7.6 cm) to #7 hooks about that are about one and a quarter inches tall (3.2 cm) for black cod and other smaller fish (Pettis, 2002).

Gear for fish living directly on the bottom

Groundline

The ground line used to fish for fish living on the bottom is usually about 5/16th inch diameter and is made of nylon or another non-buoyant material. Also ground line made of polypropylene with some lead fibers mixed in is used.

Ground line is stored either wound on a hydraulic powered reel, for snap on gangion gear sets or is coiled up in round ‘wash tubs’ for tied-on or ‘stuck’ gangion gear (Pettis, 2002)..

Weights

Weights of one to five pounds are sometimes attached to the groundline either to speed sinking rate through upper waters that might house non-desired species, or when fishing uneven bottom contours to ensure the groundline does not ‘clothesline’ from high point to high point missing the lower ground completely (Pettis, 2002).

Gear for fishing living near the bottom

When fishing for fish that live directly on the ocean bottom, the fisherman must put his gear where the fish live, directly on the bottom. One problem with doing this is that many other ‘hungry’ sea creatures live there as well. In an attempt to save his bait for the desired species, and keep it above the rest (starfish, crabs, etc.), the fishermen seeking fish species that live just off the bottom will use a modified groundline and a series of weights and small floats (Pettis, 2002).

Groundline

Groundline used slightly off the bottom is made of materials that have positive buoyancy (e.g. polypropylene). This helps the floats hold the hooks and bait above the bottom.

Floats and Weights

A series of weights are used along the groundline to sink the groundline to the bottom. The floats have enough buoyancy to lift the groundline, hooks and gangions, but not enough to hold up the weights. The floats keep most of the hooks above the bottom. The height off the bottom can be regulated with the amount of line used between the groundline and the weights. Another way to control ‘fishing height’ is the number of hooks between weights and floats. (Pettis, 2002).

Advantages of each type of bottom longline

The direct on the bottom longline gets the gear down and fishing faster. This is beneficial during short duration fisheries such as West Coast halibut with only ten hour seasons. This gear sinks faster and is less affected by surface currents, so fishing very close to other fisheries on ‘hot spots’ creates fewer tangles. Sinking faster also reduces marine bird bycatch. (Pettis, 2002).

The just above the bottom longline keeps the bait ‘fishing’ much longer. It also allows the hooked fish to swim around a little above the bottom. This helps keeps predators from damaging desired fish and allows unwanted fish (those without swim bladders) to be released alive when hauling. Fewer opportunities to snag the bottom exist when only the anchors and small groundline weights contact the bottom. This reduces the impact of the gear on the ocean floor environment. (Pettis, 2002).

Examples of gear configurations for some groundfish longline fisheries

A Pacific halibut ground line is generally composed of ten skates of 300 fathoms (548.6 meters), covering 18,000 feet (5.6 km or 3 nautical miles). It is generally composed of #72 nylon twine with a test of 1800 pounds. Each skate weighs 32 pounds (on deck). Each gangion, also composed of #72 thread braided nylon, averages about 58 inches (1.5 meters) long, is attached to the groundline with snap gear, with a hook at the other end. Each groundline might contain up to 800 hooks and take three hours to retrieve. (Hook spacings of 26 feet (7.9 meters) are common, but spacings between 18 feet (5.5 meters) and 36 feet (11 meters) also have been used.) Halibut longlines are generally set at depths ranging from 30-150 fathoms (but some may be fished down to 600 fathoms) and are left to fish for six to twelve hours before hauling. (Browning, 1980?)

A blackcod ground line might cover one and a half nautical miles (2.8 km) and contain 3,000 hooks. Hook spacings of about three feet (.9 meters) is about standard. The groundline and gangions are similar to that used for the halibut fishery (generally #72 nylon twine). Blackcod gear is generally hauled after four to six hours due to the propensity of black cod to escape or to be taken by predators. Blackcod is fished year round from inside 100 fathoms to 500 fathoms, with most of the fishery historically taking place in 350-400 fathoms (Browning, 1980)

A groundfish ground line typically covers one nautical mile (1.9 km) and is composed of ten skates of groundline, each 100-150 fathoms long. Gangions are snapped onto the groundline at three to four foot intervals. Herring and squid are used for bait on the hooks. Intermediate weights are used on the groundline to minimize the movement of the groundline across the bottom. The gear is left to fish for two to twelve hours before hauling. (NPFMC, 2002)

A sturgeon longline fishery takes place on the lower Columbia River. Gillnet boats are used, and groundlines are wound on the net reel. The seasons are variable but may run for two months in early spring and a month or more in the summer. Groundline length?, spacing? (ask John Devore)

Gear Components of Bottom Longlines That Contact or Effect the Seabed

The principal components of the longline that can produce effects on the seabed are the anchors or weights, the hooks and the mainline. The key determinant of the effects of longlines is how far they travel over the seabed during setting or retrieval. Significant travel distance is more likely during retrieval. If the hauling vessel is not above the part of the line that is being lifted, the line, hooks and anchors can be pulled across the seabed before ascending. If the hooks and line snare exposed organisms they can be injured or detached. Lines may undercut emergent structures or roll over them. The relatively low breaking strength of the line may limit damage to more durable seafloor features. (Rose et. al. 2002)

The mainline can also be moved numerous feet along the bottom and up into the water column by fish, particularly halibut during escape runs. Objects in the path of the groundline can be disturbed (Johnson 2002).

Pelagic Longlines

As noted above, pelagic longline gear is currently not in use in the U.S. waters off Washington, Oregon, or California. It is prohibited gear in Washington and California and while allowed under a developmental fishery permit in Oregon, no permits are currently in effect.

Though the gear is not in use currently, it is described here for informational purposes. Pelagic longline gear can be fished either near the surface or at a certain depth. Several lines may be fished at the same time, kept separated with the help of outriggers. Pelagic longlines can be fixed (anchored to the seafloor) or can be drifted. The nets can be kept near the surface or at a specified depth in the water column by a series of floats and weights. Drift longlines may remain attached to a vessel, but the vessel drifts with the gear as it is being fished (Goen and Hastie 2002).

2. Handline and Jig Gear

Handline and jig fisheries use vertical, weighted monofilament lines on which baited hooks are attached at intervals using wire spreaders or individual leaders attached with swivels. In a typical jig arrangement, a line is 400 pound (181 kg) test monofilament and the jig weighs eight pounds. The hooks are attached to the mainline and are dressed up with colorful segments of rubber surgical tubing, hoochies, or bait (herring or other fish). By hand, or with mechanical gear, the jig is dropped to the bottom to determine the depth. The line is then usually lifted a short distance off the bottom and then jigged vertically up and down to produce movements of the hoochies or bait and induce the fish into biting. This type of gear is used to harvest lingcod and rockfish.

With mechanical jigs, the gear is automated and lets out and reels in line as programmed. It can also be programmed to sense when the gear hits the sea bed and automatically pull in enough line so that the hooks stay a few feet above the bottom without snagging (Sainsbury 1996) . When a pre-set weight of fish has been hooked, the jigger can automatically reel in the monofilament line. Mechanical jiggers will generally utilize between six and sixteen hooks on gangions and many lines can be actively jigged. Squid jigging vessels may utilize up to 30 jigs and attract the squid with bright lights.

Handlines can also be fished without active jigging.

Handline/Jig Gear Components That Contact or Effect the Seabed

The jig (weight) is dropped periodically to the seabed to determine depth.

3. Stick (Pipe) Gear

Stick gear uses a plastic (PVC) or aluminum pipe which is suspended from a mainline and weighted with about a three pound weight (1.5 kg). Wire spreaders are attached at a selected distance up and down the pipe. Leaders are attached with a swivel clip to these wire spreaders. This gear can move along the bottom and is often set near the edge of kelp beds (Riley, 2002)

Stick Gear Components That Contact or Effect the Seabed

The weight contacts the seabed and can bounce along the bottom.

4. Rod and Reel Gear

Fishing poles rigged with monofilament line of various strengths and hooks of various sizes and designs are used to fish salmon and groundfish in commercial, recreational and charter boat (also called party boat or commercial passenger vessel) fisheries. Flashers, hoochies, and bait are used to attract fish to the hooks. Lines may be cast or trolled. Lines are weighted with sinkers that generally range from half an ounce to six ounces (.23-2.7grams). These may be round or pyramid or crescent shaped. Weighted lines and hooks are cast overboard and allowed to descend to the desired depth. When a fish is on the line, fish are reeled back in. The number of hooks and lines fished may be regulated. When multiple hooks are fished, each hook may be fished from an eight to twelve inch “dropper” line attached with a three way swivel to the leader from the main fishing line. Multiple leaders may be attached to each other. Leaders are generally 24” long with one dropper line attached to each end.

Rod and Real Gear Components That Contact or Effect the Seabed

When fishing near the bottom or near reefs, the sinkers may come in contact with the substrate.

5. Vertical Hook and Line (also called vertical longline, buoy or Portuguese long line)

Vertical longline gear is used in Southern California and Oregon (elsewhere?) to target rockfish. This hook-and-line gear involves a single line anchored at the bottom and buoyed at the surface so as to fish vertically. Baited circle hooks are spaced about 12 inches apart (30.5 cm) and are tied, with monofilament leader, to the mainline. Wind and waves jiggle the buoy, which wiggles the line and the hooks.

Vertical Hook and Line Gear Components That Contact or Effect the Seabed

The anchor contacts the seabed.

6. Troll Gear

Trolling involves towing multiple lines with multiple hooks behind a vessel moving at speeds suited to the fish desired (e.g. a speed of one to four knots for salmon, four to eight knots for albacore). Fishing lines are rigged to a pair (or more, depending on regulations) of three inch to six inch diameter outriggers (trolling poles) which are lowered to approximately 45 degree angles from the boat. Tag lines which are attached to the trolling pole hold the fishing lines away from the boat. A wedge-shaped stabilizer made of steel or wood and lead is often also hung on steel wire or chain from each outrigger to help stabilize the boat. These stabilizers ride from 10-20 feet (1.5-3.0 meters) below the surface.

Fishing lines are set and retrieved using gurdies (powered spools or reels) mounted on the vessel in sets of two, three or four. Each gurdy spool, usually powered by hydraulics, contains and works one main line.

Salmon Troll Fishery:

Salmon troll vessels ranges in size from 18 to 60 feet. Steel lines (main lines), attached to the poles by a tag line, are weighted with 20-65 pound (9-29 kg) lead weights called cannonballs. The main lines and cannonballs are used to control fishing depth and to keep the lines apart. Up to four main lines are used on each outrigger, though two or three mainlines are most common. Each line may have four to ten spreads per line depending on the species of salmon targetted. A spread consists of monofilament leaders with attractants and hooks attached. Spreads are placed every two to five fathoms up from the cannonball, generally by being snapped onto the main line between stops set onto the main line. Troll fishermen have used longer and fewer spreads to better target chinook while avoiding coho salmon (Heikkila, 2002). Fish are attracted to the hooks with a flasher and terminal gear usually consists of plugs, spoons, plastic squid hoochies or hooks baited with herring or anchovy. Hooks must be single point, single shank, and barbless.

Fishing lines are set and retrieved using gurdies (powered spools or reels) mounted on the vessel in sets of two, three, or four. Each gurdy spool contains and works one main line.

Salmon are fished pelagically as well as close to the bottom in water depths up to about 80 fathoms (146 meters) and up to 50 miles (85 kilometers) offshore, from central California to the U.S./Canadian over bottom habitat of any type. The fishery occurs intermittently between March and October, subject to area restrictions.

While many salmon fishermen will stay at sea for many days before delivering their iced product, the addition of freezer capacity has allowed other vessels to stay at sea much longer and go much further away from port.

Salmon Troll Gear Components That Contact or Effect the Seabed

Most salmon troll gear never comes in contact with the seabed. However, in shallow areas (less than 10 fathoms (18 m) with flat sandy bottoms near the surf zone, the cannonballs and hooks may be fished in contact with the bottom (Tracy, 2002). However, most fishermen will avoid contact with the bottom because of loss of gear, safety concern, and encounters with lost crab pot gear (Heikkila, 2002)**.** In order to avoid loss of line and outriggers if hang-ups occur, the cannonball weights may be attached to the lines by leather straps or other lighter line which is designed to break should the weight hang up on the seabed or gear.

Albacore Troll Fishery

Vessels targeting albacore tuna range in size from 40 to 70 feet and tow up to 13 lines of varying lengths from the outrigger poles and the stern. A lure called a jig is attached to the end of each generally unweighted line (unless ocean conditions require weights to keep lures from bouncing free of the water). One or two lines on each pole may also be weighted with chain heavy enough to sink line and lure so that outside lines may be hauled over them without snagging. Jigs have metal heads, plastic skirts or feathers, and large, barbless double hooks. Fish are pulled aboard by hand or by line haulers (pulleys) located on the stern.

Albacore jigs are fished on the surface of the water. While the season is open year round, albacore are usually fished from July through October, when the water is warmer not too far offshore (e.g. 20-60 miles (32-96 km). . (Albacore prefer water from 58 - 64 degrees Fahrenheit (14-18 degrees C). However, some fishermen will venture out much further, as far as 1500 miles (2413 km) offshore (Goblirsh, 2002). The development of vessels with large fuel capacity and on-board freezing systems has allowed this far-ranging fishery. Some of these fishermen deliver back to the West Coast, others go to Midway, Hawaii and the South Pacific, delivering to at-sea tenders or to ports in these places.

Albacore Troll Gear Components That Contact or Effect the Seabed

Albacore gear does not come in contact with or affect the seabed.

Groundfish Troll Fishery

Troll gear is also used to harvest groundfish. One type of gear is often called ‘dingle bar’ gear, so named because when the five to seven foot iron bar (1.5-1.75" in diameter) touches bottom there is a distinct ‘ding’ transmitted up the steel trolling wire. The gear is designed to be fished three to six feet above rocky bottom and the iron weight is allowed to touch the bottom only occasionally to adjust for varying depths. This gear is used primarily to target lingcod (sometimes halibut) and is very selective. It has been used to target lingcod for over 50 years. (Heikkila, 2002).

The gear is attached to trolling wire with double troll snaps usually two to three feet above where the iron bar is attached. The mainline is normally 400 pound/test monofilament line (181 kg) with small brass spreaders with three swivels spread six feet apart. Two four to five inch (10-13 cm) hard plastic floats are placed in the middle and end of the gear. The fishing lures, six to eight ounce (170-227 gram) lead-head jigs, are hung on five foot, 200 lb/test monofilament gangions attached to the center swivel of the spreaders. The jigs are baited with large plastic worms called ‘scampies’ and are sometimes tipped with bait. Normally four to eight jigs are used. (Heikkila, 2002).

Other groundfish trolling gear is similar to the above described ‘dingle bar’ gear, except it uses a bent steel bar about four feet in length (1.2 m) that weighs about 40 pounds (18 kg) rigged at the end of the steel main line (trolling wire). The bend in the bar assists the bar slide over the seabed or rocks. It is attached to the main line by a breaking strap which will break if a hang-up occurs. The gear consists of a snap link attached to a swivel, followed by 1 fathom (1.8 m) of monofilament line, then about 2 ft of thicker spreader bar. This combination is repeated a number of times to form a string. Gangions of monofilament and heavy stainless wire with weighted hooks are connected to each swivel of the string. At the end of the string, a rigid plastic float is rigged to provide drag and flotation to keep the string and hooks horizontal and suspend the hooks just above the bottom. Ten to fifteen of these strings may be attached to main line above the bent weight bar at various depths to target rockfish congregating at different depths around rock pinnacles (Sainsbury 1996, CDFG, 2001).

To fish a number of depths near the surface, floats are rigged on the main lines, followed by a number of leaders and a heavy weight (CDFG, 2001). By adjusting the weights, length of main line and location of leaders, the hooks can be rigged to fish a range of depths within the desired band. (Sainsbury 1996)

Groundfish Troll Gear Components That Contact or Effect the Seabed

The iron and steel “dingle” bars can contact the seafloor. The hooks and line can snag on rocks, corals, kelps and other objects during retrieval. This may upend smaller rocks and break hard corals, while leaving soft corals unaffected. Invertebrates and other light weight objects can also be dislodged.

California Halibut Troll Fishery ?

7. Mooching

Mooching is a fishing technique used for catching salmon. It involves fishing multiple fishing poles with baited hooks behind a vessel while the vessel either drifts or stays stationary in the current. This is not legal commercial gear in Oregon and Washington where the gurdies or poles have to be fixed to the vessel, but it is used for recreational fishing. Salmon mooching is both a commercial and recreational fishery in California, primarily south of Point Arena and particularly in Monterey Bay and San Francisco Bay. This fishery is usually pursued by small outboard boats owned by recreational fishermen who also hold a commercial permit. This fishing gear is described in the recreational fishing section below. Mooching gear does not generally come in contact with or affect the seabed.

E. Other Fishing Gear

1. Dive, Hand/Mechanical Collection Fisheries

In Washington and Oregon sea urchins, clam, octopus, oyster, sea cucumber, scallop, and ghost shrimp are harvested by hand, dive, or mechanical collection methods. Finfish are also taken by divers using a spear or speargun and live fish are taken in California by divers using a short fishing line deployed underwater near the target fish. In California, abalone and sea urchin are taken in dive fisheries as are crab, scallops, and lobster. Swordfish is taken with harpoons, and other fish (e.g. skates, rays, certain sharks are taken with spears, spearguns, harpoons, and bow and arrows). Bow and arrow gear may also be used to take certain finfish.

Dive fisheries (using either a self contained air tank, or breathing off a hose “hooka” from a low pressure air compressor vessel) are used to pursue various fish and shellfish such as urchins, lobsters, and sea cucumbers which are hand collected, sometimes using rakes or other hand carried implements. Regulations may control the number of divers in the water by permit. Scuba gear is also used to pursue finfish with a spear or speargun. The swordfish fishery uses harpoons. Clam rakes are used to harvest clams in estuarine and shoreline waters.

Harpoons, spears and sticks are shafts with sharp, pointed, or barbed tips. These may be propelled by hand or by mechanical means. Harpoons are not legal gear in Washington. The harpoon is attached by line to an inflatable buoy and to the fishing vessel by a recovery line (tag line) that spools out of line on board the vessel. The movement of the fish, once struck is shown by the buoy, so that the vessel may follow its movements. Swordfish harpoon vessels in California work in conjunction with an airplane to spot swordfish basking at the surface. Harpoons are hand propelled. Modern harpoons may employ electrical shocks to kill or stun the fish so it can be brought on-board without excessive fighting activity. An electric cable is incorporated into the hunting line or runs along side it, with the electrical pulse supplied from a separate battery system. (Is this used here?)

Urchin harvest occurs at depths of five to 100 feet (1.5- 30.5 m), with most dives taking place in 20-60 feet (in Oregon and Washington, dives must be in water depths greater than 10 feet (3.5 m) from the mean-lower low water). Red, purple, and green urchins are harvested commercially. Red and green are primarily harvested in Washington, red in Oregon, and red and purple in California). Urchins are harvested from the ocean bottom with a hand-held rake or hook and put into a hoop net bag or wire basket. The basket is winched onto the boat and emptied into a larger net bag. Limited entry permits and lower size limits are used in Washington, Oregon and California to control the harvest for red sea urchins (additionally upper size limits and seasonal and area restrictions are used in Washington, and seasonal requirements and log book requirements are in place for regulating this fishery in California).

Clams are taken in shallow estuarine waters or along the nearshore by hand-held hoes and rakes, and in some cases (e.g. geoduck clams) by using hand held water hoses with a one inch (2.5 cm) nozzle at the end that is attached to a 11 hp motor. This water hose liquifies the sediment around the clam and allows it to be captured. Abalone are taken in dive fisheries by hand sometimes employing hand held hooks.

There is currently interest in Oregon to harvest bay clams using a water hose similar to that used in the geoduck fishery, but with a smaller pump (5hp) that pushes air through a nozzle that is a half inch in diameter. Lack of capability to monitor effects has put a hold on these experimental fishery permits. Gapers are generally found in a sandy/muddy/shell habitat from the intertidal zone to depths of 17 fathoms (30m). If allowed in Oregon, mechanical gear would be limited to depths greater than ten feet (3 m) to protect the intertidal zone.

Gear Components of Dive and Hand/Mechanical Collection Gear That Contact or Effect the Seabed

The urchin collection bags may sit on the bottom during harvesting(?). Clam rakes and hoes and water from hoses disturb the bottom to dislodge the shellfish. Hooks used to dislodge abalone from their substrate can contact the substrate.

2. Herring spawn on kelp

A fishery for herring eggs (roe) that have been laid on naturally growing kelp is conducted in Puget Sound, Washington and in California. The kelp fronds with their clinging eggs are cut by hand from small skiffs. The weight of the catch (including the plants) is limited to twenty-five pounds in California. (Contact Greg Bargmann at WDFW for herring and kelp info). Oregon also had a fishery for eggs on kelp, with Macrosystis (giant kelp) shipped in from California and hung on rocks for the herring to spawn on (Hettman, 2002, personal communication).

3. Herring brush weir

In Puget Sound, Washington, fishermen also construct structures made of (?) that are placed in bays where herring spawn. The weir is removed from the water and the eggs collected.

4. Ghost shrimp pumps

Commercial fishermen use gas operated pumps or hand propelled pumps in the nearshore to harvest mud and ghost shrimp from tidal mudflats. The mouth of these pumps mechanically evacuates smallish diameter holes in portions of the sediment. The holes are how wide and how deep?

5. Poke Pole

Poke poles are long bamboo poles with baited hooks attached to the end (?) that are used in intertidal areas by recreational fishermen along the northern California coast to capture cabezon, greenling, and an occasional shallow water rockfish or prickleback.

6. Bait Pens

(List of continuing fisheries notes WA, OR, CA bait pens with about 13 participants, info?)

Only legal commercial fishing gear of certain types is allowed to be used to harvest live finfish and shellfish. The gears have already been described, but further information is provided here to define the gears used in the live fish fishery.

7. Live Groundfish

Live groundfish are caught in the open access groundfish hook and line fishery, with limited entry longline gear and with limited entry pot gear, and a variety of other hook gears (e.g. stick gear). Additionally, California halibut and rockfish taken in gill and trammel nets have increasingly appeared in the live/premium fish fishery *(*CDFG, Dec 2001). A new development is California urchin divers fishing with hooka gear underwater during the off-season for urchins. They fish a short line (18" line) underwater to target the same fish that are targeted by the other hook and line gear. Landings of 80-100 pounds (36-45 kg) of fish have been made at times by the three or four fishermen who currently are using this gear in California (Calvis, 2002).

In California hook and line gear for the live-fish fishery within one mile of the mainline shore has been limited, since 1995, to a maximum of 150 hooks per vessel and 15 hooks per line. (CDFG, 2001). Traps are limited to 50 per fisherman.

In Washington, it is illegal to possess live bottom fish taken under a commercial fishing license.

In Oregon, nearshore rockfish and species such as cabezon and greenling are the target of the live fish fishery. Only sablefish and rockfish have certain limits on their catch (the catch is credited against the federally set limited-entry allocations). This fishery occurs in waters of ten fathoms or less (18 m). In early 2002, an Oregon Development Fisheries Permit was required for fishermen landing live fish species (e.g. cabezon, greenling (except kelp greenling), brown, gopher, copper, black and yellow, kelp, vermilion, and grass rockfish (among others), buffalo sculpin, Irish lords, and many surfperch species). Additionally commercial fishing for food fish is prohibited in Oregon bays and estuaries and within 600 feet (183 m) seaward of any jetty. Only legal gears must be used to catch nearshore live fish.

Live Finfish (non-groundfish), Live Shellfish Fisheries

Baited traps, no larger than three feet in its largest dimension, are used for shiner perch, Pacific staghorn sculpin and longjaw mudsuckers in California.

Dip nets and baited hoop nets not greater than three feet (. 9 m) in diameter may be used to take herring, Pacific staghorn sculpin, shiner surfperch, surf smelt, topsmelt, anchovies, shrimp, and squid in California.. Hawaiian type throw nets are also used to take these species north of Point Conception.

Beach nets not over 20 feet (6 m) in length with meshes at least 7/8ths of an inch in length are allowed to be used to take surf smelt north of Point Conception, California.

Prawns (spot and ridgeback primarily) are taken with a trap fishery as are Dungeness crab.

II. Gear Used in Tribal Fisheries

The Gear Used in Tribal Fisheries is the same as the gear used in the commercial and recreational fisheries described above and below.

III. Gear Used In Recreational Fisheries

Recreational fishing is fishing with authorized gear for personal use only and not for sale or barter.

The only gear legal to use for groundfish in the area between 3 and 200 miles from shore (4.8-322 km) are hook and lines and spears (see description above).

Rockfish and cabezon are generally fished off lines with multiple hooks suspended. Baits include sand and ghost shrimp, pile worms, herring and squid. Alternatively a quarter of an ounce to a one ounce “leadhead jig” with a rubber worm is used. Lingcod is fished using dead bait or sometimes live greenling.

In California recreational groundfish fishermen are restricted to one line and three hooks. Rod and reel gear and handlines are used.

In Washington only one line with two hooks is allowed to be used for all species taken in marine waters. In some Puget Sound areas (Marine Areas 5-13) anglers are required to use only barbless hooks for all species. The exception to this rule is that anglers may use another line equipped with a forage fish jig with up to nine barbed hooks in certain areas (Marine areas 5-13) (WDFW, 2002). Dip nets are allowed to be used to land legally hooked fish.

Flatfish are fished in areas with sandy or muddy bottom with rod and reel gear using a small jig or a hook baited with shrimp, marine worm, or mussels.

Pacific Halibut is taken with rod and reel gear using large herring, jigs, spoons or shrimp flies deployed on wire or very heavy monofilament leaders.

The only recreational gear allowed to be used for salmon is hook and line gear that is cast, trolled or mooched. Shore and boat anglers use spinners or bait; offshore anglers troll or mooch. Ocean coho are fished in the upper layers of the water while chinook are deeper and caught with larger plugs (greater than six inches) herring, spoons, spinners or metal jigs.

Trolling involves towing lines from fishing poles behind a vessel. Salmon mooching uses different terminal gear (gear at the end of the line than trolling) though lines are also drifted behind the vessel from fishing poles. In Washington, primarily Puget Sound, and in Oregon, a technique called motor mooching is used. The vessel uses a trolling motor to keep the boat relatively stationary in respect to the current. The gear is rigged to create a spinning bait (herring, sardine or anchovy). The pole is secured in a pole holder on board, or the line may be cast and reeled. In California, drift mooching is practiced. The boat motor is turned off and the boat drifts with the current. The hook is turned around backwards in the bait, usually anchovy (that is the hook is embedded in the biggest part of the fish) and the intent of the technique is to gut hook the fish.

Large tuna poles are generally used and once the fish hits the bait, more fishing line is fed to allow the hook to go deeper, then the rod is jerked. Circle hooks have been required (instead of J hooks for a number of years to reduce hooking mortality when prohibited fish are released, but hooking mortality remains very high (46%) in comparison to sport trolling hooking mortality rates of about 14% (Grover, 2002).

Green and white sturgeon are fished by both boat and shore anglers using shrimp, smelt or herring.

Striped bass (an introduced species) is fished in San Pablo and San Francisco Bays and the ocean area offshore these bays. Gear is generally caught by bait fishing or trolling, though sometimes fly fishing or casting plugs or jigs is used. Trolling or bait fishing gear is generally used although some fishers may cast jigs or plugs or flyfish. Dead baits include threadfin shad, anchovies, sardines, staghorn sculpins, gobies, shrimp, blood worms and pile worms. Drift fishing with live anchovies or shiner perch occurs in San Francisco Bay and the ocean, while live golden shiner minnows or threadfin shad are sometimes used in the delta. Trolling methods are specialized for striped bass and many types of plugs, jigs, spoons are used, frequently in combination.

There are no federal regulations for recreational take of coastal pelagic species (e.g. sardines, anchovy, herring, smelt, squid or mackerel); state regulations apply. Surf smelt are taken from beaches with dip and A-frame nets. Pacific herring, northern anchovy, sardine and smelt are caught in bays with multiple-hook herring jigs or nets. Bait includes sand and kelp worms, sand shrimp, clam necks and mussels. Dip nets are allowed to be used to harvest these forage fish in Washington for recreational purposes.

Recreational fisheries for highly migratory species (billfish, sharks, tunas, dorado) use hook and line gear fished from private or charter vessels.

For albacore tuna, anglers use live bait or metal-headed plastic or feather jigs trolled at five knots or faster. Handlines are often used instead of a rod and reel.

There are numerous surfperch species targeted by sport fishermen. Redtail and silver surfperch are found mostly in the surf. Striped seaperch, pile perch, white seaperch, shiner surfperch all live near rocks, docks or pilings in bays. Baits include sand and kelp worms, sand shrimp, clam necks and mussels. Surfperch are fished with rod and reel gear using gear that has multiple hooks.

In CA beach nets may be used to take surf smelt north of Point Conception.

Spears harpoons, bow and arrow fishing tackle may be used to take rays, skates, and sharks (except the white shark).

Clams, mussels, limpets, and other invertebrates are collected from tidal and nearshore waters by hand or using rakes, shovels or other implements allowed by law. In Washington, oysters taken in all areas must be shucked with the shells left on the beach where they were harvested. Herring rakes and smelt rakes are prohibited gear in Washington.

Crabs are allowed to be taken by rings (baited hoop nets) or with baited traps or with dipnets, tangle lines, or snares. The pots are lightweight.

There is a recreational pot fishery for coonstripe shrimp in California and for both coonstripe and spot shrimp in Puget Sound. (elsewhere?) The pots are lightweight.

Recreational fishermen in San Francisco Bay are allowed to use a hand powered shrimp trawl no greater than 18" by 24" at the mouth and a daily bag limit of five pounds.

Components of Recreational Gear That Contact or Effect the Seabed

The principal components of the hook and line gear that could produce benthic habitat effects are the weights, hooks and line. Potential impacts could be related to the line snagging on rocks, corals, kelps and other objects during retrieval. This may upend smaller rocks and break hard corals, while leaving soft corals unaffected. Invertebrates and other light weight objects can also be dislodged. If during escape runs large bottom fish, e.g. halibut, remain on or near the bottom, objects in their path can also be disturbed (Johnson, 2002).

Pots gear used by recreational fishermen contacts the seabed.

Rakes and shovels used for harvest of shellfish and shrimp pumps is intended to disturb the seabed to dislodge the shellfish.

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V. Diagrams of Fishing Gears

(The following images were assembled by Fran Recht, Pacific States Marine Fisheries Commission and Jennifer Gilden, Pacific Fishery Management Council). With the exception of the copyrighted diagrams, these images may be used if the source of the image is retained.

APPENDIX 2: GEAR TYPES IN THE PACFIN DATABASE

The following table provides a list of the gear types contained in PACFIN database

```
         Gear                                                  Date
Type GRID Group Short Name Description                          Entered
---- ---- ----- ---------- ------------------------------------ ---------
1    ODG  DRG   OTH-DREDGE OTHER DREDGE GEAR
1    SCD  DRG   SCL-DREDGE SCALLOP DREDGE

1    DRL  HKL   DROP LINE  DROP LINE
1    HDL  HKL   HAND LINE  HAND LINE
1    HLR  HKL   POLE(REC)  HOOK AND LINE (RECREATIONAL)
1    JIG  HKL   JIG        JIG
1    LGL  HKL   LONGLINE   LONGLINE OR SETLINE
1    OHL  HKL   OTH HK&LN  OTHER HOOK AND LINE GEAR
1    POL  HKL   POLE(COM)  POLE (COMMERCIAL)
1    STL  HKL   SETLINE    SETLINE
1    VHL  HKL   VRTCL HKL  VERTICAL HOOK AND LINE GEAR          10-DEC-98

1    DVG  MSC   DIVING GR  DIVING GEAR                          22-DEC-98
1    OTH  MSC   OTH-KNOWN  OTHER KNOWN GEAR
1    RVT  MSC   RVR-TRAWL  RIVER TRAWL
1    USP  MSC   UNKN-GEAR  UNKNOWN OR UNSPECIFIED GEAR

1    DGN  NET   DRF GL NET DRIFT GILL NET                       22-DEC-98
1    DPN  NET   DIP NET    DIP NET
1    GLN  NET   GILL NET   GILL NET
1    ONT  NET   OTHER NETS OTHER NET GEAR
1    SEN  NET   SEINE      SEINE
1    SGN  NET   SUNKN GLNT SUNKEN GILLNET
1    STN  NET   SET NET    SET NET
1    TML  NET   TRAMMEL    TRAMMEL

1    CLP  POT   C&L POT    CRAB AND LOBSTER  POT
1    CPT  POT   CRAB POT   CRAB POT
1    FPT  POT   FISH POT   FISH POT
1    LPT  POT   LBSTR POT  LOBSTER POT
1    OPT  POT   OTHER POTS OTHER POT GEAR
1    PRW  POT   PRWN TRAP  PRAWN TRAP
1    SPT  POT   SNAIL POT  SNAIL POT

1    BTR  TLS   BTM-TROLL  BOTTOMFISH TROLL
1    HTR  TLS   HAND TROLL HAND TROLL
1    PTR  TLS   P-G-TROLL  POWER GURDY TROLL
1    TRL  TLS   TROLL      TROLL

1    BMT  TWL   BEAM TRAWL BEAM TRAWL
1    BTT  TWL   BTM-TRAWL  BOTTOM TRAWL
1    CBF  TWL   CTCHER-FR  BOTTOM TRAWL, CATCHER BOAT, FOREIGN
1    CBJ  TWL   CTCHER-JV  BOTTOM TRAWL, CATCHER BOAT, JV
1    DNT  TWL   DNSH SEINE DANISH/SCOTTISH SEINE (TRAWL)        07-JUN-00
1    FFT  TWL   FLT-TRAWL  FLATFISH TRAWL
1    GFL  TWL   GFTRAWL>8  GROUNDFISH TRAWL, FOOTROPE > 8 in.   07-JUN-00
```

```
1    GFS  TWL   GFTRAWL<8  GROUNDFISH TRAWL, FOOTROPE < 8 in.   07-JUN-00
1    GFT  TWL   GFSH-TRAWL GROUNDFISH TRAWL (OTTER)
1    LFZ  TWL   LARGE-FRZ  BOTTOM TRAWL, LARGE FREEZER TRAWLER
1    MDT  TWL   MID-TRAWL  MIDWATER TRAWL
1    MPT  TWL   CP-MTRAWL  MIDWATER TRAWL - CATCHER/PROCESSOR
1    OTW  TWL   OTH TRAWLS OTHER TRAWL GEAR
1    PRT  TWL   PAIR TRAWL PAIR TRAWL
1    RLT  TWL   RLR-TRAWL  ROLLER TRAWL
1    SFZ  TWL   SMALL-FRZ  BOTTOM TRAWL, SMALL FREEZER TRAWLER
1    SRM  TWL   SURIMI     BOTTOM TRAWL, SURIMI TRAWLER

1    DST  TWS   DBL-SHRIMP SHRIMP TRAWL, DOUBLE RIGGED
1    PWT  TWS   PRWN-TRAWL PRAWN TRAWL
1    SHT  TWS   SHMP-TRAWL SHRIMP TRAWL, SINGLE OR DOUBLE RIG
1    SST  TWS   SGL-SHRIMP SHRIMP TRAWL, SINGLE RIGGED


2    DRG  ALL   DREDGES    ALL DREDGE GEAR
2    HKL  ALL   HOOK&LINE  ALL HOOK AND LINE GEAR EXCEPT TROLL
2    MSC  ALL   OTH GEARS  ALL OTHER MISCELLANEOUS GEAR
2    NET  ALL   NETS       ALL NET GEAR EXCEPT TRAWL
2    POT  ALL   POT&TRAP   ALL POT AND TRAP GEAR
2    TLS  ALL   TROLLS     ALL TROLL GEAR
2    TWL  ALL   TRAWLS     ALL TRAWLS EXCEPT SHRIMP TRAWLS
2    TWS  ALL   SH-TRAWLS  ALL SHRIMP TRAWLS
```

APPENDIX 3

Pacific Coast Groundfish EFH

The Effects of Fishing Gears on Habitat: West Coast Perspective

DRAFT 5

Prepared for

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9 February 2004

Table of Contents

1 INTRODUCTION

The U.S. District Court for the District of Columbia has found that the EAs prepared by NOAA Fisheries' for the Councils' amendments on the subject of EFH were inadequate and in violation of NEPA. The suit that gave rise to this finding specifically contested the adequacy of the evaluations of fishing gear impacts on EFH in the fishery management plan amendments, and the analyses of environmental impacts in the EAs. In response, NOAA Fisheries has initiated a project to complete new NEPA analyses for Amendment 11 to the Pacific Coast Groundfish FMP.

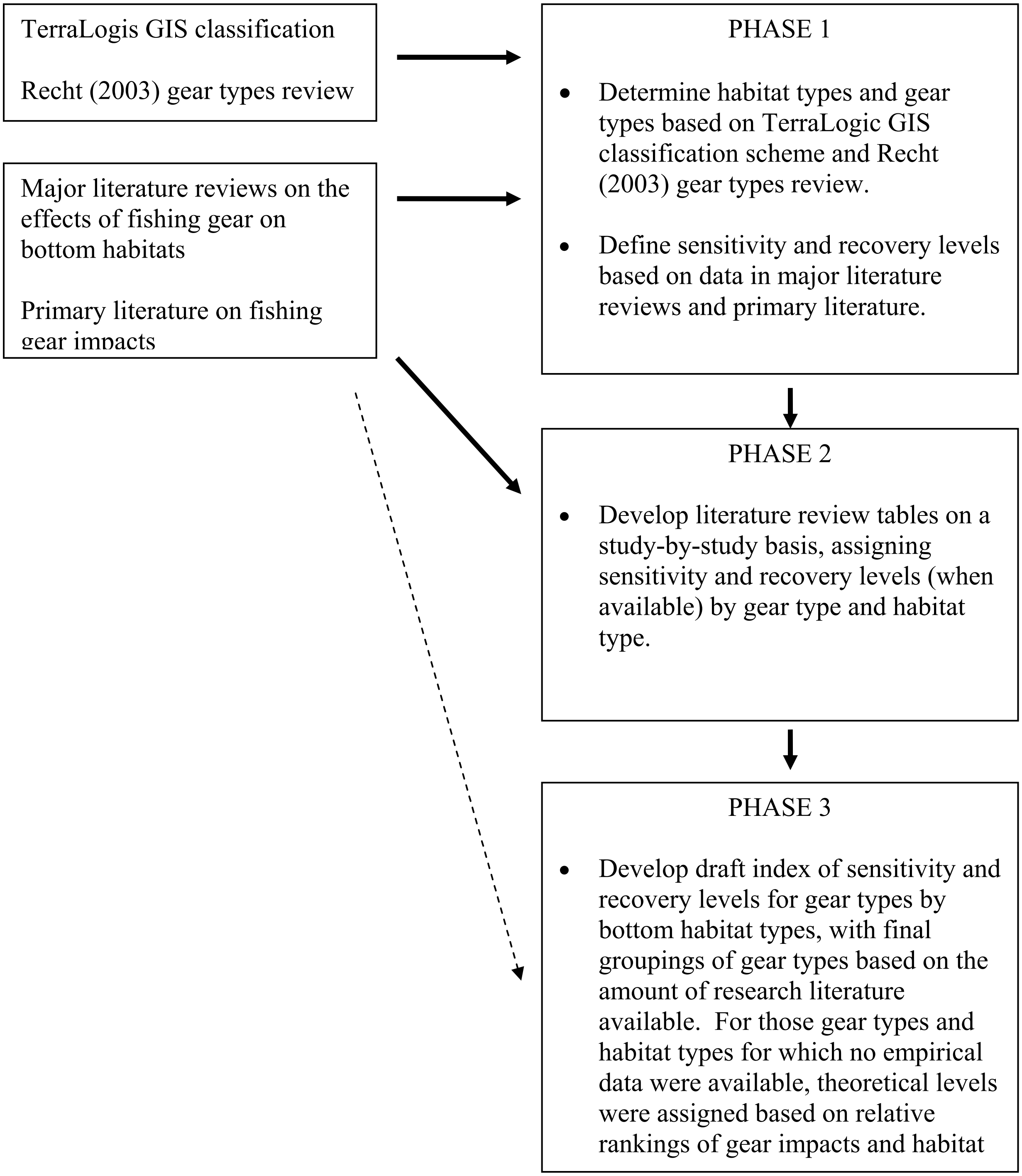
Pre-planning for this NEPA process requires an understanding of the status of groundfish habitat and associated risks and a conceptual framework for predicting the costs and benefits of conservation strategies. The pre-planning effort is being overseen by the Pacific Fishery Management Council's (Council) *ad hoc* Groundfish Habitat Technical Review Committee (Committee). On February 19-20, 2003, the Committee reviewed the proposed risk assessment framework and recommended that Pacific States Marine Fisheries Commission contract for development of an index of fishing gear impacts by gear type that will serve as an input into the model. The Committee suggested that, while several literature review and indices exist that may be utilized for this project, there is no clear direction on how that information should be applied to the west coast. As justification for the recommendation, the committee cited the general lack of west coast specific studies and the need to determine specifically how to make inferences from studies that occurred in other parts of the world.

This document describes the process followed in the development of a draft index of adverse effects for fishing gears that are utilized on the west coast of the US. The draft index consists of two matrices (spreadsheets), one describing the sensitivity levels of bottom habitats to gear impacts and another describing recovery times from gear impacts. The values in the matrices will be used as input variables for a Bayesian risk assessment model being developed to form the basis for developing fishing impacts alternatives for the overall EIS. The form of each matrix is based on gear types used on the west coast, bottom habitat type designations used in the GIS mapping of habitat (See Analytical Framework Document), and the available literature on gear impacts. Development of the final two matrices required several preliminary steps. The overall process is described in the following sections.

2 METHODS

The overall analysis consisted of three phases, each building upon the preceding phase, with the final Phase 3 being development of the draft index of gear impacts. Three major sources of information were drawn from in the process: TerraLogic's GIS-based classification scheme of habitat types; Recht's (2003) review of gear types used on the west coast; and recent major reviews (particularly Johnson 2002) of the impacts of fishing gear on bottom habitats. The overall "information flow" is shown schematically below (Fig. 1).

Information Flow for Development of Impact Matrices for Pacific Gear Effects



TerraLogis GIS classification

Recht (2003) gear types review

Major literature reviews on the effects of fishing gear on bottom habitats

Primary literature on fishing gear impacts

PHASE 1

- Determine habitat types and gear types based on TerraLogic GIS classification scheme and Recht (2003) gear types review.
- Define sensitivity and recovery levels based on data in major literature reviews and primary literature.

PHASE 2

- Develop literature review tables on a study-by-study basis, assigning sensitivity and recovery levels (when available) by gear type and habitat type.

PHASE 3

- Develop draft index of sensitivity and recovery levels for gear types by bottom habitat types, with final groupings of gear types based on the amount of research literature available. For those gear types and habitat types for which no empirical data were available, theoretical levels were assigned based on relative rankings of gear impacts and habitat

Fig. 1. Information flow diagram showing how information from other components of the overall project were used in relation to the literature that provided the "raw data" for the present analysis (see text for details).

Phase 1: Descriptors for gear types, habitat types, and impact levels

The first phase of the analysis was designed to set the limits on the universe of west coast gear types and habitat types examined. The approach to quantifying the relative levels of sensitivity of the habitats to contact from the various gear types, and the scaling of the time taken for the habitats to recover from different types of impacts, was also determined during Phase 1.

2.1.1 Gear types

Recht (2003) describes gear types used on the west coast of the US. This paper provided the primary basis for the gear classification scheme used in this analysis. Seven major categories – trawls, nets, dredges, traps and pots, hook and line, trolling, and miscellaneous – were expanded into a total of approximately thirty (30) types of gear:

Trawls (TWL)
- Otter Trawl
- Shrimp Trawl
- Beam Trawl
- Midwater Trawl

Nets (NET)
- Demersal Seine
- Round Hall Seine
- Gillnet
- Trammel Net
- Dip Net
- Salmon Reef Net

Dredges (DRG)
- New Bedford Dredge
- Hydraulic Clam Dredge
- Oyster Dredge

Traps & Pots (POT)
- Pots

Hook & Line (HKL)
- Hook & Line
- Bottom Longline
- Pelagic Longline
- Handline, Jig
- Stick (Pipe)
- Rod & Reel
- Vertical Hook & Line
- Mooching

Trolling (TLS)
- Trolling

Miscellaneous (MSC)
- Diving, Hand/ Mech.
- Herring Spawn Kelp
- Herring Brush Weir
- Ghost Shrimp Pump
- Poke Pole
- Bait Pen
- Live Fish, Shellfish

2.1.2 Habitat types

The Analytical Framework document (MRAG 2003) describes the classification of benthic habitat based on physical features in several levels of a hierarchical system. The levels, in order, are: megahabitat, seafloor induration, meso/macrohabitat, and modifier(s). For the west coast, the following types have been delineated:

Level 1: Megahabitat:

- Continental Rise/Apron;
- Basin Floor;
- Continental Slope;
- Ridge;
- Continental Shelf.

Level 2: Seafloor Induration:

- Hard substrate;
- Soft substrate.

Level 3: Meso/macrohabitat:

- Canyon wall;
- Canyon floor;
- Exposure, bedrock;
- Gully;
- Gully floor;
- Ice-formed feature;
- Landslide.

Level 4: Modifier:

- Bimodal pavement;
- Outwash;
- Unconsolidated sediment.

Each unique combination of these four characteristics defines a unique benthic habitat type. For the west coast EFH project, 35 unique benthic habitat types have been delineated (see Analytical Framework document for details). A total of forty-three (43) megahabitat/substrate/macrohabitat types are described in the present analysis. It should be noted that the extra habitat types are a result of adding the "Estuarine" megahabitat (with three substrate types) and the "Biogenic" substrate type to all other megahabitat types. These forty-three and, if available, their assigned Pencil Codes were used in the present analysis.

2.1.3 Sensitivity and Recovery scales

The final step in Phase 1 was the development of scales for habitat sensitivity levels to gear impacts and recovery times for habitat impacted by fishing gears. The sensitivity scale consists of four levels (0, 1, 2, and 3) representing relative sensitivity to gear impacts. The descriptors for the sensitivities at each level are based on the actual impacts reported in the references listed in the tables in Appendix 1. The recovery scale is in units of time (years) with the values taken directly from each report cited.

2.2 Phase 2: Literature summaries

The second phase of the analysis was the construction of summaries of the literature on gear impacts on a study-by-study basis. These summaries were tabulated in spreadsheet format and grouped by habitat and gear types. This arrangement allows appropriate mean values (and variability around the means) to be calculated for direct entry into the final two spreadsheets (Phase 3). For example, referring to Table A1.1 (page 29), the mean value "0.8" is the mean of the five sensitivity levels for the impact of otter trawls on Soft Sediment substrates in Estuarine megahabitats. There are five references listed in the rows above that row, and the actual sensitivity levels (as described in Table 2 on pages 9 and 10) reported in those references ranged from 0 to 1. Mean values with standard errors were calculated in this way for various combinations of gear and habitat categories so that they could be directly entered into the final impact matrices (Tables 3 - 7). At present, variability around each mean is presented as standard error of the mean.

Johnson (2002) provides a major review of the national and international literature on fishing impacts on bottom habitats and was relied upon heavily for constructing these tables. Other reviews that provided additional literature and/or interpretations of the literature were Watling and Norse (1998), Auster and Langton (1999), Dayton et al. (2002), National Research Council (2002), and Morgan and Chuenpagdee (2003).

Several points should be noted regarding the literature summary tables:

- References were used only if they provided quantitative information on sensitivity and/or recovery of habitat. Hence, the reviews cited above contain references that are not listed in the results tables. In some cases, however, these references may have contributed to the theoretical analysis used to derive sensitivity and recovery values for gear/habitat combinations for which no empirical data were available (see below).

More than thirty fishing gear types are used on the west coast (Recht 2003). There have been no studies on the impacts of most of these on bottom habitats. Hence, most gear types are not listed in the summary tables. Those for which useful studies were found included eight gear types: otter trawls, beam trawls, shrimp trawls, New Bedford/scallop dredges, hydraulic dredges, oyster dredges, pots, and hand/mechanical harvesting. Nearly all (69 of 73) of the studies listed, however, have been done on two major gear categories "trawls" and "dredges" (see references listed in Tables A1.1 - A1.5 in Appendix 1).

- Only two studies directly on west coast gears were found to be useful. Hence, research from areas other than the Pacific coast provided most of the information on which this analysis is based.

2.3 Phase 3: Draft indices of sensitivity and recovery for the effects of fishing gear on bottom habitats

The existing literature dealing with fishing gear impacts on the seabed is substantial, consisting of well over 100 studies globally (Johnson 2002). Much of this research, however, does not provide data useful for quantitative modeling. Moreover, the vast majority of the research has been done only on trawls and dredges, and there has been very little work done in water exceeding 200 meters in depth. Therefore, development of a comprehensive (in terms of gear and habitat types) index required using a combination of empirical data with theoretical information. It also required making decisions with respect to how many gear and habitat types should be included.

Indices of sensitivity and recovery for the effects of fishing gear on bottom habitats were prepared by converting the mean values in the literature summary tables into a form useful for modeling. For example, referring to Table 5 on page 24, the value "0.83" for the sensitivity of "Estuarine, Soft Sediment" habitats to "Bottom Trawls" is the mean of the first six studies listed in Table A1.1 (see pages 28 and 29) in Appendix 1; these six included five studies on otter trawls and one on beam trawls, both being combined into the category "Bottom Trawls" in Table 6. All the mean values in Tables 6 and 7 were derived in this fashion by combining the appropriate categories in the tables in Appendix 1.

3 RESULTS

3.1 Phase 1: Descriptors for gear types, habitat types, and impact levels

Table 1. Habitat descriptors based on water depth, substrate, megahabitat, and macrohabitat. Megahabitat/substrate/macrohabitat taxonomy and Pencil Codes (as provided by TerraLogic GIS). Tables 1a, b and c are provided to show how the final habitat categories in Table 1d are related to environmental features (e.g. water depth) commonly used as habitat descriptors. NOTE: Only the Megahabitat/Substrate/Macrohabitat designations shown in Table 1d are used further in the report (and therefore listed in Tables 4 - 7, and A1.1) because these are the "habitat types" used in the GIS analysis.

Table 1a. Habitat descriptors

WATER DEPTH	**SUBSTRATE**	**MEGAHABITAT**
0 to 10+ m	Rocky	Estuarine
10 to 200 m	Boulder	Shelf
200 to 4000 m	Cobble	Slope
	Gravel	Basin
	Halimeda	Ridge
	Pebble	
	Sedimentary	
	Mud	
	Sand	
	Mixed (Rocky+Sedimentary)	
	Biogenic	
	Algae	
	Seagrass	
	Invertebrates	

Table 1b. Habitat descriptors based on water depth and substrate

0 to 10+ m water depth (Estuarine)			
Rocky Estuarine	**Sedimentary Estuarine**	**Mixed (Rocky+ Sedimentary)**	**Biogenic Estuarine**
Boulder	Mud		Algae
Cobble	Sand		Seagrass
Gravel			Invertebrates
Halimeda			
Pebble			

10 to 200 m water depth (Shelf)			
Rocky Shelf	**Sedimentary Shelf**	**Mixed (Rocky+ Sedimentary)**	**Biogenic Shelf**
Boulder	Mud		Algae
Cobble	Sand		Seagrass
Gravel			Invertebrates
Halimeda			
Pebble			
200 to 4000 m (Slope/Basin/Ridge)			
Rocky Slope/ Basin/ Ridge	**Sedimentary Slope/ Basin/ Ridge**	**Mixed (Rocky+ Sedimentary)**	**Biogenic Slope/ Basin/ Ridge**
Boulder	Mud		Algae
Cobble	Sand		Seagrass
Gravel			Invertebrates
Halimeda			
Pebble			

Table 1c. Habitat descriptors based on megahabitat and substrate

Estuarine (0 to 10+ m water depth)			
Rocky Estuarine	**Sedimentary Estuarine**	**Mixed (Rocky+ Sedimentary)**	**Biogenic Estuarine**
Boulder	Mud		Algae
Cobble	Sand		Seagrass
Gravel			Invertebrates
Halimeda			
Pebble			
Shelf (10 to 200 m water depth)			
Rocky Shelf	**Sedimentary Shelf**	**Mixed (Rocky+ Sedimentary)**	**Biogenic Shelf**
Boulder	Mud		Algae
Cobble	Sand		Seagrass
Gravel			Invertebrates
Halimeda			
Pebble			
Slope (200 to 3000 m)			
Rocky Slope	**Sedimentary Slope**	**Mixed (Rocky+ Sedimentary)**	**Biogenic Slope**
Boulder	Mud		Invertebrates
Cobble	Sand		
Gravel			
Halimeda			

Pebble			
Basin (1000 to 2500 m)			
Rocky Basin	**Sedimentary Basin**	**Mixed (Rocky+ Sedimentary)**	**Biogenic Basin**
Boulder	Mud		Invertebrates
Cobble	Sand		
Gravel			
Halimeda			
Pebble			
Ridge (200 to 2500 m)			
Rocky Ridge	**Sedimentary Ridge**	**Mixed (Rocky+ Sedimentary)**	**Biogenic Ridge**
Boulder	Mud		Invertebrates
Cobble	Sand		
Gravel			
Halimeda			
Pebble			

Table 1d. Habitat descriptors based on megahabitat, substrate, and macrohabitat

MEGAH X SUBSTRATE X MACROH		**Habitat Code**
Estuarine (0 to 10+ m water depth)		
	Estuarine, Hard	
	Estuarine, Soft Sediment	
	Estuarine, Biogenic	
Shelf (10 to 200 m water depth)		
	Shelf, Hard, Exposure	She
	Shelf, Soft Sediment	Ss_u
	Shelf, Hard, Canyon Wall	Shc
	Shelf, Soft Sediment, Canyon Wall	Ssc_u
	Shelf, Hard, Canyon Floor	
	Shelf, Soft, Canyon Floor	Ssc/f_u
	Shelf, Hard, Gully	
	Shelf, Soft, Gully	Ssg
	Shelf, Hard, Glacial Pavement	Shi_b/p
	Shelf, Soft, Glacial Outwash	Ssi_o
	Shelf, Biogenic	
Slope (200 to 3000 m)		
	Slope, Hard, Exposure	Fhe
	Slope, Soft Sediment	Fs_u
	Slope, Hard, Canyon Wall	Fhc

MEGAH X SUBSTRATE X MACROH		Habitat Code
	Slope, Soft Sediment, Canyon Wall	Fsc_u
	Slope, Hard, Canyon Floor	Fhc/f
	Slope, Soft, Canyon Floor	Fsc/f_u
	Slope, Hard, Gully	Fhg
	Slope, Soft, Gully	Fsg
	Slope, Hard, Landslide	Fhl
	Slope, Soft, Landslide	Fsl
	Slope, Hard, Glacial Pavement	
	Slope, Soft, Glacial Outwash	
	Slope, Biogenic	
Basin (200 to 4000 m)		
	Basin, Hard, Exposure	Bhe
	Basin, Soft Sediment	Bs_u
	Basin, Hard, Canyon Wall	
	Basin, Soft Sediment, Canyon Wall	Bsc_u
	Basin, Hard, Canyon Floor	
	Basin, Soft, Canyon Floor	Bsc/f_u
	Basin, Hard, Gully	
	Basin, Soft, Gully	Bsg
	Basin, Hard, Landslide	
	Basin, Soft, Landslide	
	Basin, Hard, Glacial Pavement	
	Basin, Soft, Glacial Outwash	
	Shelf, Biogenic	
Ridge (200 to 2500 m)		
	Ridge, Hard, Exposure	Rhe
	Ridge, Soft Sediment	Rs_u
	Ridge, Biogenic	
Cont. Rise (3000 to 5000 m)		
	Rise, Hard, Exposure	Ahe
	Rise, Soft Sediment	As_u
	Rise, Hard, Canyon Wall	Ahc
	Rise, Soft Sediment, Canyon Wall	Asc_u
	Rise, Hard, Canyon Floor	
	Rise, Soft Sediment, Canyon Floor	Asc/f
	Rise, Hard, Gully	
	Rise, Soft, Gully	Asg

Table 2. Descriptions of sensitivity and recovery levels for gear impacts assessmets.

Sensitivity Level	Sensitivity Description
0	No detectable adverse impacts on seabed; i.e. no significant differences between impact and control areas in any metrics.
1	Minor impacts such as shallow furrows on bottom; small differences between impact and control sites, <25% in most measured metrics.
2	Substantial changes such as deep furrows on bottom; differences between impact and control sites 25 to 50% in most metrics measured.
3	Major changes in bottom structure such as re-arranged boulders; large losses of many organisms with differences between impact and control sites >50% in most measured metrics.
Recovery Level	**Recovery Description**
0	No recovery time required because no detectable adverse impacts on seabed.
1	Recovery time up to 6 months.
2	Recovery time greater than 6 months but less than 3 years.
3	Recovery time 3 years or longer.

As indicated above, the sensitivity and recovery levels 0 to 3 were intended to provide a relative scale for defining the actual sensitivity and recovery descriptions which were based on literature values. The range of sensitivity impacts found in the existing literature (see references listed in the table in Appendix 1) is from no detectable impacts (level 0) to major changes in various seabed characteristics (level 3). This range of levels corresponds to a range of actual measured changes ranging from "no significant differences" in any metrics measured to 100% (or nearly so) losses of some organisms. Sensitivity range intervals as indicated in Table 2 (no significant differences, <25% difference, etc) were chosen and assigned to the four sensitivity levels. The values for recovery levels were derived in similar fashion. In other words, the ranges of intervals chosen were somewhat arbitrary but the actual % differences used in the subsequent analyses were based directly on the values reported in each reference reviewed (Appendix 1). This procedure was developed because there was a wide range of metrics measured and reported in the literature, and it was necessary to assess each study on a quantitative scale that could be applied to all studies.

3.2 Phase 2: Literature summaries

Six tables summarizing the available literature are provided in Appendix 1. Table A1.1 is a summary of references on impacts of all gear types on estuarine habitats. Table A1.2 is a summary of references on impacts of trawls on shelf habitats. Table A1.3 is a summary of references on impacts of dredges on shelf habitats. Table A1.4 is a summary of references on impacts of multiple mobile gears on shelf habitats. Table A1.5 is a summary of references on impacts of pots and traps on shelf habitats. Table A1.6 is a summary of references on impacts of trawls on slope habitats.

These tables represent the "raw data" of subsequent analyses. As an illustration of how the values in the tables were derived, consider the study by Brylinsky et al. (1994) on the effects of otter trawls on estuarine soft sediment bottoms (Table A1.1, p. 32). A sensitivity level of "1" was assigned based on the reported impacts of relatively shallow trawl marks (5 cm deep) and decreases in some invertebrate populations but no differences in others. A recovery time of "0.6 yr" was assigned because the recovery times reported ranged from 2 to 7 months for the trawl marks to 4 to 6 weeks for some invertebrate taxa. The derivation of the actual sensitivity and recovery time levels assigned for each study can be checked by examining the information provided in the corresponding "Sensitivity Comments" and "Recovery Comments" cells.

3.3 Phase 3: Draft index of effects of fishing gear on bottom habitats

Table 3 and Table 4 contain only empirical data taken from the literature summaries (Appendix 1). They are arranged with rows representing the megahabitat/substrate/macrohabitat types that will be used in the GIS analysis, and columns representing fourteen of the most commonly used gear types on the west coast and/or for which gear impact references were available. These two tables reveal the dearth of empirical data available using even an abbreviated listing of gear types. Furthermore, inspection of the values in these tables reveals that in many cases there were only 1 or 2 ("n" values) studies available. Hence, there was a need to further combine categories to give sufficient sample sizes for use in the Bayesian modeling (see Table 5 below).

As an illustration of how the values in Tables 3 and 4 were derived, consider the mean of 0.5 (and associated statistics) for the effect of otter trawls on Estuarine, Soft Sediment habitat (Table 3, p. 14). It was taken directly from Table A1.1 (p. 35) where the sensitivity values from six separate studies were tabulated, and the statistics shown. All of the sensitivity and recovery values in Tables 3 and 4 were taken directly from the statistics shown in bold in Appendix 1, Tables A1.1-6.

Table 3. Sensitivity levels for all gear types by megabhabitat/substrate/macrohabitat (from Greene et al. 1999). Sensitivity levels range from 0 to 3.0 (see Table 2 for descriptions). SE = standard error of the mean. n = number of references (sample size) used to calculate mean. See Appendix 1 for data summaries and references. NOTE: blank cells indicate that no literature exists for those gear-by-habitat combinations.

		Trawl (TWL)			**Net (NET)**				**Dredges (DRG)**			**Pots (POT)**	**Hook & Line (HKL)**		**Other (MSC)**
MEGAH X SUBSTRATE X MACROH	**Hab. Code**	**Otter Trawl**	**Beam Trawl**	**Shrimp Trawl**	**Demersal Seine**	**Round Hall Seine**	**Gillnet**	**Salmon Reef Net**	**New Bed-ford**	**Hydr-aulic Dredge**	**Oyster Dredge**	**Crab, Shrimp Pots**	**Bottom Longline**	**Trolling**	**Hand/ Mech.**
Estuarine (0-10+ m water depth)															
Estuarine, Hard															
Estuarine, Soft Sediment		0.5 (SE=0.19 n=6)	1.8 (n=1)						1.3 (SE=0.0, n=2)	0.7 (SE=0.34 n=4)					
Estuarine, Biogenic		0.0 (n=1)							2.8 (n=1)	2.9 (SE=0.1, n=2)	1.4 (SE=1.0, n=2)				3.0 (n=1)
Shelf (10 to 200 m water depth)															
Shelf, Hard, Exposed	She	3.0 (n=1)	2.0 (n=1)						1.7 (SE=0.30, n=7)			0.3 (SE=0.30, n=2)			
Shelf, Soft Sediment	Ss_u	1.1 (SE=0.12, n=16)	1.3 (SE=0.19, n=12)	1.0 (n=1)					1.2 (SE=0.10, n=22)	0.8 (SE=0.16, n=6)					
Shelf, Hard, Canyon Wall	Shc														
Shelf, Soft Sediment, Canyon Wall	Ssc_u														
Shelf, Hard, Canyon Floor															
Shelf, Soft, Canyon Floor	Ssc/f_u														

		Trawl (TWL)			Net (NET)				Dredges (DRG)			Pots (POT)	Hook & Line (HKL)		Other (MSC)
MEGAH X SUBSTRATE X MACROH	**Hab. Code**	**Otter Trawl**	**Beam Trawl**	**Shrimp Trawl**	**Demersal Seine**	**Round Hall Seine**	**Gillnet**	**Salmon Reef Net**	**New Bedford**	**Hydraulic Dredge**	**Oyster Dredge**	**Crab, Shrimp Pots**	**Bottom Longline**	**Trolling**	**Hand/ Mech.**
Shelf, Hard, Gully															
Shelf, Soft, Gully	Ssg														
Shelf, Hard, Glacial Pavement	Shi_b/p														
Shelf, Soft, Glacial Outwash	Ssi_o														
Shelf, Biogenic		1.8 (SE=0.39, n=3)							1.9 (SE=1.00, n=2)			0.8 (n=1)			
Slope (200 to 3000 m)															
Slope, Hard, Exposed	Fhe	3.0 (n=1)													
Slope, Soft Sediment	Fs_u	1.0 (n=1)													
Slope, Hard, Canyon Wall	Fhc														
Slope, Soft Sediment, Canyon Wall	Fsc_u														
Slope, Hard, Canyon Floor	Fhc/f														
Slope, Soft, Canyon Floor	Fsc/f_u														
Slope, Hard, Gully	Fhg														
Slope, Soft,	Fsg														

		Trawl (TWL)			Net (NET)				Dredges (DRG)			Pots (POT)	Hook & Line (HKL)		Other (MSC)
MEGAH X SUBSTRATE X MACROH	**Hab. Code**	**Otter Trawl**	**Beam Trawl**	**Shrimp Trawl**	**Demersal Seine**	**Round Hall Seine**	**Gillnet**	**Salmon Reef Net**	**New Bed-ford**	**Hydr-aulic Dredge**	**Oyster Dredge**	**Crab, Shrimp Pots**	**Bottom Longline**	**Trolling**	**Hand/ Mech.**
Gully															
Slope, Hard, Landslide	Fhl														
Slope, Soft, Landslide	Fsl														
Slope, Hard, Glacial Pavement															
Slope, Soft, Glacial Outwash															
Slope, Biogenic		3.0 (n=1)													
Basin (200 to 4000 m)															
Basin, Hard, Exposed	Bhe														
Basin, Soft Sediment	Bs_u														
Basin, Hard, Canyon Wall															
Basin, Soft Sediment, Canyon Wall	Bsc_u														
Basin, Hard, Canyon Floor															
Basin, Soft, Canyon Floor	Bsc/f_u														
Basin, Hard, Gully	Bhg														

		Trawl (TWL)			Net (NET)				Dredges (DRG)			Pots (POT)	Hook & Line (HKL)		Other (MSC)
MEGAH X SUBSTRATE X MACROH	**Hab. Code**	**Otter Trawl**	**Beam Trawl**	**Shrimp Trawl**	**Demersal Seine**	**Round Hall Seine**	**Gillnet**	**Salmon Reef Net**	**New Bedford**	**Hydraulic Dredge**	**Oyster Dredge**	**Crab, Shrimp Pots**	**Bottom Longline**	**Trolling**	**Hand/ Mech.**
Basin, Soft, Gully	Bsg														
Basin, Hard, Landslide															
Basin, Soft, Landslide															
Basin, Hard, Glacial Pavement															
Basin, Soft, Glacial Outwash															
Basin, Biogenic															
Ridge (200 to 2500 m)															
Ridge, Hard, Exposed	Rhe														
Ridge, Soft Sediment	Rs_u														
Ridge, Biogenic															

Table 4. Recovery levels for all gear types by megabhabitat/substrate/macrohabitat (from Greene et al. 1999). Recovery levels range from 0 to 3 (see Table 2 for descriptions). SE = standard error of the mean. n = number of references (sample size) used to calculate mean. See Appendix 1 for data summaries and references. NOTE: blank cells indicate that no literature exists for those gear-by-habitat combinations.

Recovery Level - Gear Type x Terralogic GIS Habitat Descriptions																
		Trawl (TWL)			**Net (NET)**				**Dredges (DRG)**			**Pots (POT)**	**Hook & Line (HKL)**		**Other (MSC)**
MEGAH X SUBSTRATE X MACROH	**Hab. Code**	**Otter Trawl**	**Beam Trawl**	**Shrimp Trawl**	**Demersal Seine**	**Round Hall Seine**	**Gillnet**	**Salmon Reef Net**	**New Bedford**	**Hydraulic Dredge**	**Oyster Dredge**	**Crab, Shrimp Pots**	**Bottom Longline**	**Trolling**	**Hand/ Mech.**
Estuarine (0-10+ m water depth)															
Estuarine, Hard															
Estuarine, Soft Sediment		0.5 (SE=0.20 n=6)							1.0 (n=1)	0.7 (SE=0.29, n=4)					
Estuarine, Biogenic		0.0 (n=1)								2.5 (SE=0.5, n=2)	0.0 (n=1)				
Shelf (10 to 200 m water depth)															
Shelf, Hard, Exposed	She											0.0 (SE=0.0, n=2)			
Shelf, Soft Sediment	Ss_u	0.8 (SE=0.28, n=6)	1.0 (SE=0.0, n=2)						1.6 (SE=0.21, n=7)	0.7 (SE=0.24, n=4)					
Shelf, Hard, Canyon Wall	Shc														
Shelf, Soft Sediment, Canyon Wall	Ssc_u														
Shelf, Hard,															

Recovery Level - Gear Type x Terralogic GIS Habitat Descriptions															
		Trawl (TWL)			Net (NET)				Dredges (DRG)			Pots (POT)	Hook & Line (HKL)		Other (MSC)
MEGAH X SUBSTRATE X MACROH	Hab. Code	Otter Trawl	Beam Trawl	Shrimp Trawl	Demersal Seine	Round Hall Seine	Gillnet	Salmon Reef Net	New Bed-ford	Hydr-aulic Dredge	Oyster Dredge	Crab, Shrimp Pots	Bottom Longline	Trolling	Hand/ Mech.
Canyon Floor															
Shelf, Soft, Canyon Floor	Ssc/f_u														
Shelf, Hard, Gully	Shg														
Shelf, Soft, Gully	Ssg														
Shelf, Hard, Glacial Pavement	Shi_b/p														
Shelf, Soft, Glacial Outwash	Ssi_o														
Shelf, Biogenic		2.0 (SE=0.0, n=2)							2.4 (SE=0.40, n=2)			0.8 (n=1)			
Slope (200 to 3000 m)															
Slope, Hard, Exposed	Fhe														
Slope, Soft Sediment	Fs_u														
Slope, Hard, Canyon Wall	Fhc														
Slope, Soft Sediment, Canyon Wall	Fsc_u														
Slope, Hard, Canyon Floor	Fhc/f														
Slope, Soft,	Fsc/f_u														

Recovery Level - Gear Type x Terralogic GIS Habitat Descriptions															
		Trawl (TWL)			Net (NET)				Dredges (DRG)			Pots (POT)	Hook & Line (HKL)		Other (MSC)
MEGAH X SUBSTRATE X MACROH	**Hab. Code**	**Otter Trawl**	**Beam Trawl**	**Shrimp Trawl**	**Demersal Seine**	**Round Hall Seine**	**Gillnet**	**Salmon Reef Net**	**New Bed-ford**	**Hydr-aulic Dredge**	**Oyster Dredge**	**Crab, Shrimp Pots**	**Bottom Longline**	**Trolling**	**Hand/ Mech.**
Canyon Floor															
Slope, Hard, Gully	Fhg														
Slope, Soft, Gully	Fsg														
Slope, Hard, Landslide	Fhl														
Slope, Soft, Landslide	Fsl														
Slope, Hard, Glacial Pavement															
Slope, Soft, Glacial Outwash															
Slope, Biogenic		3.0 (n=1)													
Basin (200 to 4000 m)															
Basin, Hard, Exposed	Bhe														
Basin, Soft Sediment	Bs_u														
Basin, Hard, Canyon Wall															
Basin, Soft Sediment, Canyon Wall	Bsc_u														
Basin, Hard,															

Recovery Level - Gear Type x Terralogic GIS Habitat Descriptions

		Trawl (TWL)			Net (NET)				Dredges (DRG)			Pots (POT)	Hook & Line (HKL)		Other (MSC)
MEGAH X SUBSTRATE X MACROH	**Hab. Code**	**Otter Trawl**	**Beam Trawl**	**Shrimp Trawl**	**Demersal Seine**	**Round Hall Seine**	**Gillnet**	**Salmon Reef Net**	**New Bedford**	**Hydraulic Dredge**	**Oyster Dredge**	**Crab, Shrimp Pots**	**Bottom Longline**	**Trolling**	**Hand/ Mech.**
Canyon Floor															
Basin, Soft, Canyon Floor	Bsc/f_u														
Basin, Hard, Gully															
Basin, Soft, Gully	Bsg														
Basin, Hard, Landslide															
Basin, Soft, Landslide															
Basin, Hard, Glacial Pavement															
Basin, Soft, Glacial Outwash															
Basin, Biogenic															
Ridge (200 to 2500 m)															
Ridge, Hard, Exposed	Rhe														
Ridge, Soft Sediment	Rs_u														
Ridge, Biogenic															

In order to develop as many mean values as possible with reasonable error terms, it was necessary to re-combine the detailed data in Table 3 and Table 4 by collapsing the fourteen categories of gear types (shown in those two tables) to five major categories, and collapsing the habitat types to six megahabitat/substrate types. In most cases for which empirical data were available, these combinations resulted in samples sizes sufficient to derive useful means. However, it should be noted that several gear/habitat combinations have only one or two studies (n < 2) providing useable data on sensitivity and/or recovery levels.

Table 5. Empirical values from literature review for sensitivity and recovery levels for five major gear categories and nine major megahabitat types. SE = standard error. (nd) = no data.

Sensitivity levels

Megahabitat	Bottom Trawls	Nets	Dredges	Pots & Traps	Hook & Line
Estuarine (0-10+ m water depth)					
Estuarine, Hard Bottom	(nd)	(nd)	(nd)	(nd)	(nd)
Estuarine, Soft Sediment	0.70 (SE=0.25, n=7)	(nd)	0.90 (SE=0.25, n=6)	(nd)	(nd)
Estuarine, Biogenic	0.00 (SE= , n=1)	(nd)	2.28 (SE=0.57, n=5)	(nd)	(nd)
Shelf (10 to 200 m water depth)					
Shelf, Hard Bottom	2.50 (SE=0.50, n=2)	(nd)	1.70 (SE=0.30, n=7)	0.30 (SE=0.30, n=2)	(nd)
Shelf, Soft Sediment	1.19 (SE=0.14, n=29)	(nd)	1.16 (SE=0.12, n=28)	(nd)	(nd)
Shelf, Biogenic	1.80 (SE=0.39, n=3)	(nd)	1.90 (SE=0.90, n=2)	0.80 (SE= , n=1)	(nd)
Slope (200 to 3000 m water depth)					
Slope, Hard Bottom	3.00 (SE= , n=1)	(nd)	(nd)	(nd)	(nd)
Slope, Soft Sediment	1.00 (SE= , n=1)	(nd)	(nd)	(nd)	(nd)
Slope, Biogenic	3.00 (SE= , n=1)	(nd)	(nd)	(nd)	(nd)

Recovery levels

Megahabitat	Bottom Trawls	Nets	Dredges	Pots & Traps	Hook & Line
Estuarine (0-10+ m water depth)					
Estuarine, Hard Bottom	(nd)	(nd)	(nd)	(nd)	(nd)

Estuarine, Soft Sediment	0.46 (SE=0.19, n=57)	(nd)	0.76 (SE=0.23, n=5)	(nd)	(nd)
Estuarine, Biogenic	(nd)	(nd)	1.66 (SE=0.88, n=3)	(nd)	(nd)
Shelf (10 to 200 m water depth)					
Shelf, Hard Bottom	(nd)	(nd)	(nd)	0.00 (SE=0.0, n=2)	(nd)
Shelf, Soft Sediment	0.83 (SE=0.29, n=8)	(nd)	1.27 (SE=0.22, n=11)	(nd)	(nd)
Shelf, Biogenic	2.00 (SE=0.0, n=2)	(nd)	2.40 (SE=0.40, n=2)	0.80 (SE= , n=1)	(nd)
Slope (200 to 3000 m water depth)					
Slope, Hard Bottom	(nd)	(nd)	(nd)	(nd)	(nd)
Slope, Soft Sediment	(nd)	(nd)	(nd)	(nd)	(nd)
Slope, Biogenic	3.00 (SE= , n=1)	(nd)	(nd)	(nd)	(nd)

The data in Table 5 represent the empirical data available for use in the Bayesian modeling. This amount of collapsing of habitat categories, however, was considered too severe for the overall assessment process because it would leave too many geographic areas without data. Hence, it was decided that theoretical information would be combined with the empirical data in Table 5 to construct the final two tables that represent the first-draft indices of gear impacts for the west coast.

Following comments received at the SSC Groundfish Sub-Committee meeting in Seattle in February 2004, the bottom habitat type "Biogenic" was subdivided into as many categories as practicable based on the available literature. Studies have been conducted on four major biogenic bottom types: shellfish reefs (mussels and oysters), macrophytes (mostly seagrasses), sponges, and corals. Other comments received at the February meeting included the suggestion that recovery levels be re-defined and calculated based on actual recovery time. Therefore, the existing literature summaries in Appendix A were revised to show the above four biogenic subcategories for each of the megahabitat types (Estuarine, Shelf, etc) where appropriate, and recovery levels were presented as time in years.

A new Table 5b was constructed to summarize the primary literature entries for the biogenic subcategories for each of five major gear types. Two important general observations can be made. First, most research has been done on trawls and dredges, as is the case generally for gear impacts research. Second, most of the values for both sensitivity and recovery are based on only one study (n=1). Clearly, much more work must be done before we have a good understanding of how the full range fishing gear types impact the many kinds of biogenic habitats. Nonetheless, research has been done on several major biogenic habitat types, particularly on the continental shelf, and some trends appear to be emerging. For example, dredges and trawls appear to be nearly equally damaging to biogenic habitats on the shelf regardless of the kind of biogenic bottom. And recovery times can be substantial for those habitats dominated by long-lived species; e.g., see Slope, Corals entry.

Two gear / habitat combinations in Table 5b warrant further comment because they show very low impacts of gear types that have been shown to be quite damaging on some biogenic bottoms. The impact of bottom trawls in estuarine macrophyte habitats is shown as "0.0, SE=0.0, n=3" for sensitivity and recovery. Although these means are based on three studies, they probably do not represent the situation for estuarine macrophytes generally. The three studies were all done on turtle grass (*Thalassia testudinum)* using a relatively light-weight (75 kg) trawl with the footrope rigged with rollers designed for catching shrimp in seagrasses. Turtle grass has leaves that range from several centimeters to a meter or so long and they are quite flexible, capable of lying nearly flush against the substrate in tidal currents. Hence, it may be expected that this type of gear could move above the turtle grass with minimal impact. The authors of these studies noted that certain gear specifications are needed to minimize damage to seagrasses. Hence, these studies should not be interpreted to represent the range of macrophyte and gear type combinations that may occur on the west coast.

The second gear by habitat combination that warrants comment is dredges in estuarine shellfish habitats, where sensitivity and recovery values were also quite low. All studies to date have been done on previously harvested oyster reefs where the natural vertical structure probably had already been greatly reduced. Oyster reefs that have not been harvested can have vertical relief ranging from < 1 m to several meters. Mechanical harvesting gears (whether hand-held or towed under power) typically used to harvest oysters are capable of greatly reducing this vertical structure because their effect is to destroy the natural aggregated nature of the reef, typically resulting in a reef that largely consists of individual oysters lying flat on the bottom. The studies summarized in Table 5b indicate that once the vertical structure of a reef is destroyed, further dredging apparently has only minimal impact on reef characteristics, including productivity. This is an important finding, but as in the case of the three trawl studies on one kind of seagrass, must not be pressed too far.

In conclusion, it should be emphasized that we only have a preliminary understanding of how fishing gear impacts biogenic habitats. Some trends are emerging, but further consideration of the two gear/habitat combinations that departed from general trends should be a warning that the relationships involved can be quite complex.

Table 5b Breakdown of sensitivity and recovery for biogenic bottom types.

(i) Sensitivity Levels

	Bottom Trawls	**Nets**	**Dredges**	**Pots & Traps**	**Hook & Line**
Estuarine (0-10+ m water depth)					
Estuarine, Biogenic, Macrophytes	0.0 (SE=0.0, n=3)	(nd)	2.9 (SE=0.07 , n=4)	(nd)	(nd)
Estuarine, Biogenic, Shellfish			0.90 (SE=0.93, n=3)		
Shelf (10 to 200 m water depth)					
Shelf, Biogenic, Macrophytes	2.0 (SE= , n=1)	(nd)	2.8 (SE= , n=1)	(nd)	(nd)
Shelf, Biogenic, Shellfish	1.0 (SE= , n=1)	(nd)	1.0 (SE= , n=1)	0.80 (SE= , n=1)	(nd)
Shelf, Biogenic, Sponges	2.2 (SE=0.15 , n=2)	(nd)	(nd)	(nd)	(nd)
Shelf, Biogenic, Corals	1.0 (SE= , n=1)	(nd)	(nd)	(nd)	(nd)
Slope (200 to 3000 m water depth)					
Slope, Biogenic, Sponges	3.00 (SE=0.00 , n=2)	(nd)	(nd)	(nd)	(nd)
Slope, Biogenic, Corals	3.00 (SE=0.00 , n=2)	(nd)	(nd)	(nd)	(nd)

(ii) Recovery Time (years)

	Bottom Trawls	**Nets**	**Dredges**	**Pots & Traps**	**Hook & Line**
Estuarine (0-10+ m water depth)					
Estuarine, Biogenic, Macrophytes	0.0 (SE= , n=1)	(nd)	2.7 (SE=0.33, n=3)	(nd)	(nd)
Estuarine, Biogenic, Shellfish	(nd)	(nd)	0.0 (SE=0.00, n=2)	(nd)	(nd)
Shelf (10 to 200 m water depth)					
Shelf, Biogenic, Macrophytes	3.0 (SE=0.0, n=3)	(nd)	> 4.0 (SE= , n=1)	(nd)	(nd)
Shelf, Biogenic, Shellfish	(nd)	(nd)	(nd)	0.1 (SE= , n=1)	(nd)

	Bottom Trawls	Nets	Dredges	Pots & Traps	Hook & Line
Shelf, Biogenic, Sponges	> 1.0 (SE= , n=2)	(nd)	(nd)	(nd)	(nd)
Shelf, Biogenic, Corals	3.0 (SE= , n=1)	(nd)	(nd)	(nd)	(nd)
Slope (200 to 3000 m water depth)					
Slope, Biogenic, Macrophytes	3.00 (SE= , n=1)	(nd)	(nd)	(nd)	(nd)
Slope, Biogenic, Sponges	(nd)	(nd)	(nd)	(nd)	(nd)
Slope, Biogenic, Corals	> 7.0 (SE= , n=1)	(nd)	(nd)	(nd)	(nd)

Table 6 is a first-draft "sensitivity matrix" and Table 7 is a first draft "recovery matrix." Each impact level is expressed as a range, which represents plus or minus one standard error around the mean for the values based on empirical data and plus or minus 50% of the mean for the derived values. The values in the two matrices are color-coded based on how they were determined. Those in highlighted (shaded) cells are means calculated from the literature summaries in Appendix 1 and summarized in Table 5; i.e. these are the empirical data. Those in un-highlighted cells were derived by adjusting the appropriate empirical literature values using the relative rankings of gear impacts determined in the present analysis as well as information in recent reviews (Auster and Langton 1999; Hamilton 2000; Barnette 2001; Johnson 2002; Morgan and Chuenpagdee 2003). Some example calculations are given below.

The present analysis (Table 5) suggests the following relative rankings of gear from highest to lowest impact: dredges > bottom trawls > pots & traps (no empirical data available for nets and hook & line gears). Although very little research exists, the various types of nets are generally considered to have much less impact on the seabed than dredges and trawls, and hook & line methods have the least impact (Hamilton 2000; Barnette 2001; Johnson 2002). Hence, the derived values reflect this relative ranking of impacts: dredges > trawls > nets > pots and traps > hook and line.

In addition to the relative gear rankings, the present analysis of empirical research also showed a nearly consistent ranking by substrate/macrohabitat type almost regardless of gear type from most adversely impacted to least: biogenic > hard bottom > soft sediment. This ranking is the same as that in two recent conceptual models of gear impacts by bottom type (Auster and Langton 1999; NRC 2002).

Inspection of Tables 6 and 7 shows that all values for the Basin and Ridge megahabitats, and most for the Slope are derived values and not means calculated from empirical values in the literature. This is because there has been very little research useful for the present analysis on gear impacts in water depths exceeding 200 m. Therefore, in most cases for both matrices, the values from the appropriate shelf substrate/macrohabitat categories were transferred without change to the Slope, Basin, and Ridge cells. It should be noted, however, that there are theoretical bases for adjusting values from these deeper habitats. Benthic communities in deeper waters where wind and waves do not disturb the seabed are probably less adapted to resisting and recovering from physical disturbances generally. No such adjustments, however, were attempted for the present analysis.

To illustrate the general process for obtaining the values given in Tables 6 and 7, consider the "Dredges" column in "Estuarine" habitats and the relative ranking of sensitivity by habitat type discussed above (biogenic > hard > soft). Note that the derived cell (dredges on estuarine hard bottom) was assigned a range of 0.9-2.6, which falls below the sensitivity range for biogenic habitat but above the range for soft sediments. In similar fashion, consider The empirical values for the sensitivity of "Shelf, Biogenic" habitat. The literature values reflect the ranking of dredges having the most impact (1.0-2.8), followed by trawls (1.4-2.2). There were no studies on nets, so it was assigned a value (0.9-1.8) less than Trawls but more than Pots and Traps for which there were empirical values (0.4-1.2). And Hook and Line was assigned the smallest range (0.0-0.9).

In similar fashion, moving across most rows in the two tables, note that the ranges reflect the relative rankings of impacts of gear types (dredges > trawls > nets > pots and traps > hook and line). It should be noted, however, that where empirical data departed from either of these trends (e.g. the effects of bottom trawls in estuarine habitats) the empirical data were used to control the derived values.

As noted above, the ranges given in the highlighted cells reflect plus or minus one standard error around the means for each gear-by-habitat combination given in Table 5. For example, the range of sensitivity for Bottom Trawls on Estuarine, Soft Sediments in Table 6 is 0.5-1.0 (column 1 and row 2). This is the mean (0.70) plus or minus the 0.25, the standard error around the mean given in Table 5 (column 1, row 2), rounded to the nearest 0.1 of a unit. All values in Tables 6 and 7 were rounded to the nearest tenth. The ranges given for the derived (un-highlighted) values represent approximately plus or minus 50% of the midpoint of each range. This range of variability was chosen because it is representative of the variability in those empirical means for which sample sizes (n values in Table 5) were 3 or more.

Table 6. Sensitivity level ranges for five major gear categories by five megahabitat / substrate / macrohabitat types. Sensitivity levels range from 0 to 3 (see Table 2 for descriptions). Values in shaded cells are ranges from the literature, showing + or - one SE around the calculated means in Table 5. Others are derived values (see text for details).

MEGAHAB X SUBSTRATE X MACROHAB	Habitat Code	Bottom Trawls	Nets	Dredges	Pots & Traps	Hook & Line
Estuarine (0-10+ m water depth)						
Estuarine, Hard		0.5-1.4	0.3-0.9	0.9-2.6	0.2-0.5	0.0-0.2
Estuarine, Soft Sediment		0.5-1.0	0.3-0.8	0.7-1.2	0.1-0.4	0.0-0.2
Estuarine, Biogenic		0.0-0.0	0.0-0.0	1.7-2.9	0.0-0.0	0.0-0.0
Shelf (10 to 200 m water depth)						
Shelf, Hard, Exposed		2.0-3.0	0.8-1.6	1.4-2.0	0.0-0.6	0.0-0.3
Shelf, Soft Sediment		1.0-1.3	0.5-1.0	1.0-1.3	0.0-0.5	0.0-0.2
Shelf, Hard, Canyon Wall		2.0-3.0	0.8-1.6	1.4-2.0	0.0-0.6	0.0-0.3
Shelf, Soft Sediment, Canyon Wall		1.0-1.3	0.5-1.0	1.0-1.3	0.0-0.5	0.0-0.2
Shelf, Hard, Canyon Floor		2.0-3.0	0.8-1.6	1.4-2.0	0.0-0.6	0.0-0.3
Shelf, Soft, Canyon Floor		1.0-1.3	0.5-1.0	1.0-1.3	0.0-0.5	0.0-0.2
Shelf, Hard, Gully		2.0-3.0	0.8-1.6	1.4-2.0	0.0-0.6	0.0-0.3
Shelf, Soft, Gully		1.0-1.3	0.5-1.0	1.0-1.3	0.0-0.5	0.0-0.2
Shelf, Hard, Glacial Pavement		2.0-3.0	0.8-1.6	1.4-2.0	0.0-0.6	0.0-0.3
Shelf, Soft, Glacial Outwash		1.0-1.3	0.5-1.0	1.0-1.3	0.0-0.5	0.0-0.2
Shelf, Biogenic		1.4-2.2	0.9-1.8	1.0-2.8	0.4-1.2	0.0-0.9
Slope (200 to 3000 m)						
Slope, Hard, Exposed		1.5-3.0	0.8-1.5	1.7-3.0	0.4-0.8	0.2-0.4
Slope, Soft Sediment		0.5-1.5	0.5-1.0	1.0-2.0	0.2-0.6	0.1-0.3
Slope, Hard, Canyon Wall		1.5-3.0	0.8-1.5	1.4-2.0	0.0-0.6	0.0-0.3
Slope, Soft Sediment, Canyon Wall		0.5-1.5	0.5-1.0	1.0-1.3	0.0-0.5	0.0-0.2
Slope, Hard, Canyon Floor		1.5-3.0	0.8-1.5	1.4-2.0	0.0-0.6	0.0-0.3
Slope, Soft, Canyon Floor		0.5-1.5	0.5-1.0	1.0-1.3	0.0-0.5	0.0-0.2

MEGAHAB X SUBSTRATE X MACROHAB	Habitat Code	Bottom Trawls	Nets	Dredges	Pots & Traps	Hook & Line
Slope, Hard, Gully		1.5-3.0	0.8-1.5	1.4-2.0	0.0-0.6	0.0-0.3
Slope, Soft, Gully		0.5-1.5	0.5-1.0	1.0-1.3	0.0-0.5	0.0-0.2
Slope, Hard, Landslide		1.5-3.0	0.8-1.5	1.4-2.0	0.0-0.6	0.0-0.3
Slope, Soft, Landslide		0.5-1.5	0.5-1.0	1.0-1.3	0.0-0.5	0.0-0.2
Slope, Hard, Glacial Pavement		1.5-3.0	0.8-1.5	1.4-2.0	0.0-0.6	0.0-0.3
Slope, Soft, Glacial Outwash		0.5-1.5	0.5-1.0	1.0-1.3	0.0-0.5	0.0-0.2
Slope, Biogenic		1.5-3.0	1.0-2.0	1.7-3.0	0.5-1.0	0.3-0.8
Basin (200 to 4000 m)						
Basin, Hard, Exposed		1.5-3.0	0.8-1.5	1.7-3.0	0.4-0.8	0.2-0.4
Basin, Soft Sediment		0.5-1.5	0.5-1.0	1.0-2.0	0.2-0.6	0.1-0.3
Basin, Hard, Canyon Wall		1.5-3.0	0.8-1.5	1.7-3.0	0.4-0.8	0.2-0.4
Basin, Soft Sediment, Canyon Wall		0.5-1.5	0.5-1.0	1.0-2.0	0.2-0.6	0.1-0.3
Basin, Hard, Canyon Floor		1.5-3.0	0.8-1.5	1.7-3.0	0.4-0.8	0.2-0.4
Basin, Soft, Canyon Floor		0.5-1.5	0.5-1.0	1.0-2.0	0.2-0.6	0.1-0.3
Basin, Hard, Gully		1.5-3.0	0.8-1.5	1.7-3.0	0.4-0.8	0.2-0.4
Basin, Soft, Gully		0.5-1.5	0.5-1.0	1.0-2.0	0.2-0.6	0.1-0.3
Basin, Hard, Landslide		1.5-3.0	0.8-1.5	1.7-3.0	0.4-0.8	0.2-0.4
Basin, Soft, Landslide		0.5-1.5	0.5-1.0	1.0-2.0	0.2-0.6	0.1-0.3
Basin, Hard, Glacial Pavement		1.5-3.0	0.8-1.5	1.7-3.0	0.4-0.8	0.2-0.4
Basin, Soft, Glacial Outwash		0.5-1.5	0.5-1.0	1.0-2.0	0.2-0.6	0.1-0.3
Basin, Biogenic		1.5-3.0	1.0-2.0	1.7-3.0	0.5-1.0	0.3-0.8
Ridge (200 to 2500 m)						
Ridge, Hard, Exposed		1.5-3.0	0.8-1.5	1.7-3.0	0.4-0.8	0.2-0.4
Ridge, Soft Sediment		0.5-1.5	0.5-1.0	1.0-2.0	0.2-0.6	0.1-0.3
Ridge, Biogenic		1.5-3.0	1.0-2.0	1.7-3.0	0.5-1.0	0.3-0.8

Table 7. Recovery level ranges for five major gear categories by five megahabitat/substrate/macrohabitat types. Recovery levels range from 0 to 3 (see Table 2 for descriptions). Values in shaded cells are ranges from the literature, showing + or - one SE around the calculated means in Table 5. Others are derived values (see text for details).

MEGAHAB X SUBSTRATE X MACROHAB	Habitat Code	Bottom Trawls	Nets	Dredges	Pots & Traps	Hook & Line
Estuarine (0-10+ m water depth)						
Estuarine, Hard		0.5-1.4	0.3-0.9	0.7-2.0	0.1-0.5	0.0-0.3
Estuarine, Soft Sediment		0.3-0.7	0.2-0.5	0.5-1.0	0.1-0.4	0.0-0.2
Estuarine, Biogenic		0.5-2.0	0.3-1.0	0.8-2.5	0.1-0.7	0.0-0.4
Shelf (10 to 200 m water depth)						
Shelf, Hard, Exposed		0.7-2.5	0.8-1.6	1.5-2.6	0.0-0.1	0.0-0.1
Shelf, Soft Sediment		0.5-1.1	0.5-1.0	1.1-1.5	0.0-0.1	0.0-0.1
Shelf, Hard, Canyon Wall		0.7-2.5	0.8-1.6	1.5-2.6	0.0-0.1	0.0-0.1
Shelf, Soft Sediment, Canyon Wall		0.5-1.1	0.5-1.0	1.1-1.5	0.0-0.1	0.0-0.1
Shelf, Hard, Canyon Floor		0.7-2.5	0.8-1.6	1.5-2.6	0.0-0.1	0.0-0.1
Shelf, Soft, Canyon Floor		0.5-1.1	0.5-1.0	1.1-1.5	0.0-0.1	0.0-0.1
Shelf, Hard, Gully		0.7-2.5	0.8-1.6	1.5-2.6	0.0-0.1	0.0-0.1
Shelf, Soft, Gully		0.5-1.1	0.5-1.0	1.1-1.5	0.0-0.1	0.0-0.1
Shelf, Hard, Glacial Pavement		0.7-2.5	0.8-1.6	1.5-2.6	0.0-0.1	0.0-0.1
Shelf, Soft, Glacial Outwash		0.5-1.1	0.5-1.0	1.1-1.5	0.0-0.1	0.0-0.1
Shelf, Biogenic		1.0-3.0	0.9-1.8	2.0-2.8	0.4-1.2	0.0-0.9
Slope (200 to 3000 m)						
Slope, Hard, Exposed		1.5-3.0	0.8-1.5	1.7-3.0	0.4-0.8	0.2-0.4
Slope, Soft Sediment		0.5-1.5	0.5-1.0	1.0-2.0	0.2-0.6	0.1-0.3
Slope, Hard, Canyon Wall		1.5-3.0	0.8-1.5	1.5-2.6	0.0-0.1	0.0-0.1
Slope, Soft Sediment, Canyon Wall		0.5-1.5	0.5-1.0	1.1-1.5	0.0-0.1	0.0-0.1
Slope, Hard, Canyon Floor		1.5-3.0	0.8-1.5	1.5-2.6	0.0-0.1	0.0-0.1
Slope, Soft, Canyon Floor		0.5-1.5	0.5-1.0	1.1-1.5	0.0-0.1	0.0-0.1
Slope, Hard, Gully		1.5-3.0	0.8-1.5	1.5-2.6	0.0-0.1	0.0-0.1

MEGAHAB X SUBSTRATE X MACROHAB	Habitat Code	Bottom Trawls	Nets	Dredges	Pots & Traps	Hook & Line
Slope, Soft, Gully		0.5-1.5	0.5-1.0	1.1-1.5	0.0-0.1	0.0-0.1
Slope, Hard, Landslide		1.5-3.0	0.8-1.5	1.5-2.6	0.0-0.1	0.0-0.1
Slope, Soft, Landslide		0.5-1.5	0.5-1.0	1.1-1.5	0.0-0.1	0.0-0.1
Slope, Hard, Glacial Pavement		1.5-3.0	0.8-1.5	1.5-2.6	0.0-0.1	0.0-0.1
Slope, Soft, Glacial Outwash		0.5-1.5	0.5-1.0	1.1-1.5	0.0-0.1	0.0-0.1
Slope, Biogenic		1.5-3.0	1.0-2.0	1.7-3.0	0.5-1.0	0.3-0.8
Basin (200 to 4000 m)						
Basin, Hard, Exposed		1.5-3.0	0.8-1.5	1.7-3.0	0.4-0.8	0.2-0.4
Basin, Soft Sediment		0.5-1.5	0.5-1.0	1.0-2.0	0.2-0.6	0.1-0.3
Basin, Hard, Canyon Wall		1.5-3.0	0.8-1.5	1.7-3.0	0.4-0.8	0.2-0.4
Basin, Soft Sediment, Canyon Wall		0.5-1.5	0.5-1.0	1.0-2.0	0.2-0.6	0.1-0.3
Basin, Hard, Canyon Floor		1.5-3.0	0.8-1.5	1.7-3.0	0.4-0.8	0.2-0.4
Basin, Soft, Canyon Floor		0.5-1.5	0.5-1.0	1.0-2.0	0.2-0.6	0.1-0.3
Basin, Hard, Gully		1.5-3.0	0.8-1.5	1.7-3.0	0.4-0.8	0.2-0.4
Basin, Soft, Gully		0.5-1.5	0.5-1.0	1.0-2.0	0.2-0.6	0.1-0.3
Basin, Hard, Landslide		1.5-3.0	0.8-1.5	1.7-3.0	0.4-0.8	0.2-0.4
Basin, Soft, Landslide		0.5-1.5	0.5-1.0	1.0-2.0	0.2-0.6	0.1-0.3
Basin, Hard, Glacial Pavement		1.5-3.0	0.8-1.5	1.7-3.0	0.4-0.8	0.2-0.4
Basin, Soft, Glacial Outwash		0.5-1.5	0.5-1.0	1.0-2.0	0.2-0.6	0.1-0.3
Basin, Biogenic		1.5-3.0	1.0-2.0	1.7-3.0	0.5-1.0	0.3-0.8
Ridge (200 to 2500 m)						
Ridge, Hard, Exposed		1.5-3.0	0.8-1.5	1.7-3.0	0.4-0.8	0.2-0.4
Ridge, Soft Sediment		0.5-1.5	0.5-1.0	1.0-2.0	0.2-0.6	0.1-0.3
Ridge, Biogenic		1.5-3.0	1.0-2.0	1.7-3.0	0.5-1.0	0.3-0.8

4 DISCUSSION AND CONCLUSIONS

This analysis is a first attempt to quantify the sensitivity of bottom habitats to and recovery of bottom habitats from the impacts of different types of fishing gear that occur along the US west coast. The analysis was based on major literature reviews, particularly Johnson (2002) but also Watling and Norse (1998), Auster and Langton (1999), Dayton et al. (2002), National Research Council (2002), and Morgan and Chuenpagdee (2003). The resulting sensitivity and recovery values are presented in Tables 6 and 7 (pp 24-27). The intention is for these values, or values modified based on additional information and/or analysis, to be used in the Bayesian modeling process to identify fishing impacts and ways of preventing, minimizing or mitigating those impacts. Before proceeding to the modeling process, however, several topics warrant discussion.

First, it may be useful to discuss Tables 6 and 7 from the perspective of what this analysis does and does not aim to be. The values in all cells are given as ranges. As discussed on page 23, the ranges represent plus or minus one standard error around the mean for all values given. The magnitude of each range reflects the amount of uncertainty in a statistical sense, which is affected in large measure by the number of studies incorporated into each mean. For those gear-by-habitat combinations for which there were few studies, the ranges are generally greater compared to those that had relatively large "n" values; see Table 5 for statistics for each gear-by-habitat combination for which empirical data were available. The values presented in Tables 6 and 7 are adequate for use in the Bayesian modeling process, but they should not be pressed too far quantitatively.

This caveat is based on the paucity of empirical data for the overall analysis, but also the fact that an arbitrary scale of 0 to 3 was used to standardize the various metrics reported in the literature (Appendix 1). Researchers have used a wide range of metrics to try to assess gear impacts, and the various ecological processes that determine EFH characteristics are not well understood. Hence, the present analysis should not be interpreted as a direct quantification of gear impacts that can be used to infer, for example, functional habitat characteristics related to EFH. The relative effects of gear types on some functional habitat characteristics may well be reflected in the ranges of values given in Tables 6 and 7, but they do not represent a direct quantification of any particular impact on habitat function. The relationship of EFH to various habitat characteristics is complicated and not well understood quantitatively.

Secondly, it was noted in the Introduction section that the literature consists largely of research in other areas. There is therefore a need to determine how studies in other parts of the world relate to impacts on habitats from fishing gears used on the Pacific coast. Only two studies from the Pacific were found that had useful information for the present analysis (see first two entries in Table A1.2). In order to develop a more complete picture of potential impacts, studies from other areas must be relied upon. This raises the question of how inferences can and/or should be drawn from studies in other areas. This is essentially a question of applicability that is relevant to all of the sciences: How representative are the findings from one study of situations in other areas or at other times?

All the major reviews on the impacts of fishing gear on fish habitat address this issue directly or implicitly. For example, the extensive international review and assessment of the impacts of trawling and dredging on seafloor habitats (National Research Council 2002) found that (p. 20): "The extensive primary literature and many review articles… reveal several generalities about the response of seafloor communities to trawling and dredging." In another review, Morgan and Chuenpagdee (2003) ranked gear types by their relative impacts based on the scientific literature as well as surveys of those involved in the research and management of fisheries. With respect to the utility of their findings to others, they state (p. v): "The methods demonstrated here can be applied to specific fishery management councils to catalyze both regional and national conversations on how to manage truly sustainable ecosystems for fishing and other societal values." Auster and Langton (1999) have taken what might be considered a first step towards a general theory of gear impacts based on habitat complexity, fishing intensity, and ecological theory. Their analysis essentially takes a global perspective based on the overall literature.

Three major facts support this kind of reasoning: (1) many of the same gear types are used in many different geographic areas of the world, (2) seafloor habitats worldwide have a variety of ecological similarities, particularly as related to water depth and substrate characteristics, and (3) many harvested species have broad geographic ranges. Therefore, it seems quite reasonable to infer impacts from studies in other areas so long as they are based on similar gear x habitat combinations. The present analysis considered only studies that involved gear types used on the west coast and the major habitat types that occur there.

Another topic that warrants discussion is the disparity between the number of sensitivity (n=89) and recovery (n=41) studies (see summary in Table 5). Clearly, most of the research has been done on short-term impacts (sensitivity) and there is a need to better understand how habitats recover from different types of impacts in order to better quantify the long-term and cumulative impacts of fishing gear. However, the overall trends for both sensitivity and recovery values relative to gear and habitat types were similar. Most studies showed that all habitat types were most sensitive (greatest short-term impact) to dredges, followed by trawls, then pots and traps (Table 5a). A similar relative ranking occurred for recovery times (Table 5b). This does not negate the need for a better quantitative understanding of the recovery process but it does suggest that the recovery times are related to the level of the initial impacts.

A related topic that was not considered in the present analysis is the issue of fishing intensity, or frequency of disturbance of the bottom by fishing gear. Where available, relevant comments were recorded in the literature summary tables in Appendix 1. However, there was no consideration of these data in the formulation of the sensitivity and recovery values in the impact tables. Two major reviews developed conceptual models incorporating fishing intensity to their assessment of gear impacts. Auster and Langton (1999) related "level of fishing effort" to changes in habitat characteristics, particularly habitat complexity. The National Research Council 2002 related "frequency of fishing disturbance" and "frequency of natural disturbance" to their overall effect on benthic communities in different kinds of substrates. These kinds of analyses recognize the fact that fishing intensity is an important consideration regardless of how gear impacts are assessed.

A final topic to consider for future research is the possibility of refining the substrate categories, which at present include only "soft," "hard" and "biogenic." For example, the impacts of fishing gear generally are very different when comparing mobile sands and stable muds with some biogenic structure, both being classified as "soft" sediments in the present analysis. It might, for example, be useful to incorporate information such as water depth and potential frequency of natural disturbance (e.g. storm waves). Even if the existing literature was not adequate for a quantification of the differences, ecological theory and/or conceptual models (National Research Council 2002, p. 23) would allow a semi-quantitative assessment.

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ANNEX 1: LITERATURE SUMMARIES

Table A3.1. Summary of references on impacts of **ALL GEAR TYPES** on **ESTUARINE HABITATS**

Reference	Location	Megahabitat	Water Depth	Substrate Type	Macrohabitat	Habitat Code	Sensitivity Level	Sensitivity Comments	Recovery Level	Recovery Comments	Sampling Methods	Gear Comments
Otter Trawls x Soft Sediment												
Gibbs et al. 1980	New South Wales, Australia	Estuarine	"shallow" estuary	Soft Sediment; sand, 0-30% mud	n/a	n/a	0, 0, 0, 0 (avg=0.0)	minor disturbance of sand; no significant differences between fished and control sites in any community characteristics measured	0, 0, 0, 0 (avg=0.0)	(no detrimental impact)	Smith-McIntyre grab samples	10-m otter trawl with 1 x 0.5 m boards and chain spiders; before & after seasonal prawn trawling and repeated experimental trawling for 1 wk
Smith et al. 1985	Long Island Sound, NY	Estuarine	?	Soft Sediment; sand, mud	n/a	n/a	1, 1, 0, 1 (avg=0.8)	tracks in sediment 1 to 6" deep; attraction of predators; suspension of epibenthos	1, 1, 0, 1 (avg=0.8)	tracks "naturalized" by tidal currents after ??; lobster burrow alterations "easily" repaired by lobsters	diver observations	otter trawl with 6' doors, 30-60' scissors, 60-110' extended wing nets, 3/8" chain footrope
Brylinsky et al. 1994	Bay of Fundy, NS	Estuarine	0 to 10+ m; intertidal (6 to 8 m tidal range)	Soft Sediment; mud (silt)	n/a	n/a	1, 1, 1, 1 (avg=1.0)	5 cm deep x 30 cm wide tracks in sediment; decrease in nematodes and diatoms; no effect on polychaetes	1,1,1,1 (avg=1.0)	furrows 2 to 7 mo; 4 to 6 wk for nematodes; 1 mo for diatoms - quick recovery expected because of frequent natural disturbance by storms and ice	core (?) samples of seabed	otter trawl, 18 m trawl, 220 kg doors, 29 cm rollers; experimental tows
DeAlteris et al. 1999	Narragansett Bay, RI	Estuarine	0 to 10+ m; 14 m	Soft Sediment; mud (also see sand)	n/a	n/a	1, 1, 1, 1 (avg=1.0)	otter trawl door tracks (5 to 10 cm) and berms (10 to 20 cm) formed	1, 1, 1.5, 1 (avg=1.1)	hand dug scars persisted >60 da	side scan sonar	otter trawl; observations with side scan sonar of otter trawl door tracks; divers monitored hand dug scars
DeAlteris et al. 1999	Narragansett Bay, RI	Estuarine	0 to 10+ m; 7 m	Soft Sediment; sand with sand waves (also see mud)	n/a	n/a	1, 0, 0, 0 (avg=0.3)	no tracks observed (but see mud)	1, 0, 0, 0 (avg=0.3)	hand dug scars recovered in 1 to 4 da	side scan sonar	otter trawl; sand in shallow areas eroded daily, gear impacts may be inconsequential
Cahoon et al. 2001	Pamlico River Estuary, North Carolina	Estuarine	?	Soft Sediment; (no grain size given)	n/a	n/a	0	"…no significant or consistent effect …on any of the soft-sediment organisms we studied."	0	(no effects)	replicate Ponar grabs in six areas, before and after trawling, and in areas known to be affected by shrimp and crab trawling and others unfished	"shrimp and crab trawl" rigged as used in commercial fishery
							Mean = 0.5 Std Err = 0.19 n=6		**Mean = 0.5 Std Err = 0.20 n=6**			
Beam Trawls x Soft Sediment												
Hall-Spencer et al. 1999	Gulf of Venice	Estuarine	25 m	Soft Sediment; sand and mud	n/a	n/a	1, 1, 3, 2 (avg=1.8)	decreased # of large, slow-moving epifauna (scallops, sea cucumbers), inc. # scavengers	(not studied)	none	video surveys 1 and 15 hr post trawling	3-m Rapido (toothed beam) trawl; five passes across study area

							Mean = 1.8 Std Err = n=1		**Mean = Std Err = n = 0**			
Otter Trawls x Biogenic												
Futch and Beaumariage 1965; Meyer et al. 1991; Tabb 1958	Florida	Estuarine	0 to 10+ m; "shallow"	Biogenic; seagrass (*Thalassia*) *beds;* (sediment??)	n/a	n/a	0, 0, 0, 0 (avg=0.0)	removed some leaves and algae; no change in shoot density, blade number and length, or below ground biomass	0, 0, 0, 0 (avg=0.0)	(no detrimental impact)	?	"Tarpon Springs" & "St. Petersburg" shrimp roller trawls with 4.5 to 8 in rollers; 75 kg roller trawl with steel rollers
							Mean = 0.0 Std Err = n = 1		**Mean = 0.0 Std Err = n = 1**			
New Bedford/Scallop Dredges x Soft Sediment												
Eleftheriou & Robertson 1992	Loch Ewe, Scotland	Estuarine	5 m	Soft Sediment; sand	n/a	n/a	2, 1, 1, 1 (avg=1.3)	shallow furrows by teeth; no changes in infauna; crustaceans and sea stars increased; urchins, scallops, razor clams and other epifauna damaged or removed	(not studied)	?	photographic obser.; grab samples of epifauna and large infauna; samples taken before and after dredging	scallop dredge, 1.2 m wide with nine 12-cm long teeth, no chain bag; 25 tows in one area over 9-da period
Watliing et al. 2001	Damariscotta River, Maine	Estuarine	15 m	Soft Sediment; silty sand	n/a	n/a	1, 1, 2, 1 (avg=1.3)	tilled sediment to 9 cm; trenches 2 cm deep; decearse in fines and org. cont at surf, inc. at 5-9 cm; decreased macrofauna	1, 1, 1, 1 (avg=1.0)	sediments similar after 4 - 6 mo; no differences in macrofauna after 6 mo.	sediment samples collected before, immediately after, and 4 - 6 months after dredging	New Bedford style, 2 m wide with chain sweeps, no cutterbar; "intensive" experimental dredging at one site
							Mean = 1.3 Std Err = 0.0 n = 2		**Mean = 1.0 Std Err = n = 1**			
Hydraulic/Suction Dredges x Soft Sediment												
Kyte et al. 1975	Maine	Estuarine	intertidal	Soft Sediment; mud	n/a	n/a	0, 0, 0, 1 (avg=0.3)	turbidity plumes, limited effects on infauna	1, 0, 0, 1 (avg=0.5)	rapid recruitment of benthic organisms	water samples and sediment/benthos (cores?); sampled prior to dredging, during, and after 10 mo.	escalator dredge
Hall et al. 1990	sea loch, Ireland	Estuarine	7 m	Soft Sediment; fine sand	n/a	n/a	1, 1, 1, 1 (avg=1.0)	trenches 0.25 m deep, some holes 0.6 m deep immediately after dredging; no sig diff in infauna	1, 1, 1, 1 (avg=1.0)	all dredge-caused sediment features gone after 40 da; quick recovery probably because of winter storms in area	diver observations; sediment/benthos samples before, after, and 40 da after	suction dredging for razor clams; experimental dredging for 5 hr to simulate commercial fishing
Maier et al. 1995	South Carolina	Estuarine	intertidal creeks	Soft Sediment; muddy sand	n/a	n/a	0, 0, 0, 0 (avg=0.0)	short-term turbidity plumes; no significant changes in dominant taxa or abundances	0, 0, 0, 0 (avg=0.0)	(no measured impact)	turbidity levels and benthic infauna (cores?); samples before, during, and 2 wk after dredging	mechanical escalator dredge

Kaiser et al. 1996	southeastern England	Estuarine	intertidal	Soft Sediment; muddy sand	n/a	n/a	1, 1, 2, 2 (avg=1.5)	large amounts of sand re-suspension; sig diffs in total infaunal numbers	1, 1, 2, 1 (avg=1.3)	"complete recovery" of sediments and benthos after 7 mo	sediment/benchos samples (cores?) taken before, 3 hr after, and 7 mo after in impacted area and control site	suction dredging for manila clams; experimental dredging to simulate commercial fishing
							Mean = 0.7 Std Err = 0.34 n = 4		**Mean = 0.7 Std Err = 0.29 n = 4**			
New Bedford/Scallop Dredges x Biogenic												
Fonseca et al. 1984	Beaufort, North Carolina	Estuarine	intertidal, shallow subtidal	Biogenic; Soft Sediment; eelgrass beds in muddy sand	n/a	n/a	3, 3, 3, 2 (avg=2.8)	sig decreases in eelgrass biomass and shoot density at both sites, with reduction to ~0 at 30 times site	(not studied)	(no long-term sampling)	sampling of eelgrass	hand-operated scallop dredge, 0.65 m wide, 13 kg, no teeth; experimental dredging at two sites with diff intensity: 0, 15, 30 tows
							Mean = 2.8 Std Err = n = 1		**Mean = Std Err = n =**			
Hydraulic/Suction Dredges x Biogenic												
Godcharles 1971	Tampa Bay, Florida	Estuarine	?	Biogenic, Soft Sediment; seagrasses, algae, sand	n/a	n/a	3, 3, 3, 2 (avg=2.8)	trenches 5 in deep; all vegetation in path uprooted leaving bare sand	2, 2, 2, 2 (avg=2.0)	trenches persisted 1 - 86 da; some sediments still altered after 500 da; authors recommended complete prohibition of dredging in seagrasses with algae	diver observations	escalator dredge; experimental
Orth 1998	Chincoteague Bay, Virginia	Estuarine	?	Biogenic; Soft Sediment; seagrass beds	n/a	n/a	3, 3, 3, 3 (avg=3.0)	circular "scars" with loss of >50% seagrass cover	3, 3, 3, 3 (avg=3.0)	re-growth minimal after 2 yr; authors estimated 5 or more yr for recovery	diver observations	escalator dredge
							Mean = 2.9 Std Err = 0.1 n = 2		**Mean = 2.5 Std Err = 0.5 n = 2**			
Oyster Dredges x Biogenic												
Langan 1998	Piscataqua River, New Hampshire and Maine	Estuarine	<10 m	Biogenic; Hard; oyster reef	n/a	n/a	0, 0, 0, 0 (avg=0.0)	temporary turbidity plume; no sig diffs in infauna; oyster size larger in un-dredged area; (no exam of reef structure?)	0, 0, 0, 0 (avg=0.0)	(no serious impacts)	water samples and sediment/benthos and oyster samples in fished (ME) and unfished (NH) areas of same oyster reef	oyster dredge, 30 in wide, 60 lbs, 2-in teeth, chain mesh bag; fished (ME) vs unfished (NH) areas of same oyster reef sampled
Lenihan and Peterson 1998	Neuse River, North Carolina	Estuarine	3 - 6 m	Biogenic; Hard; oyster reef	n/a	n/a	3, 3, 2, 3 (avg=2.8)	reduction in reef height by about 30 cm in dredged areas	(not studied)	(no long-term sampling)	measured reef height and ?	oyster dredge; experimental dredging; compared dredged and un-dredged reefs

							mean = 1.4 Std Err = 1.0 n = 2		**Mean = 0.0 Std Err = n = 1**			
Hand/Mechanical x Biogenic												
Peterson et al. 1983	North Carolina	Estuarine	<10 m	Biogenic; eelgrass and shoalgrass	n/a	n/a	3	bull rake removed 89% of shoots and 83% roots; pea digger 55% and 37%	(not studied)	(no long-term sampling)	measured seagrass damage only	Hand/mechanical; clam raking with bull rakes and pea digger rakes
							Mean = 3.0 Std Err = n = 1		**Mean = Std Err = n = 0**			

Table A3.2. Summary of references on impacts of **TRAWLS** on **SHELF HABITATS**

Reference	Location	Megahabitat	Water Depth	Substrate Type	Macrohabitat	Habitat Code	Sensitivity Level	Sensitivity Comments	Recovery Level	Recovery Comments	Sampling Methods	Gear Comments
Otter Trawls x Soft Sediment												
Engel & Kvitek 1998	**central California**	**Shelf**	**180 m**	**Soft Sediment; mud, sand, gravel**	**n/a**	**PC 915**	**1, 1, 2, 1 (avg=1.3)**	**higher densities of all dom epifauna in lightly fished areas; some invert prey spp higher in heavily fished areas**	**(not studied)**	**(short-term study)**	**still and video; grab samples; fish stomachs**	**compared lightly and heavily fished areas**
High 1998	**Pacific NW USA**	**Shelf**	**?**	**Soft Sediment; "various"**	**n/a**	**PC 915**	**1**	**trawl marks visible; benthic fauna and rocks dislodged**	**(not studied)**	**(short-term study)**	**diver observations**	**?**
Gibbs et al. 1980	New South Wales, Australia	Shelf	10 m	Soft Sediment; sand	n/a	PC 915	0, 0, 0, 0 (avg=0)	infauna at low densities but no difference detected pre- and post-trawl	0, 0, 0, 0 (avg=0)	(short-term study)	grab samples of infauna pre- and post trawl; underwater observations	otter trawl; area trawled repeatedly for one week
Harris & Poiner 1991	Gulf of Carpentaria, Australia	Shelf	17-21 m	Soft Sediment; mud	n/a	PC 915	2, 1, 2, 2 (avg=1.8)	>50% reduction in total fish abundances, but some spp inc, some decreased little	(not studied)	**This study attempted to show persistent differences due to continued trawling, which might be relevant for some management**	comparison of 1964 and 1985/86 data on demersal fish	otter trawls used for prawns; compared before data after 20 yr of fishing
Mayer et al. 1991	Gulf of Maine, Mair	Shelf	20 m	Soft Sediment; mud	n/a	PC 915	1, 0, 0, 1 (avg=0.5)	furrows in sediments several cm deep; no sig diffs in infauna inside and out	0, 0, 0, 0 (avg=0.0)	(no sig effects; short-term study)	sediment/benthos, cores; sampled inside and outside trawl track before and 1 da after	otter trawl, 18 m footrope, 90 kg doors, with tickler chains; one tow
Rumohr & Krost 1991	Western Baltic Sea	Shelf	?	Soft Sediment; sand	n/a	PC 915	1	observed shell damage to ocean quahogs	(not studied)	(short-term study)	samples of bivalves	otter trawl; experimental trawling
Prena et al. 1996	Grand Banks, Canda	Shelf	?	Soft Sediment; sand	n/a	PC 915	1, 2, 1 (avg=1.3)	25% decrease in epifauna biomass in trawled area; some damage to brittle stars and urchins; no effect on molluscs	1, 2, 1 (avg=1.3)	(assumed "recovery" within 1 yr or minor effects)	sampled infauna, epifauna (sled) and observations	otter trawl; experimental trawling 12 times annually for 3 yr
Schwinghamer et al. 1998 (physical effects); Prena et al. 1999 & Kenching-ton et al. 2001 (biological effects)	Grand Banks, New Foundland	Shelf	120-146 m	Soft Sediment; fine and medium sand	n/a	PC 915	1, 1, 1, 2 (avg=1.3)	trawl marks visible, trawling smoothed the bottom, less hummocky sig diffs in various epifauna characteristics	1, 1, 2, 2 (avg=1.5)	trawl marks gone after 1 yr;"little long-term effects on infauna"; (persistent?) decreases in sand dollars, brittle stars, crabs, urchins after trawling;	video observations, epibenthic sled, grabs; multiple samples over 3 yr period	otter trawl, Engel 145 with 1250 kg oval doors, 46 cm rockhopper gear; many experimental tows in area closed to fishing for 1 - 2 yr
Tuck et al. 1998	Scottish Sea, Scotland	Shelf	30-40 m	Soft Sediment; mud	n/a	PC 915	1, 1, 1, 1 (avg=1.0)	species richness sig higher after 16 mo and throughout recovery 18 mo in fished areas; abundance higher then lower in fished areas	1, 1, 2, 1 (avg=1.3)	(minor sig but complex effects)	"biological surveys" of infauna, sampled after 5, 10, 16 mo after initiation of trawling, then 6, 12, 18 mo after end of trawling in fished and unfished areas	otter trawl, no net, with rock hopper gear; experimental trawling in area closed to fishing for 30 yr, 1 tow per mo for 16 mo
Fridd et al. 1999	North Sea	Shelf	55-80 m	Soft Sediment; mud sand	n/a	PC 915	1, 0, 1, 1 (avg=0.8)	heavy fishing decreased some taxa, but increased some opportunistic taxa - study started with a priori predictions and tested them by taxa	(not studied)	(study not directly designed to assess recovery, but did suggest persistence of benthos even with heavy trawling)	grab sampling over 27 yr period in fished areas	otter trawls used for prawns; compared 27-yr series of data during light, mod, heavy fishing
Bergman & Van Santbrink 2000	North Sea	Shelf	30 -50 m	Soft Sediment; sand, silty sand	n/a	PC 915	1, 1, 1, 2 (avg=1.3)	mortality of various taxa ranged from 0 to 52%, with average about ~20%	(not studied)	(short-term study)	grab or corer(?); sampled before tow and within 2 days after	otter tawl, (size?); single experimental sweep
Hansson et al. 2000	Sweden	Shelf	75-90 m	Soft Sediment; clay	n/a	PC 915	1, 1, 1 (avg=1.0)	differential responses by taxa, but some decrease in most	(not studied)	(short-term study)	grab sampling before and 5-9 mo after trawling in area closed to fishing for 6 yr	otter (shrimp) trawl, 14 m groundrope, 125 kg boards; experimental trawling (# tows, etc?)
McConnaughey, et al. 2000	eastern Bering Sea, Alaska	Shelf	44-52 m	Soft Sediment; sand	n/a	PC 915	1	epifauna less abundant and less diverse in fished; infauna with mixed responses, some less	(not studied)	(study designed to fished vs unfished areas)	sampled epifauna with 34 m otter trawl	studied different areas representing unfished (closed) and heavily fished with otter trawls
Moran & Stephenson 2000	northwest Australia	Shelf		Soft Sediment; sand(?)	n/a	PC 915	2, 2, 2, 2 (avg=2.0)	benthic densities decreased exponentially with # tows, 4 tows=50% reduction	(not studied)	(short-term study)	video camera on sled; multiple samples over several days(?)	otter trawl, (size etc?); experimenal trawling of short-term (days) multiple tows

Sanchez et al. 2000	Catalan coast, Spain	Shelf	30-40 m	Soft Sediment; mud	n/a	PC 915	1, 1, 0, 1 (avg=0.8)	minor sig diffs in some infaunal characteristics; furrows visible in side scan images	0, 1, 0, 1 (avg=0.5)	(minor sig effects; short-term study)	benthos, van Veen grab, side scan sonar; sampled over time after trawling (hrs): 0, 24, 102, 150	otter trawl, (size etc?); experimenal trawling of one or two tows at multiple sites
Drabsch et al. 2001	South Australia	Shelf	20 m	Soft Sediment; fine silt, sand	n/a	PC 915	1, 1, 2, 2 (avg=1.5)	28% loss of epifauna; some infauna losses; board marks on seabed	(not studied)	(short-term study)	grab or corer(?); sampled before tows and within 3 wks after	otter trawl; experimental trawling in non-fished area
							Mean = 1.1 **Std Err = 0.12** **n = 16**		**Mean = 0.8** **Std Err = 0.28** **n = 6**			
<u>Beam Trawls x Soft Sediment</u>												
de Groot and Apeldoorn 1971	southern North Sea	Shelf	20 m	Soft Sediment; sand	n/a	PC 915	2, 2, 2 (avg=2.0)	sessile organisms (e.g. hydroids, tube worms, bivalves, echinoids) badly damaged; mobile epifauna not affected	(not studied)	(short-term study)	diver observations	beam trawl; site hauled once
de Groot 1984	North Sea	Shelf	?	Soft Sediment; sand	n/a	PC 915	2, 2, 1 (avg=1.7)	trawling removed "high numbers" of hydroids	(not studied)	(short-term study)	diver observations	beam trawl; observations of immediate effects of trawl
Margetts & Bridger 1971	English Channel	Shelf	22 m	Soft Sediment; sand, mud/sand	n/a	PC 915	1, 1, 1, 1 (avg=1.0)	left 15 mm deep furrows and smoothed bottom roughness in some areas	(not studied)	(short-term study)	underwater video; obs of physical effects only	beam trawl, 9.1 m wide; experimental trawling
Fonteyne 2000	Goote Bank, Belgium and Netherlands	Shelf	20-30 m	Soft Sediment; sand, silt	n/a	PC 915	1, 1, 1, 1 (avg=1.0)	shallow furrows, sediment hardness affected	(not studied)	(short-term study)	side scan sonar, sediment physical measurements; made up to 52 hr after trawling	beam trawl, 4 m wide with tickler chain; experimental trawling
Bergman et al. 1990, Bergman & Hup 1992	North Sea	Shelf	30 m	Soft Sediment; sand	n/a	PC 915	1, 1, 2, 3 (avg=1.8)	up to 65% decrease in some epi and tube dwelling taxa, but no effect on many, some increased	(not studied)	(short-term study)	grab and trawl sampling of epifauna; sampled before and up to 16 hr after	beam trawl, 12 m, 7000 kg with ticklers; repeated exp trawling to cover study site 3 times
Philippart 1998	North Sea	Shelf	variable	Soft Sediment	n/a	PC 915	1, 1, 2, 1 (avg=1.3)	beam trawl much more effective at catching large epifauna, up to 10x for some	(not studied)	(not designed to determine recovery level)	analyzed bycatch data as fishery changed trawl types	beam trawl vs otter trawl
Kaiser & Spencer 1996, Kaiser et al. 1996, 1998, 1999	Irish Sea	Shelf	12-35 m	Soft Sediment; sand, sand with gravel and shell	n/a	PC 915	1, 2, 2 (avg=1.7)	up to 54% reduction in species numbers and abundances in some areas; losses of epi- and infauna	1, 1, 1 (avg=1.0)	differences between sites detectable only up to 6 mo	bottom sampling and observations over time (sampling schedule??)	beam trawl, 4 m, 3.5 tonnes with chain matrix; experimental tows, 10-12 passes
Santbrink & Bergman 1994	North Sea, Netherlands	Shelf	?	Soft Sediment; very fine sand	n/a	PC 915	2, 2, 2 (avg=2.0)	mortality of various taxa ranged from 4 to ~100%: echinoderms low, larger molluscs 12-85%, epifaunal crustaceans 30-74%, most annelids unaffected; fish scavengers attracted	(not studied)	(short-term study)	infauna sampling; compared before and after trawling	beam trawl; experimental trawling
Jennings et al. 2001a, b	eastern North Sea	Shelf	40-75 m	Soft Sediment; mud to sand	n/a	PC 915	2	in one area fishing intensity sig neg correlated with infaunal prod & biomass ("dramatic reductions"), no sig with epifauna; no sig correl in second area	(not studied)	(not designed to determine recovery level)	sampled epifauna with small beam trawl, infauna with anchor dredge	studied two areas, each with wide range of intensities of beam trawling
Jennings et al. 2002	central North Sea	Shelf	50-75 m	Soft Sediment; sandy, muddy sand	n/a	PC 915	0	no sig relation between production of small infauna, esp polychaetes (assumed to be fish prey items)	(not studied)	(not designed to determine recovery level)	sampled infauna at nine sites with replicate NIOZ corer	sampled nine sites representing 17.5-fold range of beam trawling intensities (from 0.35 to 6.14 times/yr disturbance)
Schratzberger et al. 2002a	North Sea	Shelf	39 and 59 m	Soft Sediment; muddy sand	na	PC 915	1	some changes in meiofaunal community structure; no sig effects o diversity or biomass	1	(recovery assumed fast because only minor impacts)	sampled meiofauna with corer from 1 to 392 days post-exp trawling	sampled two sites after 25 experimental tows with beam trawl

Schratzberger et al. 2002b	North Sea	Shelf	59 m	Soft Sediment; mud muddy sand	n/a	PC 915	1, 0, 0, 1 (avg=0.5)	minor decreases at some sites attributed to trawling	(not studied)	(short-term study)	core sampling before and after trawling, meiofauna only	beam trawl, 4 m beam, 80 mm mesh and chain matrix; experimental trawling to simulate "lightly fished"
							Mean = 1.3 **Std Err = 0.19** **n = 12**		**Mean = 1.0** **Std Err = 0.0** **n = 2**			
Shrimp Trawls x Soft Sediment												
Ball et al. 1999	Western Irish Sea	Shelf	75 m	Soft Sediment; mud	n/a	PC 915	1, 1, 2, 1 (avg=1.3)	fewer spp & abundances, and dominance by opportunists in fished area; many more spp & larger individuals of some taxa in unfished area	(not studied)	**This study attempted to show persistent differences due to continued trawling, which might be relevant for some management decisions.**	benthos, grab; sampled before and 24 hr after trawling at fished site	shrimp bottom trawl; "heavily" fished site vs unfished for 50 yr site near shipwreck
							Mean = 1.3 **Std Err =** **n = 1**		**Mean =** **Std Err =** **n = 1**			
Otter Trawls x Hard Bottom												
Auster et al. 1996; Lindholm et al. 1999	Gulf of Maine, Maine	Shelf	94 m	Hard; Boulder	n/a	PC 924	3, 3, 3, 3 (avg=3.0)	abundances of several taxa "greatly reduced" or completely absent; boulders apparently moved	(not studied)	(not designed to determine recovery level)	submersible observation in 1987 and 1993, after 6 yr of trawling by large gear	otter trawls, etc; assumed "large" trawl gear effects by before/after obs, 1987 & 1993
							Mean = 3.0 **Std Err =** **n = 1**		**Mean =** **Std Err =** **n =**			
Beam Trawls x Hard Bottom												
Kaiser & Spencer 1994	Irish Sea	Shelf	32 m	Hard; Gravel, Cobble	n/a	PC 924	2	density of epifauna reduced by 50%	(not studied)	(not designed to determine recovery level)	diver observations	beam trawls; 10 hauls with 4 m and 3 hauls with 2 m beam trawls, catches compared
							Mean=2.0 **Std Err =** **n = 1**		**Mean =** **Std Err =** **n =**			
Otter Trawls x Biogenic Bottom												
Van Dolah et al. 1987	Atlantic, Georgia	Shelf	20 m	Biogenic; sponges and octocorals; Hard; gravel, cobble	n/a		2, 2, 3, 2 (avg=2.3)	heavy damage to barrel sponges, slight damage to corals	2, 2, 2, 2 (avg=2.0)	all epifauna recovered after 12 months	diver observations	otter trawl, roller-rigged; area trawled once
Magorrian 1995	Strangford Lough, Northern Ireland	Shelf	?	Biogenic; mussel beds, (*Modiolus*)	n/a		1	mussel beds disconnected by trawling, reductions in epifauna	(not studied)	(short-term study)	side scan sonar	otter trawls; pre- and post-impact study
Guillen et al. 1994	Western Mediterranean	Shelf	?	Biogenic, Soft Sediment; seagrass (*Posidonia*) meadow	n/a		2	monitored seagrass densities	2	seagrass density had increased 6-fold after 3 years	noted 45% loss of seagrass meadows due to trawling	otter trawls; studied recovery of seagrasses after trawling stopped by artificial reefs
							Mean = 1.8 **Std Err = 0.39** **n = 3**		**Mean= 2.0** **Std Err = 0** **n = 2**			

Table A3.3. Summary of references on impacts of **DREDGES** on **SHELF HABITATS**

Reference	Location	Megahabitat	Water Depth	Substrate Type	Macrohabitat	Habitat Code	Sensitivity Level	Sensitivity Comments	Recovery Level	Recovery Comments	Sampling Methods	Gear Comments
New Bedford/Scallop Dredges x Soft Sediment												
Caddy 1968	Northumberland Strait, Gulf of St. Lawrence, Canada	Shelf	20 m	Soft Sediment; mud, sand	n/a	PC 915	1, 0, 1, 1 (avg=0.8)	2 cm deep tracks, ridges, dislodged shells in dredge tracks	(not studied)	(short-term study)	diver observations	New Bedford scallop dredge, 2.4 m wide, 0.36 m height, chain sweep, no teeth; obs in fished area
Butcher et al. 1981	Jervis Bay, New South Wales, Australia	Shelf	13 m	Soft Sediment; sand	n/a	PC 915	1, 1, 1, 1 (avg=1.0)	smoothed sand ripples	(not studied)	(short-term study)	diver obs of physical effects only	toothed scallop dredge
Langton and Robinson 1990	Fippennies Ledge, Atlantic, Maine	Shelf	56-84 m	Soft Sediment; silty sand, some gravel and shell	n/a	PC 915	1, 2, 2, 2 (avg=1.8)	sediment coarser after dredging; disruption of amphipod tube mats	2, 2, 2, 2 (avg=2.0)	scallops, burrowing anemones, tube polychaets decreased significantly after dredging (1 yr?)	submersible obs and photos; before and 1 yr after	New Bedford scallop dredge; obs made in area with "heavy commercial dredging"
Mayer et al. 1991	Atlantic, Maine	Shelf	8 m	Soft Sediment; mud with sand, shell	n/a	PC 915	1, 2, 1, 1 (avg=1.3)	decrease in fines and org content at surface, increase at 5-9 cm depth; sediment diatoms disrupted, microbial biomass increased after dredging	(not studied)	(short-term study)	core samples; sampled before and 1 day after tow	New Bedford scallop dredge; one experimental tow
Eleftheriou and Robertson 1992	Scotland	Shelf	5 m	Soft Sediment; sand	n/a	PC 915	1, 1, 1 (avg=1.0)	numbers increased with increasing tows, biomass decreased; some polychaetes, urchins and sand eels affected most	(not studied)	(short-term study)	sampled benthic fauna at 1-5 da and 9 da	scallop dredge; several tows over same track for 9 days
Black and Parry 1994, 1999	Port Phillip Bay, SE Australia	Shelf	15 m	Soft Sediment; muddy sand	n/a	PC 915	1, 1, 0, 1 (avg=0.8)	sediment plume; smoothing of seafloor; disturbance up to 6 cm deep in sediments	(not studied)	(short-term study?)	diver observations (?); short-term (?)	toothed scallop dredge; experimental towing repeatedly over 3-da periood in area not fished for 3 yr
Thrush et al. 1995	Mercury Bay, New Zealand	Shelf	24 m	Soft Sediment; coarse sand; "high energy site"	n/a	PC 915	1, 1, 1, 1 (avg=1.0)	smoothed ripples and infaunal tubes, tracks 2-3 cm deep; reduced densities of common taxa and taxa richness; some community-level changes	1, 1, 1, 1 (avg=1.0)	partial recovery after 3 mo in benthic community and pops of some dominant taxa	diver obs and core samples; before and up to 3 mo after dredging	toothed scallop dredge; experimental dredging at 2 sites, one fished
Auster et al. 1996	Stellwagen Bank, Atlantic, Massachusetts	Shelf	20-55 m	Soft Sediment; sand with ripples	n/a	PC 915	1, 1, 1, 2 (avg=1.3)	sand ripples smoothed, dispersal of shell	1, 1, 1, 2 (avg=1.3)	physical effects only; ripples restored by storms, within 1 yr (?)	side scan sonar surveys	New Bedford scallop dredge; experimental tows
Currie and Parry 1996, 1999	Port Phillip Bay, SE Australia	Shelf	15 m	Soft Sediment; muddy sand	n/a	PC 915	1, 1, 2, 1 (avg=1.3)	smoothed sand ripples and biogenic mounds; tracks up to 25 cm deep; sig decreases in several taxa; inc in some opportunistic taxa	2, 1, 2, 1 (avg=1.5)	tracks gone after 6 mo, ripples re-formed 5 da after dredging after a storm; biogenic mounds re-formed after 6 mo; most spp recovered within 6 mo, some not after 14 mo; annual recruitment 6 mo after exp caused non-sig diffs in most pops	diver obs (?); infauna sampling; monitored up to 14 mo post dredging	toothed scallop dredge; experimental towing repeatedly over 3-da period in area not fished for 3 yr
Kaiser et al. 1996a	Irish Sea	Shelf	?	Soft Sediment; ? sand, ? gravel	n/a	PC 915	1, 1, 1 (avg=1.0)	reduced abundances of most species; impacts of both gears similar	(not studied)	(short-term study)	"benthic" samples	scallop dredge and beam trawl, experimentally fished together; 10 tows of each
Bradshaw et al. 2000	Irish Sea	Shelf	25-40 m	Soft Sediment; sand, mud, gravel	n/a	PC 915	2, 1, 3, 1 (avg=1.8)	(apparently pops of many common taxa had been decreased by "towed gear" fishing)	3, 1, 3 (avg=2.3)	many epifaunal spp increased significantly in abundance… including brittle stars, a spider crab, scallops, hermit crabs, one sea star	diver obs; multiple surveys over 10 yr period (1989-1998) after area closed to fishing - a long-term, observational "recovery" study	commercially dredged area closed to fishing in 1989
Bradshaw et al. 2001	Irish Sea	Shelf	25-40 m	Soft Sediment; sand, mud, gravel	n/a	PC 915	1, 1, 0, 1 (avg=0.8)	some diffs in taxa (see recovery notes) but no sig differences in spp richness among plots	1, 1, 0, 1 (avg=0.8)	after 3-9 yr, encrusting epibenthic taxa more common in dredged areas, upright taxa more common in undredged; no sig diffs or clear trends for infauna	diver obs, grab samples 2 times annually for 10 yr (?)	scallop dredge; experimental dredging in and out of closed area (since 1989), and control sites; 10 tows along each line every 2 mo for 5 yr
Bradshaw et al. 2002	Irish Sea	Shelf	?	Soft Sediment; sand, gravel	n/a	PC 915	2, 1, 3, 1 (avg=1.8)	taxa that decreased over time: brittlestars, hydroids, bryozoans, barnacles; taxa that increased: large tunicates, crabs, shrimp, lobsters, whelks, seastars; length of fishing time rather than fishing intensity most	2, 1, 3 (avg=2.0)	recovery level estimated by comparing areas fished at different intensities, over long-term	compared recent benthic data from 7 sites exposed to different levels of fishing effort to data collected 50-60 yr earlier when scallop fishing was limited	(studied area mostly impacted by scallop dredging; see Sampling Methods notes)
Alves et al. 2003	eastern Atlantic, southern Portugal	Shelf	7-9 m	Soft Sediment	n/a	PC 915	1.5	significant decreases in abundance, taxonomic richness, and biomass; most <50% ?	(not studied)	(short-term study)	before-after experimental dredge tows in different seasons; core and quadrat samples of meio- and macroinfauna	Portugese toothed clam dredge (similar impact to scallop dredge?)

Gaspar et al. 2003	eastern Atlantic, southern Portugal	Shelf	5-12 m	Soft Sediment; sand, sandy mud	n/a	PC 915	1	"damage and mortality relatively low"; scavengers attracted to site	(not studied)	(short-term study)	experimental tows with dredge; sampled immediately after and up to 24 hr after	"commercial dredge" (clam dredge as Alves et al 2003?)
							Mean = 1.2 **Std Err = 0.10** **n = 15**		**Mean = 1.6** **Std Err = 0.21** **n = 7**			
Hydraulic Dredges x Soft Sediment												
Meyer et al. 1981	Atlantic, New York	Shelf	11 m	Soft Sediment; silty sand	n/a	PC 915	1, 0, 1, 1 (avg=0.8)	20 cm deep trenches formed; attracted predators preying on damaged and exposed infauna	1, 0, 1, 1 (avg=0.8)	within 24 hr predator numbers appeared back to normal; (no data on recovery of infauna)	diver observations	hydraulic dredge, 4 ft wide; experimental tows in surf clam bed
MacKenzie 1982	Atlantic, New Jersey	Shelf	37 m	Soft Sediment; fine to medium sand	n/a	PC 915	0, 0, 0, 0 (avg=0)	no sig diffs in any areas	0, 0, 0, 0 (avg=0)	designed to estimate recovery by comparing areas with different fishing intensities; "no lasting effcts…"	sampled benthic infauna in areas with diff fishing levels: none, active for 2 yr, fished then abandoned (for ?? yr)	hydraulic dredge; active ocean quahog fishing areas
Medcof and Caddy 1971	Southern Nova Scotia	Shelf	7-12 m	Soft Sediment; sand, sand-mud	n/a	PC 915	1, 1, 1, 1 (avg=1.0)	physical effects only; avg 20 cm deep furrows by hydraulic, 3-10 mechanical	(not studied)	(short-term study only)	diver and manned submersible observations	hydraulic dredges and toothed mechanical dredges; experimental tows
Murawski and Serchuk 1989	mid-Atantic, NJ-NY	Shelf	?	Soft Sediment; mud, sand, gravel	n/a	PC 915	1, 1, 1, 1 (avg=1.0)	trenches cut, deeper by hydraulic dredge; sand dollars, crustaceans, worms "substantially disrupted"; attraction of sea stars, fish to trenches	(not studied)	(short-term study only); sand dollars appear to recover quickly	manned submersible observations	hydraulic and scallop dredges; experimental tows
Pranovi and Giovanardi 1994	Venice Lagoon, Adriatic Sea, Italy	Shelf	1.5-2 m	Soft Sediment;	n/a	PC 915	1, 1, 1, 1 (avg=1.0)	8-10 cm deep furrows; some sig decreases in infauna, non-sig in some areas	1, 1, 1, 1 (avg=1.0)	densities recovered in 2 mo, but not biomass	sediment/infauna samples by divers; sampled immediately after tows, 3-wk intervals for 2 mo	hyrdaulic dredge, 2.7 m wide; experimental tows inside and outside commercial fishing areas
Tuck et al. 2000	Outer Hebrides, Scotland	Shelf	2-5 m	Soft Sediment; fine to medium sand; (tidal currents up to 3 knots in area)	n/a	PC 915	1, 1, 1, 1 (avg=1.0)	sediment fluidized to 30 cm depth; sig decrease in infaunal spp richness and total abundances, polychaetes most affected	1, 1, 1, 1 (avg=1.0)	benthos "recovered completely" within 11 wks	core samples, diver observations, video; sampled before, during, and up to 11 wks after tows	hydraulic dredge; experimental tows
							Mean = 0.8 **Std Err = 0.16** **n = 6**		**Mean = 0.7** **Std Err = 0.24** **n = 4**			
New Bedford/Scallop Dredges x Hard												
Caddy 1973	Chaleur Bay, Gulf of St. Lawrence, Canada	Shelf	40-50 m	Hard (Mixed); sand over gravel, some boulders	n/a	PC 924	3, 2, 2, 3 (avg=2.5)	rocks overturned, dislodged or plowed along bottom	(not studied)	(short-term study)	manned submersible observations	New Bedford scallop dredge, 2.4 m wide, 0.36 m height, chain sweep, no teeth, 1300 lbs; obs in fished area
Collie et al. 1996, 1997	Georges Bank, Massachusetts	Shelf	?	Hard; gravel pavement	n/a	PC 924	2, 0, 2, 1 (avg=1.3)	unfished areas with more epifauna, higher densities, species numbers and biomass of some infauna; different species composition also	(not studied)	best interpreted as study of chronic effects of different fishing intensities	observations and benthic samples; assessed cumulative impacts of scallop dredging by comparing fished to unfished sites	(studied area mostly impacted by scallop dredging; see Sampling Methods notes)
Veale et al. 2000	Irish Sea	Shelf	20-67 m	Hard (Mixed); sand overlain by pebbles, cobble, boulders, shell	n/a	PC 924	1, 1, 2, 1 (avg=1.3)	decreases in spp diversity and total abundances with increasing fishing effort	(not studied)	best interpreted as study of chronic effects of different fishing intensities	compared bycatch from fishing grounds exposed to different fishing intensities	(studied area mostly impacted by scallop dredging; see Sampling Methods notes)
							Mean = 1.7 **Sts Err = 0.40** **n = 3**					
New Bedford/Scallop Dredges x Biogenic												
Brown 1989	Strangford Lough, Northern Ireland	Shelf	?	Biogenic; mussel (*Modiolus*) beds	n/a		1	mussels are bycatch in dredges	2	concern that it would take "extended period" for recovery	compared benthic survey data from before and after initiation (8 yr) of scallop fishery	scallop dredging; reivew paper assessing survey data

Hall-Spencer and Moore 2000	Clyde Sea, Scotland	Shelf	10-15 m	Biogenic (maerl); calcareous red algae, sand, mud, cobble, boulders	n/a		3, 3, 2, 3 (avg=2.8)	rocks overturned, dislodged or plowed along bottom; tracks still visible after 2.5 yr in some areas; damage to many taxa	3, 3, 2, 3 (avg=2.8)	epifauna most impacted, infauna less so; taxa with regular recruitment recovered most quickly; some large epifauna did not recover after 4 yr	video monitoring by divers 2-4 times per year for 4 yr	toothed scallop dredge; experimental dredging in area fished for 40 yr and unfished area
							Mean = 1.9 **Std Err = 0.90** **n = 2**		**Mean = 2.4** **Std Err = 0.40** **n = 2**			

Table A3.4. Summary of references on impacts of **MULTIPLE MOBILE GEARS** (DREDGES, TRAWLS, etc) on **SHELF HABITATS**

Reference	Location	Megahabitat	Water Depth	Substrate Type	Macrohabitat	Habitat Code	Sensitivity Level	Sensitivity Comments	Recovery Level	Recovery Comments	Sampling Methods	Gear Comments
							Multiple gears (trawls+dredges) x Soft Sediment					
Hall et al. 1993	Turbot Bank, North Sea	Shelf	80 m	Soft Sediment; coarse sand	n/a	PC 915	0, 0, 0, 1 (avg=0.3)	no sig differences in benthos, except associated with sediment characteristics	(not studied)	n/a	sampled along gradient of fishing intensity based on distance from shipwrecks; grab sampling	otter trawls and dredges mainly
Auster et al. 1996	Swans Island Cons Area; Gulf of Maine	Shelf	30-40 m	Soft Sediment; sand, shell, cobble	n/a	PC 915	2, 1, 2, 2 (avg=1.8)	some epifauna and biogenic structure such as depressions and debris less common outside cons area	?	(sensitivity comments also relevant here, but no easy way to quantify?)	in vs. out of Cons. Area closed for 10 yr; ROV, video transects	otter trawls and dredges mainly
Auster et al. 1996	Stellwagen Bank, Massachusetts	Shelf	32-43 m	Soft Sediment; sand, shell	n/a	PC 915	1, 1, 2, 1 (avg=1.3)	loss of some hydroids, algae, and shrimp by fishing gear	(not studied)	n/a	ROV observations	otter trawls and dredges mainly
Thrush et al. 1998	Hauraki Gulf, New Zealand	Shelf	17-35 m	Soft Sediment; mud, sand	n/a	PC 915	2, 1, 2, 1 (avg=1.5)	various changes to infauna (spp #, densities), and density of large epifauna; overall 15-20% of differences attributed to fishing	(not studied)	n/a	sampled 18 sites over wide gradient of fishing intensity; sampled with video, corer, grab, dredge	otter trawls and dredges mainly?
Almeida et al. 2000	Closed Area II, Georges Bank, Massachusetts	Shelf	?	Soft Sediment; sand	n/a	PC 915	1, 0, 1, 1 (avg=0.8)	some fish spp more abundant inside; scallops larger inside; sponges more abundant inside; other benthic characters similar	1, 0, 2 (avg=1.5)	(sensitivity comments also relevant here, but no easy way to quantify?)	in vs out after 4.5 yr closed; sampling of seabed, fish, and observations	otter trawls and dredges mainly
Collie et al. 2000	Georges Bank, Massachusetts	Shelf	42-90 m	Soft Sediment; sand (also gravel, see below)	n/a	PC 915	1.5	colonial epifauna "conspicuously less abundant" in fished areas	(not studied)	(not designed to assess recovery)	compared fished vs non-fished areas; analyzed video and still photos of seabed in both areas	trawls and scallop dredges
Kaiser et al. 2000b	Devon coast, England	Shelf	15-70 m	Soft Sediment; fine to coarse sand	n/a	PC 915	2, 1, 2, 1 (avg=1.5)	sig differences in some epi- and infauna among areas related to fishing; higher biomass and abundances of hydroids, soft corals, in closed areas	(not studied)	(sensitivity comments also relevant here, but no easy way to quantify?)	compared areas of high, medium and low fishing intensity; sampled with grab, beam trawl, dredge	otter trawls and dredges mainly
							Mean = 1.2 **Std Err = 0.20** **n = 7**		**Mean = 1.5** **Std Err =** **n = 1**			
							Multiple gears (trawls+dredges) x Hard Bottom					
Valentine and Lough 1991	Georges Bank, Massachusetts	Shelf	?	Hard Bottom; gravel and sand	n/a	PC 924	2, 1, 2, 2 (avg=1.8)	unfished areas with boulders had abundant epifauna; smoother bottom and sparse epifauna in fished areas	(not studied)	n/a	correlated impacts with evidence of gear impacts on seabed; side scan sonar and submersible observations	otter trawls and dredges mainly
Auster et al. 1996	Swans Island Cons Area; Gulf of Maine	Shelf	30-40 m	Hard Bottom; shell, cobble	n/a	PC 924	2, 2, 2, 2 (avg=2.0)	some epifauna and biogenic structure such as depressions and debris less common outside cons area	?	(sensitivity comments also relevant here, but no easy way to quantify?)	in vs. out of Cons. Area closed for 10 yr; ROV, video transects	otter trawls and dredges mainly
Collie et al. 1997	Georges Bank, Massachusetts	Shelf	40-90 m	Hard Bottom; gravel, cobble	n/a	PC 924	1, 0, 2, 2 (avg=1.3)	closed area had higher numbers, biomass and species richness; closed area also had more "bushy" organisms, giving more structure to bottom	?	(sensitivity comments also relevant here, but no easy way to quantify?)	in vs. out of area closed to fishing	scallop dredges, otter trawls
Collie et al. 2000	Georges Bank, Massachusetts	Shelf	42-90 m	Hard Bottom; gravel (also soft sediment, see above)	n/a	PC 924	5	colonial epifauna "conspicuously less abundant" in fished areas	(not studied)	(not designed to assess recovery)	compared fished vs non-fished areas; analyzed video and still photos of seabed in both areas	trawls and scallop dredges
							Mean = 1.7 **Std Err = 0.16** **n = 4**					

Table A3.5. Summary of references on impacts of **POTS AND TRAPS** on **SHELF HABITATS**

Reference	Location	Megahabitat	Water Depth	Substrate Type	Macrohabitat	Habitat Code	Sensitivity Level	Sensitivity Comments	Recovery Level	Recovery Comments	Sampling Methods	Gear Comments
Pots and Traps x Biogenic												
Eno et al. 2001	Great Britain	Shelf	14-23 m	Biogenic; mud with sea pens	n/a	PC 915	1, 0, 1, 1 (avg=0.8)	bending and uprooting of sea pens	1, 0, 1, 1 (avg=0.8)	sea pens recovered within 6 da	diver observations	experimental setting and retrieval of pots at one site
							Mean = 0.8 **SE =** **n = 1**		**Mean = 0.8** **SE =** **n = 1**			
Pots and Traps x Hard Bottom												
Eno et al. 2001	Great Britain	Shelf	14-23 m	limestone slabs, boulders	n/a	PC 924	1, 0, 0, 1 (avg=0.5)	bending of sea pens	0, 0, 0 (avg=0.0)		diver observations	experimental setting and retrieval of three types of pots at one site
Eno et al. 2001	Great Britain	Shelf	14-23 m	rock	n/a	PC 924	0, 0, 0, 0 (avg=0.0)	no damage	0, 0, 0, 0 (avg=0.0)	n/a	diver observations	experimental setting and retrieval of pots at five sites
							Mean = 0.3 **SE = 0.3** **n = 2**		**Mean = 0.0** **SE = 0** **n = 2**			

Table A3.6. Summary of references on impacts of **TRAWLS** on **SLOPE HABITATS**

Reference	**Location**	**Megahabitat**	**Water Depth**	**Substrate Type**	**Macrohabitat**	**Habitat Code**	**Sensitivity Level**	**Sensitivity Comments**	**Recovery Level**	**Recovery Comments**	**Sampling Methods**	**Gear Comments**
								Otter Trawls x Soft Sediment				
Cryer et al. 2002	Western Bay of Plenty, New Zealand	Slope	205-595 m	Soft Sediment; mixed, mostly soft-bottoms	Slope, Soft Sediment	PC 917	1	fishing intensity negatively correlated with species richness and density of 15 spp, but positively to 6 spp, mostly opportunistic scavengers; overall 11-40% of changes attributed to fishing	(not studied)	Not studied - rather, the relation of benthic invert communities to different intensities of fishing was studied	66 research trawls in areas with known different fishing intensities	otter trawls used to catch demersal fish and lobsters (scampi)
							Mean = 1.0 **Std Err =** **n = 1**		**Mean =** **Std Err =** **n =**			
								Otter Trawls x Hard Bottom				
Freese et al. 1999	eastern Gulf of Alaska	Slope	206-274 m	Hard Bottom; pebble, cobble, boulders	Slope, Hard, Exposed	PC 922	3	boulders displaced; large epifauna removed or damaged; sig decreases in sponges and anthozoans but not in motile invertebrates	(not studied)	(not studied)	8 tows; manned submersible observations and video along trawl path	Nor'eastern trawl rigged with rockhopper roller gear
							Mean = 3.0 **Std Err =** **n = 1**		**Mean =** **Std Err =** **n =**			
								Otter Trawls x Biogenic				
Krieger 2002	Gulf of Alaska	Slope	260, 365 m	Hard Bottom; pebble, cobble, boulders	Slope, Biogenic		3	moved boulders, broken corals common in trawl path	3	5 of 13 large coral colonies still missing >95% of branches; 27% of corals in path detached; no young corals had re-populated the trawled area	manned submersible observations and video in 1997, 7 years after a 1990 otter trawl tow	Nor'eastern trawl rigged with rockhopper roller gear, 998 kg doors, ~15 m spread; trawl had removed large quantities of deepwater corals

Appendix 4. Pilot Project to Profile West Coast Fishing Effort Based on the Practical Experience of Fishermen

Final Report

Pilot Project to Profile West Coast Fishing Effort Based on the Practical Experience of Fishermen

A collaborative project by members of the commercial fishing community, the fisheries management community, and the scientific community:

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January 13, 2004

Contents

Section 1 - Background and Rationale

The ad hoc Groundfish Habitat Technical Review Committee (TRC), was created by the Pacific Fishery Management Council (Council) to review and guide the scientific assessment process for the Pacific Groundfish Essential Fish Habitat Environmental Impact Statement (EFH EIS).

To evaluate the status of habitat, a “risk assessment methodology” is being developed with oversight from the TRC. [1] A graphical description of the process for determining Essential Fish Habitat and associated conservation policies is included in appendix 1. One of the elements considered in this risk assessment is the amount and location of fishing effort over time.

The TRC, at their February 19-20, 2003 meeting, reviewed the results of a fishing effort model that was produced for the Pacific State Marine Fisheries Commission (PSMFC) by Ecotrust. The TRC was concerned about some of the assumptions in the model and recommended that, among other comparisons, experience-based information from fishermen be compiled for comparison with the Ecotrust product.

The methodology for responding to the TRC direction is described in the following sections. It was derived through an experimental process in which an initial pilot project was carried out in Washington State and then reviewed by the Council (and committees) and others with appropriate expertise in fisheries, management, and social sciences. The ultimate study design is the result of collaboration between PSMFC, NOAA Fisheries, Oregon Sea Grant, and commercial fishing representatives from the three coastal states. Final review and endorsement for this methodology was given by the TRC on August 4, 2003.

There are three main objectives for this pilot project:

Objective 1: To gather and produce a compilation of experienced-based information to indicate fishing effort location by gear type for areas off the West Coast over time.

Objective 2: To design and conduct this project collaboratively as a partnership with the fishing community, the fisheries management community, and the scientific community.

Objective 3: Gain experience in developing useful products for application in fisheries management that are based entirely on experience-based information.

Although the TRC recommendation focused on developing a product for comparison with the Ecotrust data, this project was designed to develop a discrete data set that could potentially be used independently. The results will be subjected to the scrutiny of the Council system (including the TRC and Scientific and Statistical Committee) and may potentially become part of the universe of available fishing effort data that, among other things, includes logbooks, observer data, and the Ecotrust model.

Section 2 - Project Design and Methodology

2.1 - Collaborative Design

This project was designed collaboratively. Collaboration has been defined as the "pooling of appreciations and resources by two or more stakeholders to solve a set of problems which neither can solve individually (Howell 1982)." The problem in this case was to not only gather experience-based information on fishing effort, but also to produce a scientifically defensible product that truly represented the experience of fishermen and would/could be useful to fishery managers. An addition goal was to conduct the project in a manner that built or strengthened relationships between all partners.

The collaborative team that was assembled for this project included representatives from the fishing, scientific, and management communities. To account for coastal diversity, stakeholders within the commercial fishing community were further stratified by geographic consideration. A collaborative team was developed to include these stakeholders as follows:

> Commercial Fishing Community - Marion Larkin, Washington; Scott McMullen, Oregon; and, Tim Athens, California. Taken together, each of the three coastal states is represented. These fishermen sit on the TRC by appointment from their respective State fisheries agencies based on their representative knowledge of the fishing industry in their geographic area of expertise.
>
> Scientific Community - Allison Bailey, Senior GIS Analyst, TerraLogic GIS; Flaxen Conway, Extension Community Outreach Specialist, Oregon Sea Grant; Randy Fisher, Executive Director, Pacific States Marine Fisheries Commission, Fran Recht, Habitat Program Manager, Pacific States Marine Fisheries Commission.
>
> Fisheries Management Community - Steve Copps, Senior Policy Analyst, NOAA Fisheries, Northwest Region.

The collaborative team held a series of meetings to refine the objectives of the project and develop a responsive process. An initial work plan and preliminary results from the pilot project that was conducted for areas north of Destruction Island, trawl gear only, were presented at the June, 2003 Council meeting (see appendix 6). Following this meeting, the collaborative team was expanded to include the members listed above.

The collaborative team reformulated the work plan based on the experience gained during the initial pilot project and input gained during review. At their August 4, 2003 phone conference meeting, the TRC agreed that the project should continue based on the methodology described in this document. Due to funding limitations, the project would be initiated in a limited geographical area (the area chosen represented that covered by one nautical chart that spanned the distance from Yaquina Bay to the Columbia River in Oregon [NOAA chart number 18520]). Expansion of the project will be considered in light of TRC and Council comments on the results and based on available funds.

2.2 – Fishing Effort Information Gathered

This project was designed to gather information on four parameters / fundamental elements that describe fishing effort: time, gear type, area, and intensity. The focus session approach described in the following sections is time consuming and necessitates significant pre-planning to ensure that basic goals are met within allotted time and budget. To account for this, and in consideration of the overall goals of the EFH analysis, categories were established within each of the elements that were thought to be most representative of broad patterns of fishing effort. Of particular concern for this study is the need to produce comparable results from different areas of the coast with different fleet characteristics. The categories were chosen based on the collective experience of the collaborative team and the comments received through review.

Time

Information on time was focused into three time periods or "eras." The time periods chosen by the team were those that corresponded to the relative levels of trawl regulation that has influenced effort patterns:

Era #1 = 1986-1999 (least regulations)
Era #2 = 2000-2002 (more regulations)
Era #3 = 2003 – present (most regulations)

We speculated that it might be difficult for any group to focus their attention on such a wide range of years. The facilitator and lead fisherman consultant asked the group of fishermen consultants to come up with a "representative" or "average" year within each era.

Additionally it was anticipated that in order to think about fishing effort, it might be necessary to talk about season differences. The collaboration team was unsure if each of these representative / average years needed to be split into two or three seasonal periods: winter and summer, or winter, summer, and the transitional season (fall/spring). Once again, the facilitator led the fishermen consultant group through a process to define appropriate seasons to discuss each gear type. Each era was subdivided to reflect seasonal variation in effort patterns by:

Winter
Summer
Transition (spring and fall)

Gear Type

Information on gear type was focused into trawl gear and fixed gear and further subdivided into 7 gear types. Gear types were chosen based on fisheries that have been prosecuted within the study area. It should be noted that the gear types could have been further divided. The collaborative team decided that these listed gear types best corresponded to the level of information we currently have on gear effects. Also, this list would likely be different if expanded into other regions. Lastly, during the focus sessions, the fishermen consultants found it useful to add information on the target species, which was recorded and is shown in the results section of this report within the tables under the "habitat/fishery" column and in the focus session flipchart notes.

Trawl Gear
    large foot rope [groundfish]
    small foot rope [groundfish]

pelagic [pelagic rockfish excluding hake]
pink shrimp

Fixed Gear
bottom long line
pot gear
- crab pot
- groundfish pot

Area

It should be noted that the fishermen consultants were not asked to provide proprietary information at the level of the individual tow or set. Rather, they were to capture the broad area patterns they experienced the fleet working in and would best reflect the other information parameters such as gear type, time, and intensity.

The project's end product was to be a variety of areas drawn on the nautical chart maps (and available electronically through the GIS database). These mapped areas would represent the fishermen consultants' knowledge of where fishing effort had occurred during the various time periods or seasons for the various gear types. These areas, called 'polygons,' would likely be discrete areas of different sizes and shapes and would not be limited to statistical area grids normally used to capture fishing effort information. Rather, they would likely coincide with depth contours, bottom types, or other factors that represent fishermen's experiences and observations.

Other than being restricted to the NOAA chart that defined the study area, the fishermen consultants were given complete freedom to define the areas in which fishing took place. The fishermen consultants were provided with several copies of the same NOAA chart they typically use for navigation and selection of fishing areas on the north coast of Oregon. They were asked to use the information on the chart (bathymetry, lat/long) to recollect and draw in the areas where the fleet fishes (stratified by gear type, era, and intensity). The information was drawn on transparent chart overlays and later input into GIS.

Intensity

While the project was primarily designed to collect spatial information about fishing effort, an attempt was made to collect information about the intensity of fishing effort for each gear type as it related to the areas fished. Each map created would display this information as well.

It is important to note that because of practical limitations on this project, it was unrealistic to expect to get detailed information down to the level of "the number of tows per year for a given area," etc. Rather, to achieve the overall goals of the project, we gathered information on one factor (which we called "c"; see directly below) of intensity -- an estimate of the average number of boats per day for that season, for that gear type in that polygon.

We also, where possible, gathered information that could -- at a later date -- further flesh out the concept of intensity. For example, we assumed that an improved estimate of intensity might be the product of three factors (a x b x c) where, *say for the trawl fleet,*

a = average length of tow each fleet makes (a constant figure; noting the normal range),

b = average number of tows per day each fleet makes (a constant figure; noting the normal range), and
c = the average number of boats per day for the season in each polygon (a variable figure; noting the normal range when possible).

Similar, but fixed-gear-appropriate parameters were used for that fleet. The specific questions that the fishermen consultants were asked in order to gain information on effort intensity is described more fully in Appendix 9.

2.3 Preparing for the Focus Sessions

The collaborative team established a multi-step process to gather and process the information. This process began with the selection and recruitment of fishermen consultants, continued with structured group focus sessions, and culminated in a set of independent GIS data layers.

Selection and Recruitment

The selection and recruitment process consisted of identifying and procuring the services of appropriate fishermen consultants to participate in the project. This was a three-step process: identification and screening, making initial contact, and validating commitment to participate.

These fishermen consultants functioned as our key informants (Bernard, 2002) - people who were highly knowledgeable about commercial fishing operations and locations, and who were willing and able to share the information necessary.

Screening criteria were developed by the collaborative team to ensure that the sum total of the fishermen consultants who provided the information on fishing effort represented a large body of knowledge and experience, and were willing and able to function appropriately to achieve the goals of the project. The screening criteria were:

must be practical experts who can speak from their own experience and knowledge;
must have roughly 20 years experience in commercial fishing on the west coast, with a high percentage of this experience gained within the region they are supplying information on;
must have good practical knowledge of the fleet's operations (know the area, know the gear types, know the fisheries);
must be able to work well with others in a small but diverse group; and,
must possess a willingness to participate openly and honestly and have an ability to follow through with this project.

A list of potential key informants was derived from a list of federal groundfish permit holders (obtained from the NMFS web site) and other sources. The lead fisherman consultant then worked through the list for the best fit based on the screening criteria, professional knowledge, and references from other key informers within the region.

The lead fisherman consultant made initial contact, by phone or in person, with approximately 45 fishermen who fit the criteria. Due to the nature of commercial fishing, most contact was made outside of the typical 9-5 workday and often resulted in leaving messages and follow up calls. Once contact was established, the potential recruit was presented with a quick summary of the project background and rationale, and the selection criteria and why they were being asked to serve as a fisherman consultant. The discussion that followed allowed an assessment of that person's interest in participating. If there was interest, the call was completed by providing information about compensation, gathering correct contact information, and explaining the next steps.

The third step involved the mailing of the recruitment package and a follow up call or visit. The recruitment package included a personalized letter from the lead fisherman, a 3-page summary of the project, a sample map (that showed arbitrarily drawn fishing areas), and a contract for them to sign (a formal agreement with the PSMFC documenting that they would be paid consultants, met the screening criteria, and would abide by the standards established for the project). The follow-up calls were used to go over the project design, the location of the meeting, and the expectations.

Group Focus Session Approach

The collaborative team made the decision to use a group focus session methodology instead of other available techniques such as conducting individual interviews with fishermen. A group focus session is a tool developed by social scientists to collect information from a group of individuals selected and assembled by researchers to discuss and comment on, from personal experience, the topic that is the subject of the research (Powell et. al. 1996, Butler et. al. 1995). Group interviews and focus sessions have been used by many researchers over the years to collect information on reported experiences, obtain information about complex topics, discover new research questions, explore a range of perceptions regarding a topic, and generate feedback from others in the group (Agar 1995, Bloore et al. 2001, Trotter and Schensul 1998). Rigorous standards and protocols were developed to discipline the focus sessions and are discussed in the sections that follow.

Specific roles and responsibilities were assigned prior to focus sessions to ensure that the right information would be gathered according to proper technical specifications and that the information could be gathered consistently among group focus sessions from diverse areas of the coast. The roles were:

> *Fishermen Consultant:* Responsible for supplying experience-based knowledge according to parameters defined for the project. Requisite skills are described above. Twenty-five Oregon fishermen fulfilled this role.
>
> *Lead Fisherman Consultant:* Responsible for selection and recruitment and supporting the facilitator in presenting information on the overall goals of the project. During the trawl focus session the Lead Fisherman Consultant also supplied his own experience-based information on fishing effort along with the other fishermen consultants. Scott McMullen fulfilled this role.
>
> *Recorder:* Responsible for providing appropriate charts and digitizing the information supplied by the fishermen consultants. The recorder was required to be technically proficient with GIS and have sufficient knowledge about the information parameters and fishery as to allow for fluent and timely transcription of consultant input into GIS. A key role played at the focus sessions was to listen and observe, allowing for accurate and thorough digitizing later. Allison Bailey fulfilled this role.

Facilitator: As the process designer and manager of the focus sessions, the facilitator had the ultimate responsibility to make sure that the information gathered from the group focus sessions was done in a consistent manner according the standards and protocols of the project design. The facilitator was required to be knowledgeable about the goals of the project; skilled at listening and extracting relevant information; clear at explaining how the session would work; good at managing the process; and good at developing and maintaining a rapport with the group (trusted). The facilitator was responsible for maintaining neutrality, drawing out diverse perspectives, and keeping the conversation on course. Flaxen Conway fulfilled this role.

Other Roles: The project manager for the EFH EIS was at the group focus session to respond to group questions regarding project goals and potential outcomes of the EFH EIS or other sources of effort information. Steve Copps fulfilled this role.

Consistency Standards

An important goal of the project was to achieve accurate and comparable results from multiple and potentially diverse group focus sessions should the geographic extent of the project be expanded. Fishermen consultants at all the focus groups were required to have a similar understanding of the project that included the objectives and protocols for participation. They were required to provide information openly and honestly and according to pre-established standards. To achieve these aims, the collaborative team derived a set of directions that each of the fishermen consultants was on briefed during recruitment and again during the focus session. The intent of these 'up-front' preparations was to fully disclose the standards before information on fishing effort was shared and assure that no "new" directions be delivered while the sessions were in progress (see Appendix 4).

Geographical Distribution

In order to test the conceptual underpinnings of the methodology, and in consideration of the broader time and budget constraints of the EFH EIS, the project was carried out on a relatively small scale. Ideally, the project would be completed for the entire coast to match the geographic extent of the EFH work and the Ecotrust product. However, we began with the area represented by NOAA Chart 18520, the northern most NOAA chart for Oregon, covering the area between Yaquina Bay and the Columbia River.

Group Focus Sessions by Gear Grouping

The collaborative team determined that completing the effort and intensity information for one full chart for each of the seven gear types would not be feasible within an eight-hour day. Gear types were broken into two broad categories of "trawl" and "fixed gear" (bottom longline and pot). A full day was allocated for each gear category.

2.4 Gathering and Processing the Information

The multi-step process that resulted in fishermen's information being recorded and transformed to a digital product is described in this section.

Group Focus Sessions Implementation

The agenda for each focus session was the same:

Welcome, Introductions	*Lead Fishermen Consultant (LFC)*
Today's Session	*Facilitator*
Quick Refresher on this Project	*LFC and Facilitator*
Assumptions / Definitions	*Facilitator and All*
Mapping & Intensity	*Facilitator, Recorder, and All*
What Happens with this Info	*LFC, Facilitator, and EFH EIS Project Manager*
Session Evaluation	*Facilitator*

The "welcome and introductions" topic followed the Lead Fishermen Consultant's "talking points" (see Appendix 2). The "today's session" topic consisted mostly of housekeeping, previewing the day's process, and going over the session ground rules. The "quick refresher on this project" topic reviewed the recruitment package information and visit.

The "assumptions and definitions" topic was designed to give the fishermen consultants an opportunity to further define the information categories that would be used throughout the day. In a facilitated discussion, the fishermen consultants defined the information categories in order to stabilize the terms they would use to categorize the information they would provide.

This facilitated discussion led the group through a series of questions:

1. What do you mean when you say a "representative or average year" within each of the three eras? For example, give us some characteristics of what you will be thinking of when you think about the fleet during the era and drawing maps where the fleet fished during that era.

2. Define "fleet"? Who/what do you mean when you say the __________ fleet (for example, large footrope or bottom longline)? Again, give us some characteristics about this fleet (size / kinds of vessels, types of gear, limitations, regulations, permits, etc.).

3. For each of these fleets, define what you mean by seasons in this representative/average year **for each fleet:**

   Winter = __________ to __________.
   Summer = __________ to __________.
   Transition (Spring/Fall) = ________ to ________ / ________ to _______.

This series of questions was designed to assist fishermen consultants to consciously think about the assumptions that they would be making in the context of the fleets, eras, and mapping of effort throughout the session. As such it wasn't designed to produce data but rather to function as a helpful tool to self-control their input throughout the long day.

Creating the Digitized Maps

There were three stages involved in producing a final map: 1) fishermen consultants drawing polygons on the NOAA chart to represent fished areas by gear type, era, and season; 2) fishermen consultants defining and assigning intensity for each of the polygons; and, 3) digitizing the information.

Working with permanent markers on clear sheets of acetate over the nautical chart, the fishermen consultants (working as a large group or several small groups) drew polygons for each fished area where marked differences in intensity was recalled. Separate maps were produced for each era, season, and gear type. Some maps covered multiple eras and/or multiple seasons for the fleet depending on the remembrance of the fishermen consultants. Polygons were numbered and before the map was turned over to the recorder, the map was reviewed and checked for accuracy and completion.

Defining and gathering information on intensity was challenging and time consuming. The facilitator led a large group discussion where fishermen consultants responded to a series of question to capture the needed information (see appendix 9).

Some of the information gathered was on factors that would be "held as constant" when considering effort (e.g. average length of tow, average number of tows per day, average number of pots per string, numbers of strings run for day, etc.). However, once that was complete, the group moved to viewing each map and then assigning a value to the third (variable) factor, "c" – average number of boats per day for the season -- to each polygon. This was recorded in tabular form for each numbered polygon (see results). Data from the tables was subsequently entered into GIS.

2.5 Learning How to Utilize Fishermen's Knowledge

It is widely recognized that the experience-based knowledge of fishermen is underutilized as a source of data for fisheries management. Despite this realization, collection of such knowledge in a systematic way for incorporation into fisheries management decision-making is atypical (Conway and Gilden, 2002). For this reason, one of the important goals of this project was to take advantage of the direction from the TRC to gain experience in developing experience-based products that might be utilized for this purpose.

Gathering data from fishermen necessarily involves data collection procedures that are typically rooted in the social science disciplines and may be somewhat unfamiliar to the traditional fisheries management process. Sampling theory as manifested in the social sciences often relies on recruitment of highly experienced "key informants" from which to gather information. This project utilized key-informant methodology well and was designed by a collaborative team of fishermen, scientists, and managers, and was reviewed by many reputable researchers, practitioners, and managers.

At the end of each group focus session, the facilitator led the group through a quick but informative session evaluation, with the goal of learning about what the fishermen consultants liked about the session, and what they thought should be changed for future sessions.

The discussion section of this report presents some of the "lessons learned." These relate not only to the information that was collected, but also to the design and implementation of a collaborative project, and the development of products for application in fisheries management. It is the hope of the collaborative team that the lessons learned through this project will open the door to an improved understanding of how to gather experience-based knowledge in a practical, timely, and sufficient manner so that it can be confidently incorporated into the universe of available data for management decisions.

Section 3 - Results

Participants

The focus sessions took place on October 8, 2003 for trawl gear fishermen and October 9, 2003 for fixed gear fishermen. Nine fixed gear fishermen and seventeen trawl fishermen, each of who met the standards for participation, served as fishermen consultants. The estimated total years of fishing experience for the group was 736—with mean experience level of 28.3 years. Every fisherman questioned had participated in multiple fisheries over their careers. Most of the fishermen consultants had considerable experience in two or more of the following fisheries:

Dungeness crab
Pink Shrimp trawl
Groundfish bottom trawl
Groundfish midwater trawl
Whiting midwater trawl
Halibut longline
Sablefish longline
Sablefish pot
Salmon troll
Alaska King & Tanner crab
Rockfish longline

All had gained their experience fishing on the West Coast and in Alaska. All had at least 15 years of recent experience in the fishing grounds located on Chart # 18520 (Yaquina Head to Columbia River, Oregon). However, many indicated that they spend less time on the ocean now than they did earlier in their careers. Their estimated number of days at sea per year ranged from an average of 200 to 300 several decades ago to less than 100 now, primarily due to increased regulation.

The quick evaluation at the end of each group focus session yielded insights into what the fishermen consultants thought should be changed for future sessions and what they liked about the session, including their interest and desire to do additional work with the project.

Products

Attached to this report (or on the accompanying compact disk) are the thirty maps that resulted from the group focus sessions with separate maps for each appropriate combination of gear type, era, and season. Some maps represent multiple eras and/or multiple seasons where applicable.

Distinct polygons on each chart represent where the fleet fished. Each polygon was given a number as an identifier only. The intensity of the fishing effort (the estimated average number of boats per day for the season) is indicated by the graded color scheme. Intensity values are independent of the size of the polygon. For example, two polygons that are vastly differing in size may both be shaded with the same fishing intensity color, indicating that a similar number of boats might be found in both polygons.

Each map has a corresponding table that provides, in text form, the same intensity information presented on the maps (except that the location is indicated only by polygon number). These tables provide information on the habitat/fishery, the estimated average number of boats per day for the season (and, in most cases, the normal range) for that particular fishing gear, era, and season (see appendix 8).

Section 4 - Discussion and Conclusions

A draft report was presented to the TRC at their November meeting. This report (dated December 23, 2003) incorporates input from the review of the TRC and the fishermen consultants who participated in the project. The maps and tables capture the information provided by the fishermen consultants. This discussion and conclusion relate primarily to the lessons learned in design and implementation of this pilot project. These lessons are grouped with regard to each objective of the project. A comparison analysis of the data (e.g. comparison with substrate GIS maps, etc.) is being conducted by TerraLogic. That analysis will provide lessons learned with regard to the accuracy or comparability of this information. The results of this analysis and any others that are done to compare distribution of fishing effort will be posted on Pacific Fishery Management Council website: www.pcouncil.org under the Groundfish Essential Fish Habitat section.

Discussion related to Objective 1-- Gathering and Producing a Compilation of Experienced-Based Information

The standards and protocols for the project were essential in producing what – in the collaborative team's opinion – is most likely a reliable and accurate product. The selection and recruitment process and the quality of the dialog during the sessions were particularly important to this perception.

Content

Discussion related to this objective can be categorized by process and content. Content issues, specifically related to interpretation of the information that was generated on this project, will require further analysis such as the one being conducted by TerraLogic. Such analyses may include:

comparison in GIS of the trawl effort information to that derived from logbook data and from the Ecotrust model; and,
comparison in GIS of the fixed gear effort information to the effort information from the Ecotrust model.

However, even a cursory perusal of the maps and tables show that the fishermen consultants noted significant differences in the location of the fleet's fishing effort as defined by the gear type, seasons, and time frames of the project design. They felt confident that their pooled knowledge of the location of the fleet's fishing effort presented a good picture of the areas where fishing actually occurred. They were comfortable with the gear type parameter, though during the discussion they found it easiest to think of specific fisheries and then 'combine' them into an overall picture of effort by gear type. For example, fishermen consultants discussed where the rockfish effort occurred then mapped this information in aggregate also considering other large footrope fisheries. They were less comfortable with the time period parameter, particularly the first era which was—possibly in retrospect—too long to have captured changes due to many and diverse factors.

Although the fishermen consultants also captured and shared information on the intensity with which the fleets fished, both they and the collaborative team struggled with how best to measure this parameter. The information on the maps represents the estimated number of boats per day for the season, yet information was also captured about such factors as length of tow, number of pots, length of lines, etc. (see appendix 9).

Because the data generated by this project is limited to one geographic area, it is impossible to test the comparability of results from diverse areas of the coast. This was an important issue that was raised by the PFMC's Scientific and Statistical Committee, and the collaborative team took several steps to foster comparability and consistency. The collaborative team believes that, based on this experience, the consistency standards could be properly administered to ensure comparability in other areas of the coast. Pending further review and the availability of funds, the project may be expanded to cover other areas of the coast. If the results of this study are consistent with logbook information for the trawl fishery, subsequent iterations may reasonably be limited to fixed gear.

Process

Regarding the process of implementing this project, several lessons were learned that could be used to tune the methodology based on the goals of the end-users. Throughout the design of the project there was a tension in developing information that would be most useful for the EFH EIS and the pragmatic issues associated with collecting information using a group focus session approach. Compromise between these competing objectives required categorization of information parameters that in some cases prohibited the direct use of all the finer-scale information that the fishermen consultants possess.

For example 'trawl gear' was grouped into 4 categories even though information could also have been mapped based on specific fisheries within each gear type. Similarly, time was divided into three eras and further sub-divided into three seasons. Time could clearly be categorized into more or less eras. The trade-off is that more divisions of any parameter would add work and time to the group focus session, unless savings can be found elsewhere. While the fishermen expressed discomfort (particularly with the length of the first era and the fact that effort patterns underwent shifts within the era as a result of market and regulatory forces), they were able to articulate and agree as a group on referenced characteristics for an "average or representative year," and complete their work within the 8-hour day. The referenced characteristics of the representative year or their definition of each particular fleet were captured on flip charts (see appendix 7). These notes primarily served participants throughout the day as a reference for the mapping exercise. However, this finer scale information was captured and could be generalized, grouped, or used in other appropriate ways (one example being the characteristics of Era 1 [see appendix 7]). Since the choice of categories is the main limitation on the product, those categories that are critically important to the end-user and must be carefully considered prior to implementation. If this project is to be continued, the adequacy of the categories chosen by the collaborative team should be reviewed.

An important lesson learned by the group is a significant amount of up-front planning was necessary to accomplish all of the desired objectives within an eight-hour focus session. The collaborative team invested hundreds of hours in designing and refining the project. These preparatory steps were essential and the time invested up-front allow us to "go fast" in the actual sessions and successfully capture the information from the fishermen consultants in two eight-hour days. The time invested in the selection, recruitment and orientation of the fishermen consultants prior to the focus sessions resulted in the fishermen requiring only a brief orientation during the meeting.

Even with this intense planning and preparation, the eight hours for the session was marginally sufficient. We were fortunate not to experience any unforeseen circumstances that would almost certainly have resulted in a longer session or an incomplete data set.

Discussion related to Objective 2 -- Collaborative Design and Implementation

The collaborative nature of the project design process was essential to incorporate the expertise necessary to achieve the objectives for this study. The relevant expertise included practical knowledge of the various fisheries, research techniques (from both the social science and natural resource disciplines), awareness of potential end-uses for managers, and expertise in GIS software.

The selection and recruitment process was essential to having the right people involved. Management of the process by a respected fisherman who functioned as a key informer played an important role in the quality of the consultants who were successfully recruited because of his professionalism, style of communication (engaging, open, honest, and willing to talk and listen), and the fact that he had much in common with those he was asking to participate (years of experience at sea, experience with the ups and downs of fishermen/management relations, etc.).

Other factors that influenced the recruitment process were weather, meeting location, and communication by the lead fisherman consultant. Weather strongly influences fishing activity. Bad weather on the days of the focus sessions worked ironically to the advantage of the project by preventing fishermen from being out at sea and otherwise unavailable. The location of the meeting was established strategically to be in close proximity to participants.

Discussion Related to Objective 3: Gaining Experience in the Utilization of Fishermen's Knowledge

The extent to which the information is actually utilized by scientists and managers remains to be seen but will become more evident with further analysis and comparisons to other sources of effort information.

All of the fisherman consultants exhibited a strong desire to participate in the study, with most expressing optimism that their input might eventually be used in the management process. It should be noted that the small amount of compensation provided for the day ($300 to cover both time and expenses) was not the notable factor that determined participation. Rather, during the recruitment almost all of the fishermen got excited about the prospects of the project and agreed to participate (if they were available) without even knowing about the compensation to be provided. Such willingness seems to indicate that the amount of money was not the factor that determined interest in participation in this project. The amount of money necessary, in absence of the motivation to participate in and of itself, was never tested.

The facilitated group focus session appears to be a reliable method of recording fishermen's knowledge. The dynamic afforded by the focus session allowed the fishermen to interact and build on each other's knowledge and ostensibly improve the amount and quality of information that was generated. This also helped maintain interest and enthusiasm throughout the day by all involved. Separating fishermen by gear type groups (trawl versus fixed and sometimes further subdividing within gear types) was helpful in creating a conducive and safe environment for sharing information and for assuring information was compatible so it could be built upon.

On a practical level, it is also clear that information from fishermen can be collected following a specific and documented methodology; that this information can be mapped on nautical charts in discrete ways, and that this mapped information can be reliably transferred to a digital format and utilized in a GIS-based system for analysis. It is also apparent that, due to the defined and documented methodology, this project could be replicated elsewhere or with fishermen in the same area, or using different parameters for information synthesis, for comparison and research purposes.

Section 6 - References

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Section 7 - Acknowledgments

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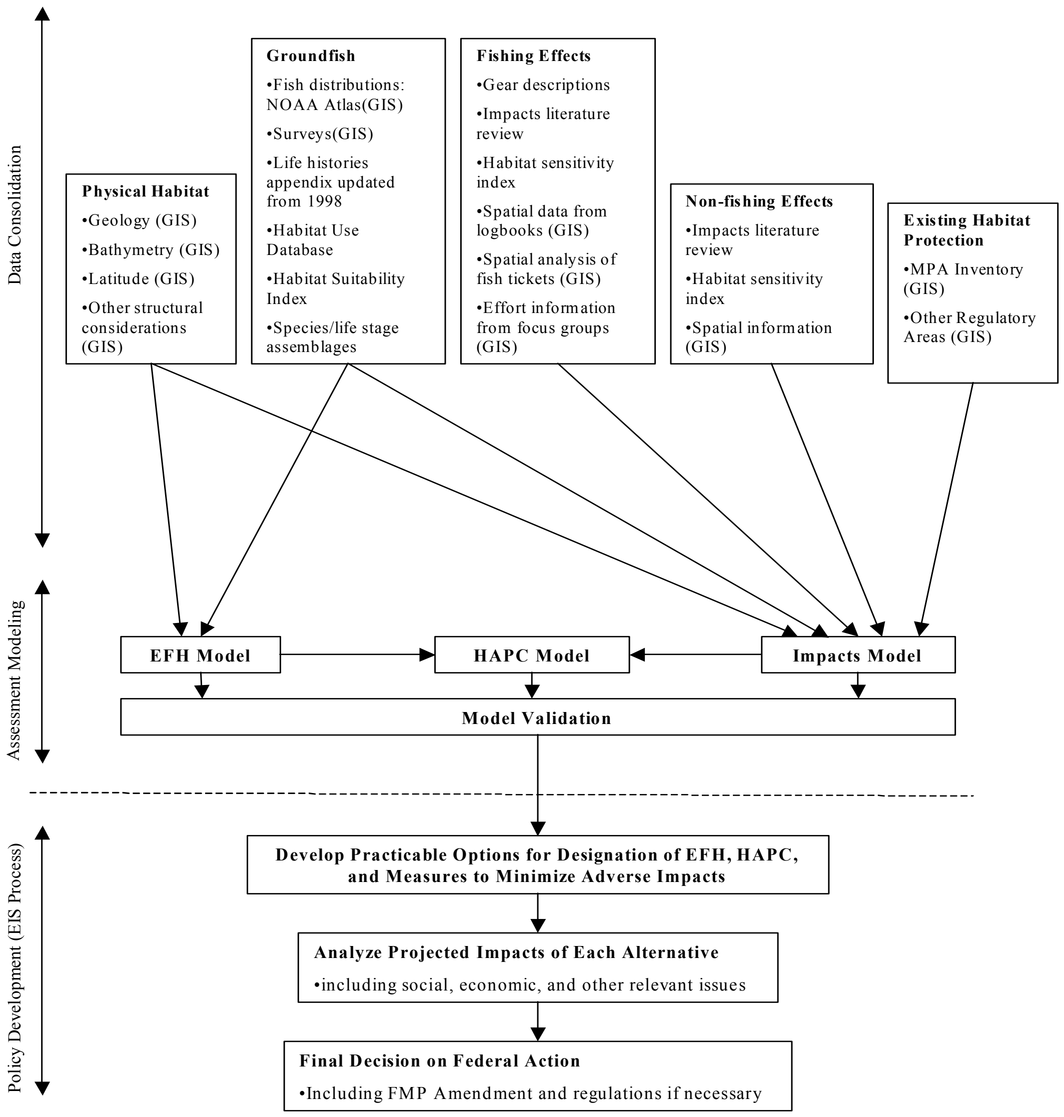
Appendix 1 - EFH EIS Background

Draft Decisionmaking Framework for Pacific Coast Groundfish Essential Fish Habitat Environmental Impact Statement
(modified from the draft presented at the April, 2002 Council meeting)



Appendix 2 – Lead Fisherman Consultant's Talking Points

[Self-introduction] Thanks to everyone for being there. Note that we have a tremendous amount of experience in the room, perhaps 300 years of on the ground experience represented today. State that they have been selected based on their long experience in the fishing industry, their knowledge of the grounds we are going to look at today, and their willingness to work together to record the information.

Mention the personal excitement about the possibilities of capturing fishermen's knowledge and recording it in a way that may allow it to be used in the management process—noting that one of our (fishermen's) complaints over the years is that the management system didn't have a way to use our experience- based information. If we pull this off, we will have showed a way to do this. There is no guarantee that our work will get used, but this is a first step that needs to be taken if we are ever going to have our experience and knowledge captured for use. Even if this isn't used we may be paving the way for future

Confirm that there are no predetermined outcomes…we are after the best fishing effort information available. Note that we are not looking for anyone to provide information on a special tow or set that would compromise a business secret, but we are looking for a consensus on patterns of where the fleet fishes.

Remind people to please turn in their completed contracts if you haven't' already. Note your awareness that those in the room are doing this because they care enough to want decisions made on good information, but that we do want to cover their costs for being with us today. Recognize that this isn't a great deal of money, but that it is acknowledgment that NOAA Fisheries and Pacific States Marine Fisheries Commission is providing some recognition for the value of their time.

Note the important background role that a couple of people in the room are taking. "Steve Copps is from NOAA Fisheries; he has been a big supporter of this project to use fishermen's experience based knowledge. Allison Bailey is a GIS specialist who is here to record the information you produce. She will digitize the info into electronic chart layers.

Flaxen Conway is here to help us do this process ~~in~~ a scientifically valid way so that what we produce can be used. And since we have a lot of ground to go over, she is also here as a facilitator to keep us on track and make sure we get through it.

Ask people to introduce themselves, noting the fisheries they participate in and home ports.

Appendix 3 - Facilitator's Talking Points (ground rules, etc.)

Housekeeping

- bathrooms
- food
- smoke breaks
- conditions for using this meeting site

What we need to accomplish in today's session

- draw maps related to 1 nautical chart
- 1 each for a "representative year" in each of three eras (1-3 seasons in that representative year)
- for all gear types
- THAT'S ___ maps...and we want to assign a relative value for intensity for each polygon drawn on these maps... SO WE'VE GOT **A LOT** TO DO!
- We need to get this done in an effective manner
- we don't have a lot of time

_ I'll be pushing to keep us going and moving ahead

We need to get this done is a fair, open, and honest way...feel tired but good at the end. Our rules of playing well together today are simple:

-build on what others have said...don't just repeat things over
-let someone finish what they have to say...don't interrupt
-everyone is expected to participate fully...several perspectives can be combined to give an accurate picture
-speak up if we don't capture your input correctly
-agree to disagree...and do it respectfully
-take care of your bodily functions...but we will have breaks in the am & pm
-cell phones on vibrate or silent please
-confidentiality (what you hear here, stays here. The data will become public knowledge...but who said what when and who was here will not).

_ So, it's a lot...and we'll be bushed at the end of the day...so let's get going.

Appendix 4 – Consistency Standards

Full Disclosure Standards: Through the recruitment process and during the focus sessions, the investigators shall practice full disclosure in potential uses of the fishing effort information being collected in this project. The fishermen consultants will be brought to a common understanding of the goals and objectives for the project and the group focus sessions, as well as relevant background. This information is the same for all the group focus sessions regardless of geographical area or gear category and is specifically designed to disclose potential uses of the information the fishermen will be providing.

Standards of Openness: For results from multiple group focus sessions to be comparable and acceptable as a reliable representation of experiential data, consultants are required to open and honest in sharing information on fishing effort.

Recording Standards: All of the information from all of the group focus sessions will technically be recorded in exactly the same way. The recorder will project (or otherwise make available) digitized nautical charts and interpretive tables. The charts will be the same ones that are predominantly used by the fleet in the appropriate geographical area to conduct fishing operations. The consultants will then guide the recorder to digitally mark up the charts and tables according to the goals and information parameters of the project. GIS technology gives the recorder considerable flexibility to respond to consultant requests for altering the display (i.e. changing scale, moving information to the background or foreground, etc.). A brief written summary (included in the recruitment package) and verbal presentation by the recorder (at the beginning of each focus session) will explain in an appropriate level of detail:

an overview of what GIS is;
the technical capabilities for the group focus sessions;
the information that will be entered into the GIS;
the chart legend that will be applied to interpret the GIS data (color schemes and patterns to differentiate between information types); and,
review procedures to ensure the final GIS product represents the information provided by the consultants.

(Note: the methodology section of this report describes the methods used to implement the group focus sessions. Please see this section for exact details of how the group focus sessions were facilitated and recorded).

Information Standards: It is a considerable challenge to ensure information that is collected from geographically diverse group focus sessions is comparable. To address this challenge, limits will be imposed on the categories of information and the means by which it is collected. Fishing effort will be categorized by time, gear, intensity, and area. Limits for each of the categories will be discussed at the recruitment visit and at the beginning of each group focus sessions (and brought up by the facilitator as necessary).

Appendix 5 - Sample Contract

Fisherman Consultant/Participant Agreement
Cooperative Fishing Effort Pilot Project

Pacific States Marine Fisheries Commission
45 SE 82nd Ave Suite 100
Gladstone, Oregon 97027-2522

PSMFC JOB NO.

LEGAL NAME:
TAX ID/SOCIAL SECURITY NO:
ADDRESS:
PHONE NO.:
FAX NO:

Pilot Project to Profile West Coast Fishing Effort Based on the Practical Experience of Fishermen

(To be filled out by PSMFC)

DATE OF COMPLETION:_______________________

APPROVED BY:______________________________

SERVICES TO BE PERFORMED: Receive briefing on project orally, read background material, fully participate in a one day meeting and supply information from my experiences of fleet fishing location and effort according to parameters defined for the project.
CONTRACT AMOUNT: $300 (includes time and expenses)
TOTAL AMOUNT DUE UPON COMPLETION OF SERVICE: $ 300

CERTIFICATIONS:
I am willing to speak about my experience and knowledge.

I have about 20 years experience in commercial fishing on the West Coast, with much of this experience gained within Oregon.

I have good practical knowledge of the fleet’s operations. I know the area, know the gear types, know the fisheries.

I will participate openly and honestly in this work.

I will read background information to prepare for the meeting and will attend the all day group session. I will help map and discuss fleet effort.

I understand that the information that I provide will be used by NMFS and other entities as a representation of fishing effort based on practical experience and that this information will become the property of the Pacific States Marine Fisheries Commission.

I am an independent contractor and understand that no insurance is being provided and that I shall be responsible for payment of all applicable federal, state, and local taxes and fees which may become due and owing by reason of this agreement.

Signature ____
Date ____________________

Appendix 6 - Initial Pilot (Trawl Effort North of Destruction)

Brief description (by Marion Larkin) of the pilot of the initial project design in Washington:

The program was explained individually by phone to trawl fishers who have extensive experience fishing the northern coastal waters of Washington. Through this process five fishermen were found who were willing to participate in the pilot program. Selection was based somewhat their availability in one port but more importantly, on their experience, integrity, and willingness to participate. All fishers know each other, know the other fishers who fish the area, felt they knew of and could represent the areas they did not fish. All fish now from the Port of Bellingham; some have fished the coast from the Bering Sea to Bodega Bay California. Fishers had fished the entire charted area for years and had extensive knowledge.

A meeting room with a large table was arranged, charts taped to the table along it's length in varying scales to allow participants to refer and study areas under discussion while the facilitator/participant (Marion) and one other fisher with a stead hand roughed in the outlines of areas of distinct fishing patterns onto a master/working chart. Work progressed from the larger areas of most homogeneity to the more complex. Pencil and eraser kept the process simple and fluid.

We decided to first define areas in which the bottom required but one gear to be utilized; rough bottom where roller bottom gear was required. This encompassed the rocky bottom where a directed rockfish, lingcod and petrale fishery had occurred. If an argument could be made about differing effort levels, subsets where created which allowed large seasonal patterns to be represented such as a dover sole fishery in the winter, rockfish fishery mostly in the summer and so on. For example - in the charted area, roller gear is used exclusively in the winter months outside 100 fm in prosecution of the dover, sable and thornyhead fishery. There are areas where winter petrale fishing also take place outside 100 fm within this area. Although a distinct fishery, it uses the same gear, occurs simultaneously with the dover sole fishery (has similar seasonal pattern) and similar effort levels. More work is yet to be done to define extremely high effort areas targeting rock and ling. In some cases these are very small areas but most highly used. We did not get into this detail.

The next process was to define areas where small footrope was useable. This is not to say that this is the gear always used but rather that it could be used there. Pelagic gear use areas was very roughly defined by inclusion in gear used in the large footrope/roller gear fisheries. Further work is needed to define sub-areas of highest use.

The final stage assigned fishing intensity levels to areas, fine tuned boundaries, and took a final look at the results. From this, using the same chart as draft, felt pen finalized the process. We found it helpful if a sub-set of the group worked on areas which took some thinking and then brought the discussion back for general discussion. This took place as a natural part of the group dynamics or through suggestion by the facilitator. Group discussion in some instances helped to refresh memories, aided in reaching consensus and is a very important part of the process.

This pilot charting took roughly 6 hours of group effort and another hour of review by the facilitator (Larkin)

Appendix 7 – Sample Flip Chart Notes
This information is directly transcribed from part of the flipchart notes taken at the fixed gear focus session. They are shared as an example and for information. (Flip chart notes are available for the trawl gear session as well. *Note: review from the fishermen consultants who participated in the focus sessions confirmed that for the trawl fleet, the seasons designated relate to approximately 90% of the fleet.*)

Defining a Representative Year for Each Era -- FIXED

Note: The idea for all of the "defining" areas of the process was for the fishermen consultants to define the strata within the various information parameters to help them develop characterizations they could recall throughout the session. So this wasn't designed to necessarily produce data, but rather to function as a way to discipline their input throughout the long day.

Era #1 [1986-1999]

Note: This was a tough thing to do, given so many years and so many changes that occurred over this era. The group shared their thoughts about milestones in this era and therefore qualities to consider when thinking about this era while doing their mapping and intensity recording.

Pre-ground fish limited entry = lots more people in the fishery
No El Niño
Wide range of management regulations re: groundfish over this era
Less effort per vessel re: crab
Prices more stable (albeit low) for crab
Bad weather kept people on the beach (on shore)
Generally, not as many quotas – short term derby (larger quotas = increased fishing and increased length of fishing season)
Limited entry for crab happened during this era
Japanese markets increased

Era #2 [2000-2002]

Similar to present
Phasing in more regulations
Observers came on the scene
No restricted fishing areas
Quotas low re: groundfish
More gear per vessel re: crab
Discussions about pot limits / vessels started happening. Led to more effort in Era #3

Era #3 [present]

Stable effort due to regulations re: groundfish
Prices jump around a lot
More effort re: crab
Limited areas to fish
Fish no matter the weather (bad weather doesn't keep you on the beach anymore)

Defining Seasons within Each of These Representative Years

__Longline (LL) Fleet

	Era #1	Era #2	Era #3
Groundfish			
Winter:	None	None	Sablefish open year-round
Summer:	June through September	August through September (shorter season)	April through October
Transition:	April and October	No transition	No transition
Halibut	Note: Change in hook shape = more effective; kills less non-target species	Still a derby, summer only	
Summer Only	Four 12-day openings May through August	Made the change to four 10-hr openings	Four 10-hr openings June through August

__Groundfish Pot (GP) Fleet

	Era #1	Era #2	Era #3
Winter:	None	None	None
Summer:	May through August	April through October	April through October
Transition:	October	Just try not to affect other fisheries.	

__Crab Pot (CP) Fleet

	Era #1	Era #2	Era #3
Winter:	December through February	December through February	90% is caught December through February
Summer:	April through July	April through July	April through July
Transition:	March and August	March and August	March and August

Define the Fleet – FIXED

Note: beginning of Era #1, open access (no permits) there were around 700 vessels (max). By the end of Era #1, 7 days after limited entry, there were 160 boats (LL) and 33 boats (GP).

Bottom Longline Fleet (LL)

With Halibut, the hooks on the bottom all eras
Longline crabbing stopped in Era #1.

Era #1

Gear modifications – hooks laid on bottom
Lots of gear lost
Just long-lined at the beginning
There were tiered levels (open access)
Lots of big Seattle boats used to come down
There were 12-15 [mid 50' – 60' range] boats. Then salmon trollers got involved [40' boats. By the end of this era, the range was 40'-60' boats.
More processing options.

Era #2

Gear modifications – By this era line/hooks floating
Somewhat less gear loss
Do variety of gears
Stopped tiered levels; slowed open access
Lots of big Seattle boats still coming down
Generally 45-65' boats
The ability to combine/stack permits resulted in bigger boats; increased boat size resulted in increased effort

Era #3

Gear modifications – now all line/hooks floating
More relaxed controlled fishing.
Less gear loss, less crew, less time, less gear.
Limited open access
Less big Seattle boats coming down; sold permits
Generally 45-65' boats
The ability to combine/stack permits resulted in bigger boats (90'); less smaller boats
Combined/stacked permits
Limited processing options

Groundfish Pot Fleet (GP)

Generally bigger boats 40'-115' (60-80' average)

Era #1

- Most pots used
- Used to fish year round, or close to it, several months
- More gear loss
- Big operations w/lots of traps
- Lots of gear conflicts
- No grading
- Most processing options

Era #2

- With quotas there became less pots
- Somewhat less gears loss
- Less traps
- Gear conflicts taper
- Grading begins
- Limited processing options

Era #3

Use less pots

- Lots less gear loss
- Least traps
- Lots less gear conflicts
- Traps modified (escape rings) = grading done in pots in the ocean
- Still limited processing options

Crab Pot Fleet (CP)

Era #1

- More day boats
- Weather plays big role
- Least amount of effort
- Less thievery / gear lost
- More, smaller boats
- More processing options
- Longer fishery
- Limited entry starts

Crab Pot Fleet (CP)

Era #2

- More effort, more crew, more attitude
- More day boats
- More gear loss
- More seasonal limits
- Less processing options

Weather playing less of a role…more apt to go out despite the weather

Era #3

- Most effort/vessels
- Most thievery
- Most gear lost
- Lots of day boats; more boats period. Bigger and smaller, port dependent.
- Fish despite weather; hang on for dear life
- Limited processing options.

Appendix 8 - Example Intensity Table

Trawl Gear Table

Gear: **LF**
Era Number: **1**
Season: **Winter**

Polygon No.	**Habitat / Fishery**	**Ave. No. of Boats per Day for the Season**	**[Note, normal days / range depended on the quota] Normal Range (Min.)**	**Normal Range (Max.)**
1	Hardbottom	1		
2	Hardbottom	2.5	2	3
3	Deep Water & Complex	14	8	20
4	Complex	3	1	10
5	Hardbottom	1.5	.5	5
6	Complex	1.5	.5	5
7	Complex	1.5	1	5
8	Hardbottom	1	.5	2
9	Complex	2	1	4
10	Hardbottom	2.5	2	6
11	Hardbottom	2.5	2	6
12	Hardbottom	1.5	1	2
14	Complex	6	3	9

(NOTE: 1 boat/day is a lot for a rock cod spot)

Appendix 9 - Questions for Facilitated Discussion on Intensity

A. Trawl Focus Session

For each part of the *trawl fleet, for each era and each season,* relative effort intensity is the product of three factors (a x b x c) as described below:
a = average length of tow this fleet makes (a constant figure; making note of the normal range whenever possible),

What is the average and normal range for?

	Average			***Normal Range***		
	Era 1	**Era 2**	**Era 3**	**Era 1**	**Era 2**	**Era 3**
LF =						
SF =						
PE=						
PS =						

b = average number of tows per day this fleet makes (a constant figure; making note of the normal range whenever possible),

What is the average and normal range for:

	Average			***Normal Range***		
	Era 1	**Era 2**	**Era 3**	**Era 1**	**Era 2**	**Era 3**
LF =						
SF =						
PE=						
PS =						

Then, for the last one – c – for each map (each era, each season, and each gear type) please work together to give me a figure (for each polygon) related to the average number of boats per day for the season (no constant; making note of the normal range when possible).

B. Fixed Gear Focus Session

For *the longline fleet*, intensity as the product of the three factors (a x b x c) as described below:
a = average length of groundline per set for this fleet (a constant; making note of the normal range and the average spacing of the hooks on that average length of groundline),

What is the average length (and normal range) of groundline?

	Average			***Normal Range***		
	Era 1	**Era 2**	**Era 3**	**Era 1**	**Era 2**	**Era 3**
BLL =						

What is the average (and normal range) for the spacing of the hooks?

	Average			***Normal Range***		
	Era 1	**Era 2**	**Era 3**	**Era 1**	**Era 2**	**Era 3**
BLL =						

b = average number of sets per day for this fleet (a constant; making note of the normal range if possible)

What is the average (and normal range) number of tubs/hooks per day?

	Average			***Normal Range***		
	Era 1	**Era 2**	**Era 3**	**Era 1**	**Era 2**	**Era 3**
BLL =						

For *the pot fleet* (both groundfish and crab), we will be looking at intensity as a x b x c, where a, b, & c, are defined as:

a = average number of pots per string in this fleet (a constant; making note of the normal range and the average distance between traps and the average length of ground line),

What is the average number of pots per string (and normal range)?

	Average			***Normal Range***		
	Era 1	**Era 2**	**Era 3**	**Era 1**	**Era 2**	**Era 3**
GP =						
CP =						

What is the average distance between traps (and normal range)?

	Average			***Normal Range***		
	Era 1	**Era 2**	**Era 3**	**Era 1**	**Era 2**	**Era 3**
GP =						
CP =						

What is the average length of groundline (and normal range)?

	Average			***Normal Range***		
	Era 1	**Era 2**	**Era 3**	**Era 1**	**Era 2**	**Era 3**
GP =						
CP =						

b = average number of strings ran per day by an average boat (a constant; making note of the normal range),

What is the average number of strings ran per day (and normal range)?

	Average			***Normal Range***		
	Era 1	**Era 2**	**Era 3**	**Era 1**	**Era 2**	**Era 3**
GP =						
CP =						

Then, for the last one – c – for each map (each era, each season, each gear type) please work together to give me a figure (for each polygon) related to the average number of boats per day for the season (no constant; making note of the normal range when possible).

GENERAL NOTE:

1 boat in 3 days = .34 boats/day for the season
1 boat in 4 days = .25 boats/day for the season
1 boat in 5 days = 0.20 boats/day for the season
1 boat in 7 days = 0.14 boats/day for the season
1 boat in 10 days = 0.10 boats/day for the season
2 boats in 10 days = 0.20 boats/day for the season
3 boats in 10 days = 0.30 boats/day for the season
1 boat in 15 days = 0.067 boats/day for the season
1 boat in 60 days = 0.0167 boats/day for the season

More information on this assessment methodology is available on the Council's web site at http://www.pcouncil.org/habitat/habback.html.

Appendix 5. Fishing Effort GIS Data Assessment for Groundfish Essential Fish Habitat

Final Report

Fishing Effort GIS Data Assessment for Groundfish Essential Fish Habitat

Prepared for:

Pacific States Marine Fisheries Commission

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May 2004

1. Introduction

Spatial delineation of fishing effort data is a necessary component of the modeling and analysis for the West Coast EFH EIS. There are several potential data sets to provide this information for the BBN impacts models. Each data set has its own strengths and limitations, especially concerning geographic coverage, gear type(s), temporal coverage, and data source(s). Now that these effort data have been compiled into one location, we are able to explore the data and perform comparisons between the various data sets.

This document describes the initial fishing effort data comparisons and review that have been completed by TerraLogic GIS in response questions from the Technical Review Committee (TRC) in November 2003. Three fishing effort data sources were used in these comparisons: (1) Trawl logbook data from PACFIN, 1987-2002, (2) Ecotrust's fishing effort model output, 1997 and 2000 (Sholz 2003), and (3) Focus group data gathered from fishermen for a single nautical chart off Oregon (18520) during three eras, 1986-1999, 2000-2002, 2003 (Bailey et al. 2004). The comparison of these three fishing effort data sets is made difficult by the variation in their spatial resolution, temporal resolution, and attribution (gear types and intensity measures). Table 1 summarizes the key characteristics of each data set.

In order to use time and budget resources most effectively, we prioritized the comparisons between the focus group data and the other two data sources. The third possible comparison, between Ecotrust data and trawl logbook data, was not undertaken because the logbook data were available to Ecotrust for their model development, whereas the other pairs of data sets were developed independently. However, if resources and priorities allow, this third comparison could be completed.

The general goals of these comparisons were to determine the extent of spatial correspondence between various data sets. The comparisons serve to answer two distinct questions:

(1) Are the spatial locations of these fishing effort data sources coincident and consistent with each other, and,

(2) are the estimates of the magnitude of area affected by fishing similar, whether or not they are they are spatially coincident?

A third question -- are the levels of intensity of fishing effort in areas of spatial coincidence consistent with each other -- has not been addressed at this stage of the analysis.

In addition to the comparisons between fishing effort data sources, we also explored the spatial and temporal characteristics of the trawl logbook data, and we investigated the relationship between the focus group polygons and geologic bottom type.

We realize that there are many more analyses that could be undertaken, particularly comparisons of intensity between data sources. Nonetheless, we provide these results as an informative initial comparison and exploration of these various data sets.

Table 1: Characteristics of Fishing Effort Data Sets

Data Set	Extent	Spatial Resolution	Gear Types	Temporal Attributes	Intensity Measure	Catch Measure
Oregon Fishermen's Focus Group	Northern coast of Oregon from Newport to Columbia River (NOAA Chart 18520)	Polygons delineated by fishermen on 1:185,238 scale chart	Trawl: Large Footrope Small Footrope Pelagic Pink Shrimp Fixed: Crab Pot Groundfish Pot Longline	Data by Era: Era 1 (1986-1999) Era 2 (2000-2002) Era 3 (2003) Data by Season: ?Summer Transition Winter	Average number of boats per day by polygon Average tows per boat Average hours per tow	None
Ecotrust Model	West Coast (OR, WA, and CA)	9 x 9 km blocks	Trawl: Trawl Fixed: Pot/Trap Longline Hook and Line Other Gear	Model results summarized by year: 1997 2000	None – Catch used as a proxy for intensity	Pounds caught per year by 9 km block Revenue per year by 9 km block
Trawl Logbook	West Coast (OR, WA, and CA)	Original data source are set points for each tow. These set points are then assigned to the Trawl Logbook Blocks (mostly 10 minute blocks with others of various size). All effort from any given tow is assigned to the block in which the set point occurs.	Trawl: Flatfish Groundfish Roller Other Midwater	Set point data for each tow from 1987 – 2002 *All records contain tow year, but only 57% contain actual date of tow. Therefore, data can be summarized by year or years however they cannot be summarized by seasons within years.	Number of tows Tow duration	Pounds caught per tow

2.1 Comparison of Ecotrust Effort Model and Focus Group Data

In order to compare the focus group data to the Ecotrust data, we generalized the focus group data to the 9 x 9 km blocks, the same spatial resolution as the Ecotrust effort model blocks. In addition, because the Ecotrust data is summarized by year, focus group polygons for all seasons within a one gear type and era were combined. Table 2 shows the total area of each focus group gear type and the increase in total area when generalizing the focus group polygons to the 9 km blocks.

Table 2: Focus Group Polygon and Block Area Summaries

Focus Group Era	Focus Group Gear Type	Area (square km)		Percent Area Increase
		Focus Group polygons	Focus Group blocks	
1	Crab Pot	5438.0	7400.6	36.1%
	Groundfish Pot	127.0	729.0	474.2%
	Longline	5354.7	9315.1	74.0%
	Large Footrope Trawl	9224.8	12312.1	33.5%
	Small Footrope Trawl	4046.4	11667.4	188.3%
	Pelagic Trawl	770.3	3159.0	310.1%
	Pink Shrimp Trawl	3855.3	6642.0	72.3%
2	Crab Pot	1753.3	7400.6	322.1%
	Groundfish Pot	7368.5	11502.1	56.1%
	Longline	5929.6	8667.1	46.2%
	Large Footrope Trawl	8462.5	12231.1	44.5%
	Small Footrope Trawl	8201.7	11667.4	42.3%
	Pelagic Trawl	435.8	1296.0	197.4%
	Pink Shrimp Trawl	3855.3	6642.0	72.3%

Once both data sets were in the same spatial and temporal context, the comparison was performed as a simple presence/absence analysis. The blocks that were intersected by focus group effort polygons, were counted as focus group blocks. Blocks that were assigned catch by the Ecotrust model, were counted as Ecotrust blocks. Any blocks that had both Ecotrust and focus group effort, were counted as coincident blocks. For purposes of this presence/absence analysis, an area of "effort" is any area where fishing occurred, regardless of its level of intensity.

Comparisons were made within corresponding gear type and era/year. Analysis was limited spatially to the boundaries of the chart used in the focus group sessions, NOAA chart 18520, an area of approximately 115 km by 190 km. Table 3 lists the comparisons performed and summarizes the number of blocks (and area) for each data source as well as the coincident blocks.

Table 3: Block summaries for focus group, Ecotrust and coincident blocks.

Focus Group Era	Eco-Trust Year	Focus Group Gear Type	Ecotrust Gear Type	Number of Blocks * (Area in km²)		
				Focus Group	Ecotrust	Coincident
1	1997	Groundfish Pot	Pot/Trap	9 (729.0)	9 (729.0)	0 (0)
		Longline	Longline	115 (9315.1)	36 (2916.0)	16 (1296.0)
		Large Footrope Trawl	Trawl	152 (12312.11)	148 (11960.4)	117 (9477.1)
		Small Footrope Trawl		155 (11667.4)	148 (11960.4)	109 (8801.3)
		Pelagic Trawl		39 (3159.0)	148 (11960.4)	28 (2268.0)
2	2000	Groundfish Pot	Pot/Trap	142 (11502.1)	14 (1134.0)	3 (243.0)
		Longline	Longline	107 (8667.1)	28 (2268.0)	9 (729.0)
		Large Footrope Trawl	Trawl	151 (12231.1)	119 (9611.3)	90 (7290.1)
		Small Footrope Trawl		155 (11667.4)	119 (9611.3)	101 (8153.3)
		Pelagic Trawl		16 (1296.0)	119 (9611.3)	11 (891.0)

* 307 blocks within study area.

To visualize the distribution of these two data sets, maps showing the focus group blocks, Ecotrust blocks, and coincident blocks by era and gear type have been developed and are provided in Appendix A.

The total area affected by fixed gear fishing (groundfish pot, longline) as predicted by the Ecotrust model, is generally much smaller than the total area affected by fixed gear as delineated by the fishermen's focus group. Spatial coincidence between the two data sources for fixed gear is also fairly low. For bottom trawl gear, the area estimates are much more similar and spatial coincidence is greater between the two data sources.

2.2 Comparison of Trawl Logbook Data and Focus Group Data

Analogous to the comparison with the Ecotrust data, we generalized the focus group effort data to the same spatial resolution as the trawl logbook blocks. The comparison was performed as a simple presence/absence analysis. The logbook blocks that were intersected by focus group effort polygons, were counted as focus group polygons.

Blocks that had logbook effort, were counted as logbook polygons. Any blocks that had both logbook and focus group effort, were counted as coincident polygons.

Trawl logbook data that had no block number or lat/long coordinate were excluded from the analysis. A total of 668,047 logbook records, from 1987 to 2002 were included in the analysis. Five gear types are available in the Pacfin logbook data: Flatfish Trawl (FFT), Groundfish Trawl (GFT), Roller Trawl (RLT), Other Trawl (OTW), and Midwater Trawl (MDT). With these categories, we are unable to distinguish large footrope trawl tows from small footrope trawl tows, so they were both compared to the four bottom trawl types (FFT, GFT, RLT, OTW). The pelagic trawl data from the focus group were compared to Midwater Trawl (MDT). The pink shrimp trawl had no corresponding gear type in the logbook data.

For the era comparisons, all logbook tows from 1987 to 1999 were combined for the comparison with focus group Era 1 data. Similarly, logbook tows from 2000 to 2002 were compared with Era 2 data. Table 4 shows the block count comparison.

Table 4: Block summaries for focus group, logbook, and coincident blocks

Focus Group Era	**Logbook Years**	**Focus Group Gear Type**	**Logbook Gear**	**Number of Blocks (76 total)**		
				Focus Group	**Trawl Logbook**	**Coincident**
1	1987-1999	Large Footrope Trawl	Bottom Trawl	63	76	63
		Small Footrope Trawl		51	76	51
		Pelagic Trawl	Midwater	23	69	23
2	2000-2002	Large Footrope Trawl	Bottom Trawl	64	76	64
		Small Footrope Trawl		51	76	51
		Pelagic Trawl	Midwater	9	57	8

The presence/absence analysis with the logbook data is somewhat limited because all or nearly all of the logbook blocks in the study area have had some effort during the two time periods. Therefore, for visualization we included an intensity measure for the logbook data. We calculated the total duration of tows for each year by block, and then averaged this value for all years in the era. Maps showing these logbook and focus group blocks, as well as focus group polygons are attached in Appendix B.

Because the large size of the logbook blocks may obscure finer scale spatial patterns, we also compared the focus group polygon boundaries to set point locations. Distinct boundaries delineated by the fishermen in the focus group are clearly exhibited in the logbook set points, particularly the deepwater boundary of the large footrope gear and some shallower areas delineated for small footrope gear (Figure 1 and 2).

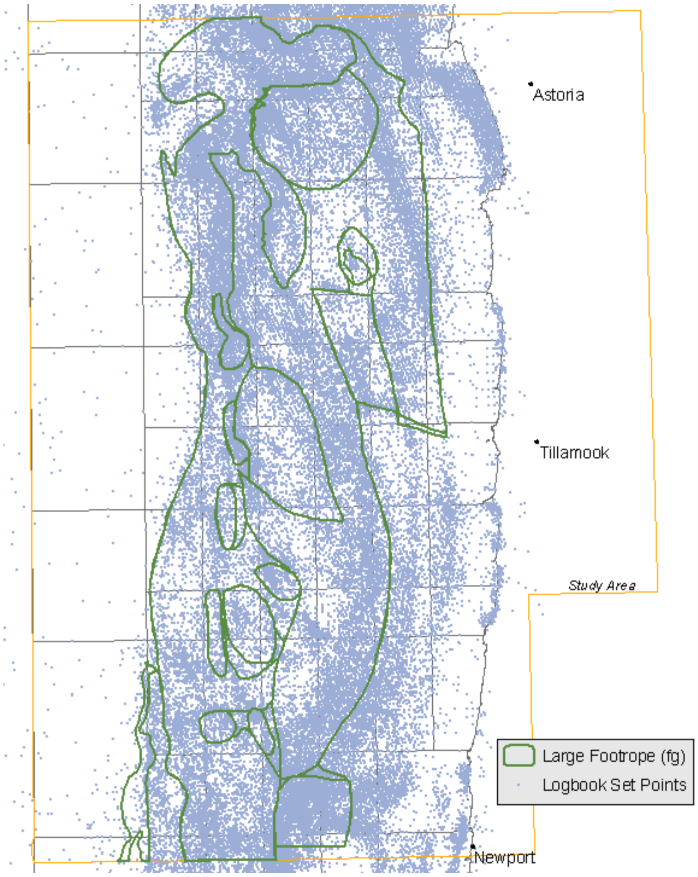

Figure 1: Trawl Logbook Bottom Trawl Set Points compared to Focus Group Large Footrope Polygons

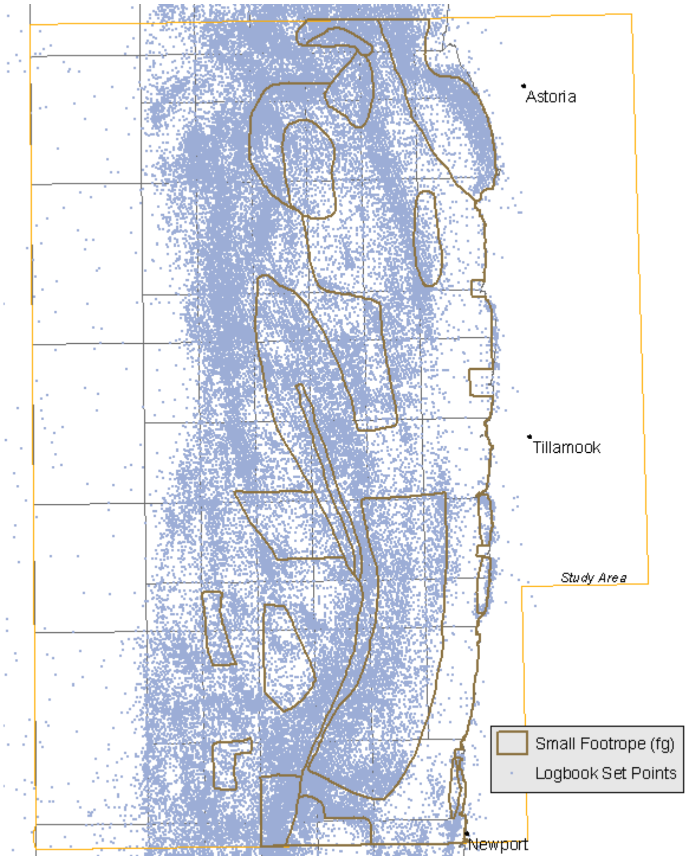

Figure 2: Trawl Logbook Bottom Trawl Set Points compared to Focus Group Small Footrope Polygons

The focus group data for pelagic trawls is less consistent with the logbook data than the bottom trawl data. It does not delineate the same areal extent as the logbook data, however, it does appear to locate areas with a higher concentration of midwater trawl set points (Figure 3).

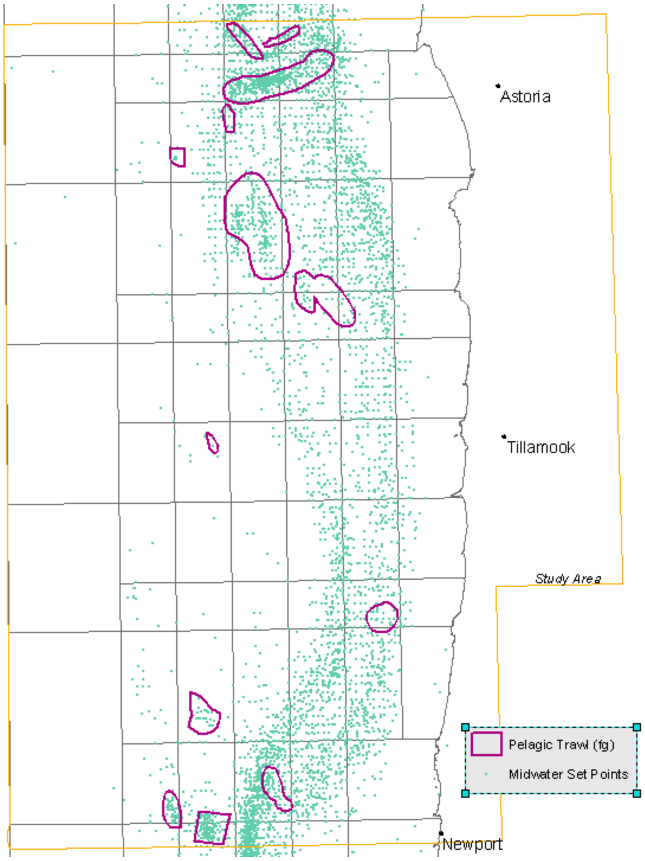

Figure 3: Trawl Logbook Midwater Trawl Set Points compared to Focus Group Pelagic Trawl Polygons

3. Spatial and Temporal Distribution of Trawl Logbook Effort

For a unique view of the changes over time in logbook effort, we created a map of the study area's logbook blocks with bar graphs depicting the total tow duration (in hours) by year in each block (Figure 4). This map depicts both the spatial and temporal distribution of trawl fishing effort in the same area covered by the Oregon focus group maps. At a glance, one can see general spatial distribution of fishing effort, as well as the change in intensity over time. We intend to create a series of maps like this one that depict the logbook blocks for the entire West Coast. In addition, because these data are available coastwide and have a range of time periods, this metric, total duration of all tows by year, will be provided as a preliminary input for the BBN impacts model.

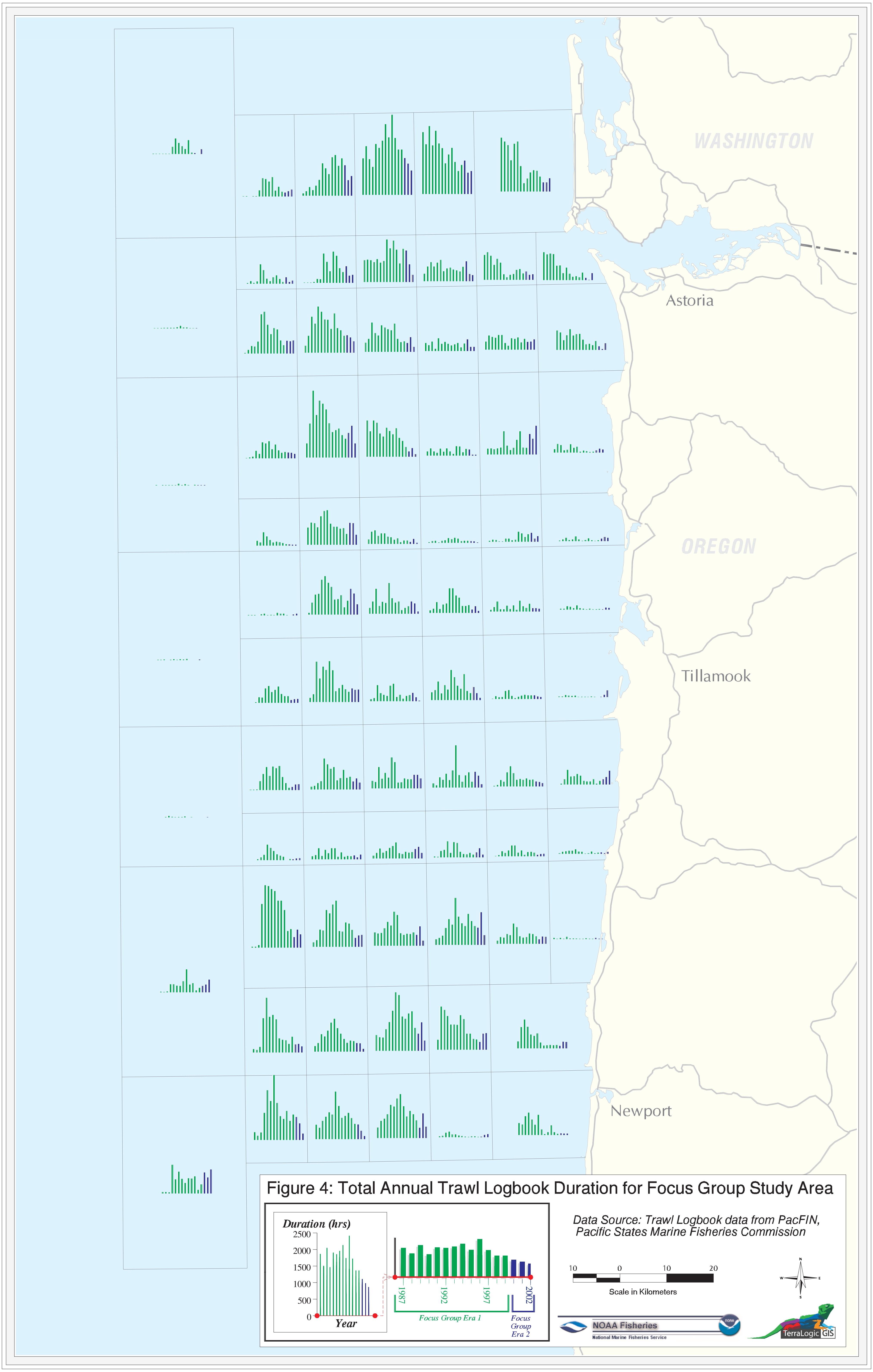

Figure 4: Total Annual Trawl Logbook Duration for Focus Group Study Area

Data Source: Trawl Logbook data from PacFIN, Pacific States Marine Fisheries Commission

4. Overlay of Focus Group Data with Geological Habitat

Focus group polygons were also overlaid with the geologic habitat data to look for habitat-specific patterns of fishing effort. Table 5 shows the total area covered by each geologic type within the study area (Table 5).

Table 5: Geologic Habitats Occurring in Focus Group Study Area

Habitat Type	Area (km2)	Percent of Total Area
Sedimentary Shelf	7350.67	36.65%
Sedimentary Slope	5820.34	29.02%
Sedimentary Ridge	3249.53	16.20%
Sedimentary Basin	1824.53	9.10%
Rocky Ridge	787.14	3.92%
Sedimentary Slope Canyon Wall	289.03	1.44%
Sedimentary Slope Canyon Floor	224.09	1.12%
Rocky Shelf	219.39	1.09%
Rocky Slope Canyon Wall	91.29	0.46%
Rocky Slope	66.73	0.33%
Sedimentary Shelf Canyon Wall	54.47	0.27%
Rocky Basin	21.89	0.11%
Sedimentary Shelf Canyon Floor	14.49	0.07%
Sedimentary Slope Gully	12.64	0.06%
Sedimentary Slope Landslide	11.92	0.06%
Rocky Slope Landslide	8.26	0.04%
Rocky Slope Canyon Floor	8.09	0.04%
Rocky Slope Gully	1.08	0.01%
Sedimentary Shelf Gully	0.70	0.00%
Island	0.09	0.00%

These results allow comparison of the habitats impacted by specific gear types to the overall coverage of each habitat type. The results from the focus group polygons and habitat overlays are shown in Table 6 (fixed gear) and Table 7 (trawl gear).

Table 6: Habitat Type Area by Focus Group Fixed Gear Polygons

Gear	Era	Season	Area (km2)	% of Total Area	Habitat Type
Crab Pot	1	Summer	2436.18	94.6%	Sedimentary Shelf
			45.92	1.8%	Sedimentary Slope
			42.81	1.7%	
			34.54	1.3%	Rocky Shelf
			12.15	0.5%	Sedimentary Shelf Canyon Wall
			1.60	0.1%	Rocky Slope
			1.10	0.0%	Sedimentary Slope Canyon Wall
			0.53	0.0%	Sedimentary Ridge
			0.08	0.0%	Island
Crab Pot	1	Transition	4041.88	94.5%	Sedimentary Shelf
			127.87	3.0%	
			45.93	1.1%	Sedimentary Slope
			45.59	1.1%	Rocky Shelf
			12.15	0.3%	Sedimentary Shelf Canyon Wall
			1.60	0.0%	Rocky Slope
			1.10	0.0%	Sedimentary Slope Canyon Wall
			0.53	0.0%	Sedimentary Ridge
			0.08	0.0%	Island
Crab Pot	1	Winter	5186.44	95.4%	Sedimentary Shelf
			127.87	2.4%	
			61.08	1.1%	Rocky Shelf
			45.93	0.8%	Sedimentary Slope
			12.15	0.2%	Sedimentary Shelf Canyon Wall
			1.60	0.0%	Rocky Slope
			1.10	0.0%	Sedimentary Slope Canyon Wall
			0.53	0.0%	Sedimentary Ridge
			0.08	0.0%	Island
Crab Pot	2 & 3	Summer	2436.18	94.6%	Sedimentary Shelf
			45.92	1.8%	Sedimentary Slope
			42.81	1.7%	
			34.54	1.3%	Rocky Shelf
			12.15	0.5%	Sedimentary Shelf Canyon Wall
			1.60	0.1%	Rocky Slope
			1.10	0.0%	Sedimentary Slope Canyon Wall
			0.53	0.0%	Sedimentary Ridge
			0.08	0.0%	Island
Crab Pot	2 & 3	Transition	5186.44	95.4%	Sedimentary Shelf
			127.87	2.4%	
			61.08	1.1%	Rocky Shelf
			45.93	0.8%	Sedimentary Slope
			12.15	0.2%	Sedimentary Shelf Canyon Wall
			1.60	0.0%	Rocky Slope
			1.10	0.0%	Sedimentary Slope Canyon Wall
			0.53	0.0%	Sedimentary Ridge
			0.08	0.0%	Island
Crab Pot	2 & 3	Winter	5186.44	95.4%	Sedimentary Shelf
			127.87	2.4%	
			61.08	1.1%	Rocky Shelf

Gear	Era	Season	Area (km2)	% of Total Area	Habitat Type
			45.93	0.8%	Sedimentary Slope
			12.15	0.2%	Sedimentary Shelf Canyon Wall
			1.60	0.0%	Rocky Slope
			1.10	0.0%	Sedimentary Slope Canyon Wall
			0.53	0.0%	Sedimentary Ridge
			0.08	0.0%	Island
Groundfish Pot	1	Summer	49.83	39.2%	Sedimentary Slope Canyon Wall
			39.22	30.9%	Sedimentary Slope
			13.46	10.6%	Rocky Slope Canyon Wall
			9.17	7.2%	Sedimentary Slope Canyon Floor
			6.31	5.0%	Sedimentary Slope Landslide
			4.72	3.7%	Rocky Slope Landslide
			3.10	2.4%	Rocky Slope
			1.15	0.9%	Sedimentary Shelf Canyon Wall
Groundfish Pot	2	Summer	4073.71	55.3%	Sedimentary Slope
			1719.98	23.3%	Sedimentary Ridge
			358.51	4.9%	Rocky Ridge
			311.49	4.2%	Sedimentary Basin
			246.92	3.4%	Sedimentary Shelf
			244.16	3.3%	Sedimentary Slope Canyon Wall
			182.59	2.5%	Sedimentary Slope Canyon Floor
			74.41	1.0%	Rocky Slope Canyon Wall
			39.40	0.5%	Rocky Slope
			38.98	0.5%	Sedimentary Shelf Canyon Wall
			20.63	0.3%	Rocky Shelf
			14.49	0.2%	Sedimentary Shelf Canyon Floor
			11.98	0.2%	Sedimentary Slope Gully
			11.55	0.2%	Sedimentary Slope Landslide
			8.26	0.1%	Rocky Slope Landslide
			7.48	0.1%	Rocky Slope Canyon Floor
			3.00	0.0%	Rocky Basin
			0.91	0.0%	Rocky Slope Gully
Groundfish Pot	3	Summer	4097.49	56.1%	Sedimentary Slope
			1719.98	23.6%	Sedimentary Ridge
			358.51	4.9%	Rocky Ridge
			311.49	4.3%	Sedimentary Basin
			244.16	3.3%	Sedimentary Slope Canyon Wall
			182.59	2.5%	Sedimentary Slope Canyon Floor
			161.44	2.2%	Sedimentary Shelf
			74.41	1.0%	Rocky Slope Canyon Wall
			45.87	0.6%	Sedimentary Shelf Canyon Wall
			39.49	0.5%	Rocky Slope
			14.49	0.2%	Sedimentary Shelf Canyon Floor
			11.98	0.2%	Sedimentary Slope Gully
			11.55	0.2%	Sedimentary Slope Landslide
			8.26	0.1%	Rocky Slope Landslide
			7.48	0.1%	Rocky Slope Canyon Floor
			6.69	0.1%	Rocky Shelf
			3.00	0.0%	Rocky Basin
			0.91	0.0%	Rocky Slope Gully

Gear	Era	Season	Area (km2)	% of Total Area	Habitat Type
Longline	1	Summer	3673.69	68.6%	Sedimentary Slope
			784.25	14.6%	Sedimentary Ridge
			373.14	7.0%	Sedimentary Shelf
			131.10	2.4%	Rocky Shelf
			126.27	2.4%	Rocky Ridge
			76.72	1.4%	Sedimentary Slope Canyon Wall
			47.17	0.9%	Sedimentary Basin
			30.88	0.6%	Rocky Slope
			29.04	0.5%	Sedimentary Slope Canyon Floor
			23.57	0.4%	Rocky Slope Canyon Wall
			18.30	0.3%	Sedimentary Shelf Canyon Wall
			14.37	0.3%	Sedimentary Shelf Canyon Floor
			8.53	0.2%	Sedimentary Slope Gully
			7.39	0.1%	Rocky Slope Landslide
			6.99	0.1%	Sedimentary Slope Landslide
			1.60	0.0%	Rocky Basin
			1.06	0.0%	Rocky Slope Gully
			0.65	0.0%	Sedimentary Shelf Gully
			0.01	0.0%	Rocky Slope Canyon Floor
Longline	1	Transition	3570.77	68.9%	Sedimentary Slope
			784.25	15.1%	Sedimentary Ridge
			342.85	6.6%	Sedimentary Shelf
			126.27	2.4%	Rocky Ridge
			92.98	1.8%	Rocky Shelf
			75.07	1.4%	Sedimentary Slope Canyon Wall
			47.17	0.9%	Sedimentary Basin
			29.28	0.6%	Rocky Slope
			29.04	0.6%	Sedimentary Slope Canyon Floor
			23.57	0.5%	Rocky Slope Canyon Wall
			18.30	0.4%	Sedimentary Shelf Canyon Wall
			14.37	0.3%	Sedimentary Shelf Canyon Floor
			8.53	0.2%	Sedimentary Slope Gully
			7.39	0.1%	Rocky Slope Landslide
			6.99	0.1%	Sedimentary Slope Landslide
			1.60	0.0%	Rocky Basin
			1.06	0.0%	Rocky Slope Gully
			0.65	0.0%	Sedimentary Shelf Gully
			0.01	0.0%	Rocky Slope Canyon Floor
Longline	2	Summer	3780.06	63.7%	Sedimentary Slope
			791.76	13.4%	Sedimentary Shelf
			621.42	10.5%	Sedimentary Ridge
			179.74	3.0%	Sedimentary Slope Canyon Wall
			136.50	2.3%	Sedimentary Slope Canyon Floor
			122.90	2.1%	Rocky Ridge
			56.50	1.0%	Sedimentary Basin
			53.66	0.9%	Rocky Slope Canyon Wall
			50.12	0.8%	Rocky Shelf
			46.88	0.8%	Sedimentary Shelf Canyon Wall
			39.73	0.7%	Rocky Slope
			14.49	0.2%	Sedimentary Shelf Canyon Floor

Gear	Era	Season	Area (km2)	% of Total Area	Habitat Type
			11.92	0.2%	Sedimentary Slope Landslide
			11.24	0.2%	Sedimentary Slope Gully
			8.26	0.1%	Rocky Slope Landslide
			1.69	0.0%	Rocky Basin
			1.08	0.0%	Rocky Slope Gully
			0.94	0.0%	Rocky Slope Canyon Floor
			0.70	0.0%	Sedimentary Shelf Gully
Longline	2	Transition	3677.82	63.9%	Sedimentary Slope
			761.48	13.2%	Sedimentary Shelf
			621.42	10.8%	Sedimentary Ridge
			178.19	3.1%	Sedimentary Slope Canyon Wall
			136.50	2.4%	Sedimentary Slope Canyon Floor
			122.90	2.1%	Rocky Ridge
			56.50	1.0%	Sedimentary Basin
			53.66	0.9%	Rocky Slope Canyon Wall
			46.88	0.8%	Sedimentary Shelf Canyon Wall
			38.13	0.7%	Rocky Slope
			14.49	0.3%	Sedimentary Shelf Canyon Floor
			12.00	0.2%	Rocky Shelf
			11.92	0.2%	Sedimentary Slope Landslide
			11.24	0.2%	Sedimentary Slope Gully
			8.26	0.1%	Rocky Slope Landslide
			1.69	0.0%	Rocky Basin
			1.08	0.0%	Rocky Slope Gully
			0.94	0.0%	Rocky Slope Canyon Floor
			0.70	0.0%	Sedimentary Shelf Gully
Longline	3	Summer	3776.00	64.4%	Sedimentary Slope
			771.86	13.2%	Sedimentary Shelf
			621.42	10.6%	Sedimentary Ridge
			179.74	3.1%	Sedimentary Slope Canyon Wall
			136.50	2.3%	Sedimentary Slope Canyon Floor
			122.90	2.1%	Rocky Ridge
			56.50	1.0%	Sedimentary Basin
			53.66	0.9%	Rocky Slope Canyon Wall
			46.88	0.8%	Sedimentary Shelf Canyon Wall
			39.73	0.7%	Rocky Slope
			14.49	0.2%	Sedimentary Shelf Canyon Floor
			12.00	0.2%	Rocky Shelf
			11.92	0.2%	Sedimentary Slope Landslide
			11.24	0.2%	Sedimentary Slope Gully
			8.26	0.1%	Rocky Slope Landslide
			1.69	0.0%	Rocky Basin
			1.08	0.0%	Rocky Slope Gully
			0.94	0.0%	Rocky Slope Canyon Floor
			0.70	0.0%	Sedimentary Shelf Gully
Longline	3	Transition	3677.82	63.9%	Sedimentary Slope
			761.48	13.2%	Sedimentary Shelf
			621.42	10.8%	Sedimentary Ridge
			178.19	3.1%	Sedimentary Slope Canyon Wall
			136.50	2.4%	Sedimentary Slope Canyon Floor

Gear	Era	Season	Area (km2)	% of Total Area	Habitat Type
			122.90	2.1%	Rocky Ridge
			56.50	1.0%	Sedimentary Basin
			53.66	0.9%	Rocky Slope Canyon Wall
			46.88	0.8%	Sedimentary Shelf Canyon Wall
			38.13	0.7%	Rocky Slope
			14.49	0.3%	Sedimentary Shelf Canyon Floor
			12.00	0.2%	Rocky Shelf
			11.92	0.2%	Sedimentary Slope Landslide
			11.24	0.2%	Sedimentary Slope Gully
			8.26	0.1%	Rocky Slope Landslide
			1.69	0.0%	Rocky Basin
			1.08	0.0%	Rocky Slope Gully
			0.94	0.0%	Rocky Slope Canyon Floor
			0.70	0.0%	Sedimentary Shelf Gully

Table 7: Habitat Type Area by Focus Group Trawl Gear Polygons

Gear	Era	Season	Area (km2)	% of Total Area	Habitat Type
Large Footrope Trawl	1	Summer & Transition	4627.61	50.2%	Sedimentary Slope
			3146.40	34.1%	Sedimentary Shelf
			748.15	8.1%	Sedimentary Ridge
			151.42	1.6%	Sedimentary Slope Canyon Wall
			128.55	1.4%	Rocky Shelf
			103.27	1.1%	Sedimentary Slope Canyon Floor
			99.40	1.1%	Rocky Ridge
			54.47	0.6%	Sedimentary Shelf Canyon Wall
			46.84	0.5%	Rocky Slope
			35.91	0.4%	Sedimentary Basin
			32.30	0.4%	Rocky Slope Canyon Wall
			14.49	0.2%	Sedimentary Shelf Canyon Floor
			11.92	0.1%	Sedimentary Slope Landslide
			10.16	0.1%	Sedimentary Slope Gully
			8.26	0.1%	Rocky Slope Landslide
			1.60	0.0%	Rocky Basin
			1.07	0.0%	Rocky Slope Gully
			0.70	0.0%	Sedimentary Shelf Gully
			0.36	0.0%	Rocky Slope Canyon Floor
Large Footrope Trawl	1	Winter	2978.36	58.6%	Sedimentary Slope
			737.20	14.5%	Sedimentary Ridge
			683.62	13.5%	Sedimentary Shelf
			151.18	3.0%	Sedimentary Slope Canyon Wall
			119.27	2.3%	Rocky Shelf
			103.05	2.0%	Sedimentary Slope Canyon Floor
			98.45	1.9%	Rocky Ridge
			50.92	1.0%	Sedimentary Shelf Canyon Wall
			44.13	0.9%	Rocky Slope
			35.49	0.7%	Sedimentary Basin
			32.13	0.6%	Rocky Slope Canyon Wall
			14.49	0.3%	Sedimentary Shelf Canyon Floor

Gear	Era	Season	Area (km2)	% of Total Area	Habitat Type
			10.55	0.2%	Sedimentary Slope Landslide
			8.96	0.2%	Sedimentary Slope Gully
			8.26	0.2%	Rocky Slope Landslide
			1.60	0.0%	Rocky Basin
			0.83	0.0%	Rocky Slope Gully
			0.36	0.0%	Rocky Slope Canyon Floor
Large Footrope Trawl	2	Summer & Transition	4203.27	52.3%	Sedimentary Slope
			2663.18	33.2%	Sedimentary Shelf
			545.73	6.8%	Sedimentary Ridge
			151.19	1.9%	Sedimentary Slope Canyon Wall
			103.05	1.3%	Sedimentary Slope Canyon Floor
			86.93	1.1%	Rocky Ridge
			81.25	1.0%	Rocky Shelf
			54.47	0.7%	Sedimentary Shelf Canyon Wall
			35.49	0.4%	Sedimentary Basin
			32.13	0.4%	Rocky Slope Canyon Wall
			31.01	0.4%	Rocky Slope
			14.49	0.2%	Sedimentary Shelf Canyon Floor
			11.92	0.1%	Sedimentary Slope Landslide
			8.26	0.1%	Rocky Slope Landslide
			7.10	0.1%	Sedimentary Slope Gully
			1.60	0.0%	Rocky Basin
			0.70	0.0%	Sedimentary Shelf Gully
			0.49	0.0%	Rocky Slope Gully
			0.36	0.0%	Rocky Slope Canyon Floor
Large Footrope Trawl	2	Winter	2832.03	64.5%	Sedimentary Slope
			677.14	15.4%	Sedimentary Ridge
			258.09	5.9%	Sedimentary Shelf
			151.18	3.4%	Sedimentary Slope Canyon Wall
			105.68	2.4%	Rocky Ridge
			103.05	2.3%	Sedimentary Slope Canyon Floor
			71.83	1.6%	Rocky Shelf
			50.92	1.2%	Sedimentary Shelf Canyon Wall
			35.49	0.8%	Sedimentary Basin
			32.13	0.7%	Rocky Slope Canyon Wall
			30.34	0.7%	Rocky Slope
			14.49	0.3%	Sedimentary Shelf Canyon Floor
			10.55	0.2%	Sedimentary Slope Landslide
			8.96	0.2%	Sedimentary Slope Gully
			8.26	0.2%	Rocky Slope Landslide
			1.60	0.0%	Rocky Basin
			0.83	0.0%	Rocky Slope Gully
			0.36	0.0%	Rocky Slope Canyon Floor
Large Footrope Trawl	3	Winter	3505.89	65.6%	Sedimentary Slope
			1036.23	19.4%	Sedimentary Ridge
			201.35	3.8%	Rocky Ridge
			166.91	3.1%	Sedimentary Slope Canyon Wall
			146.80	2.7%	Sedimentary Slope Canyon Floor
			113.39	2.1%	Sedimentary Basin
			46.41	0.9%	Rocky Slope Canyon Wall

Gear	Era	Season	Area (km2)	% of Total Area	Habitat Type
			32.36	0.6%	Sedimentary Shelf
			29.63	0.6%	Rocky Slope
			22.54	0.4%	Sedimentary Shelf Canyon Wall
			14.40	0.3%	Sedimentary Shelf Canyon Floor
			11.93	0.2%	Sedimentary Slope Gully
			5.28	0.1%	Sedimentary Slope Landslide
			3.81	0.1%	Rocky Slope Landslide
			2.95	0.1%	Rocky Slope Canyon Floor
			1.76	0.0%	Rocky Basin
			0.89	0.0%	Rocky Slope Gully
			0.11	0.0%	Rocky Shelf
Small Footrope Trawl	1 & 2	Winter	1293.57	58.5%	Sedimentary Shelf
			885.28	40.1%	Sedimentary Slope
			14.85	0.7%	Sedimentary Shelf Canyon Wall
			8.22	0.4%	Rocky Slope
			7.36	0.3%	Sedimentary Ridge
			0.89	0.0%	Rocky Shelf
			0.00	0.0%	Rocky Ridge
Small Footrope Trawl	1	Summer & Transition	6319.87	77.1%	Sedimentary Shelf
			1685.37	20.5%	Sedimentary Slope
			150.98	1.8%	Rocky Shelf
			16.63	0.2%	Sedimentary Shelf Canyon Wall
			16.03	0.2%	Rocky Slope
			7.36	0.1%	Sedimentary Ridge
			2.16	0.0%	Sedimentary Slope Canyon Wall
			2.15	0.0%	
			0.59	0.0%	Sedimentary Shelf Gully
			0.45	0.0%	Sedimentary Slope Landslide
			0.08	0.0%	Island
			0.01	0.0%	Sedimentary Slope Gully
			0.00	0.0%	Rocky Ridge
Small Footrope Trawl	2	Summer	6319.87	83.4%	Sedimentary Shelf
			1070.32	14.1%	Sedimentary Slope
			150.98	2.0%	Rocky Shelf
			16.63	0.2%	Sedimentary Shelf Canyon Wall
			15.56	0.2%	Rocky Slope
			2.16	0.0%	Sedimentary Slope Canyon Wall
			2.15	0.0%	
			0.59	0.0%	Sedimentary Shelf Gully
			0.53	0.0%	Sedimentary Ridge
			0.45	0.0%	Sedimentary Slope Landslide
			0.08	0.0%	Island
			0.01	0.0%	Sedimentary Slope Gully
Small Footrope Trawl	3	Summer	1670.11	99.9%	Sedimentary Shelf
			0.64	0.0%	
			0.38	0.0%	Rocky Shelf
Small Footrope Trawl	3	Winter	2126.58	99.8%	Sedimentary Shelf
			4.64	0.2%	
			0.30	0.0%	Rocky Shelf
			0.00	0.0%	Island

Gear	Era	Season	Area (km2)	% of Total Area	Habitat Type
Pelagic Trawl	1	Winter, Summer & Transition	408.93	53.1%	Sedimentary Shelf
			134.30	17.4%	Sedimentary Slope
			94.27	12.2%	Rocky Shelf
			45.61	5.9%	Sedimentary Ridge
			20.94	2.7%	Sedimentary Shelf Canyon Wall
			18.33	2.4%	Sedimentary Slope Canyon Wall
			17.71	2.3%	Rocky Ridge
			11.37	1.5%	Rocky Slope
			10.93	1.4%	Sedimentary Slope Canyon Floor
			3.69	0.5%	Rocky Slope Canyon Wall
			1.84	0.2%	Sedimentary Slope Landslide
			1.82	0.2%	Sedimentary Basin
			0.42	0.1%	Sedimentary Shelf Canyon Floor
			0.07	0.0%	Rocky Basin
			0.03	0.0%	Rocky Slope Landslide
Pelagic Trawl	2	Winter, Summer & Transition	267.47	61.4%	Sedimentary Shelf
			74.02	17.0%	Rocky Shelf
			39.95	9.2%	Sedimentary Slope
			20.94	4.8%	Sedimentary Shelf Canyon Wall
			18.33	4.2%	Sedimentary Slope Canyon Wall
			10.93	2.5%	Sedimentary Slope Canyon Floor
			3.69	0.8%	Rocky Slope Canyon Wall
			0.42	0.1%	Sedimentary Shelf Canyon Floor
			0.06	0.0%	Rocky Slope
Pink Shrimp Trawl	1	Summer	3250.07	84.3%	Sedimentary Shelf
			555.41	14.4%	Sedimentary Slope
			48.78	1.3%	Rocky Shelf
			1.05	0.0%	Rocky Slope
Pink Shrimp Trawl	2	Summer	3250.07	84.3%	Sedimentary Shelf
			555.41	14.4%	Sedimentary Slope
			48.78	1.3%	Rocky Shelf
			1.05	0.0%	Rocky Slope
Pink Shrimp Trawl	3	Summer	3250.07	84.3%	Sedimentary Shelf
			555.41	14.4%	Sedimentary Slope
			48.78	1.3%	Rocky Shelf
			1.05	0.0%	Rocky Slope

5. Conclusion

In December 2003 this paper was sent to members of the TRC and other interested parties involved in the EFH process for review. One comment was received during this review period and changes to the document are reflected in this final version. Additionally, this work was presented to the Groundfish Subcommittee of the Scientific and Statistical Committee (SSC) of the Pacific Fishery Management Council in February 2004 as part of their review of the analytic portions of the EIS for designating Groundfish Essential Fish Habitat (Pacific Fishery Management Council, 2004).

Based on this review process, this assessment provides sufficient data to continue with the EFH Impacts Model based on trawl logbook data stored in the PacFin Database. These data represent the most comprehensive spatial data for fishing effort on the West Coast (Pacific Fishery Management Council, 2004). In the future, NOAA Fisheries Vessel Monitoring Program will enable the refinement of trawl fishing effort. It is recognized that data gaps do exist most notably in the areas of fixed gear and recreational fishing effort. It is hoped that future data development efforts in these areas (i.e. additional focus group sessions) will provide information useful in subsequent enhancements of the EFH impacts model. Finally, this asessment highlights potential future research tracks on questions of intensity measures and effort / habitat relationships.

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Bailey, A., Conway, F., Copps, S., McMullen, S., and Recht, F. 2004. "Pilot Project to Profile West Coast Fishing Effort Based on the Practical Experience of Fishermen."

Pacific Fishery Management Council. 2004. "A Review of the Analytical Portions of the Environmental Impact Statement for Designating Groundfish Essential Fish Habitat; A Report of the SSC Groundfish Subcommittee." Exhibit C.6.c, Attachment 1, April 2004 Pacific Fishery Management Council Briefing Book.

Scholz, A. J. 2003. "Groundfish Fleet Restructuring Information and Analysis Project." Final Report and Technical Documentation. Pacific Marine Conservation Council / Ecotrust.

7. Acknowledgements

The authors would like to thank the following people and organizations for their contributions to this assessment: Bruce Thomas, TerraLogic GIS; Randy Fisher, Dave Colpo, Fran Recht, William Daspit, and Brad Stenberg, Pacific States Marine Fisheries Council; Scott McMullen, Oregon Fishermen's Cable Committee; Astrid Scholz, EcoTrust; Members of the EFH Technical Review Committee; Members of the Scientific and Statistical Committee.

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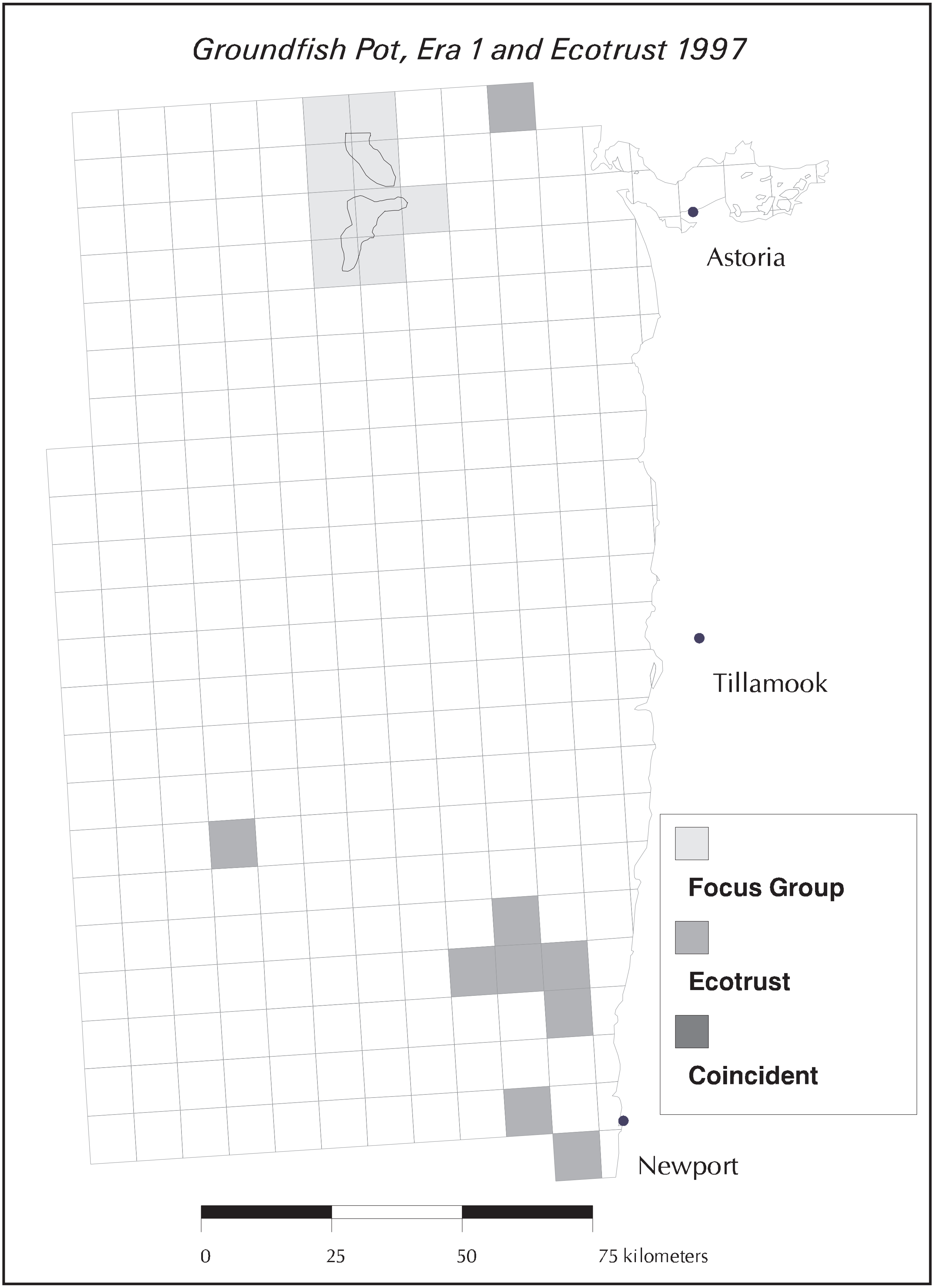
Appendix A

Focus Group and Ecotrust Comparison Maps

Coincidence of Focus Group and Ecotrust Effort



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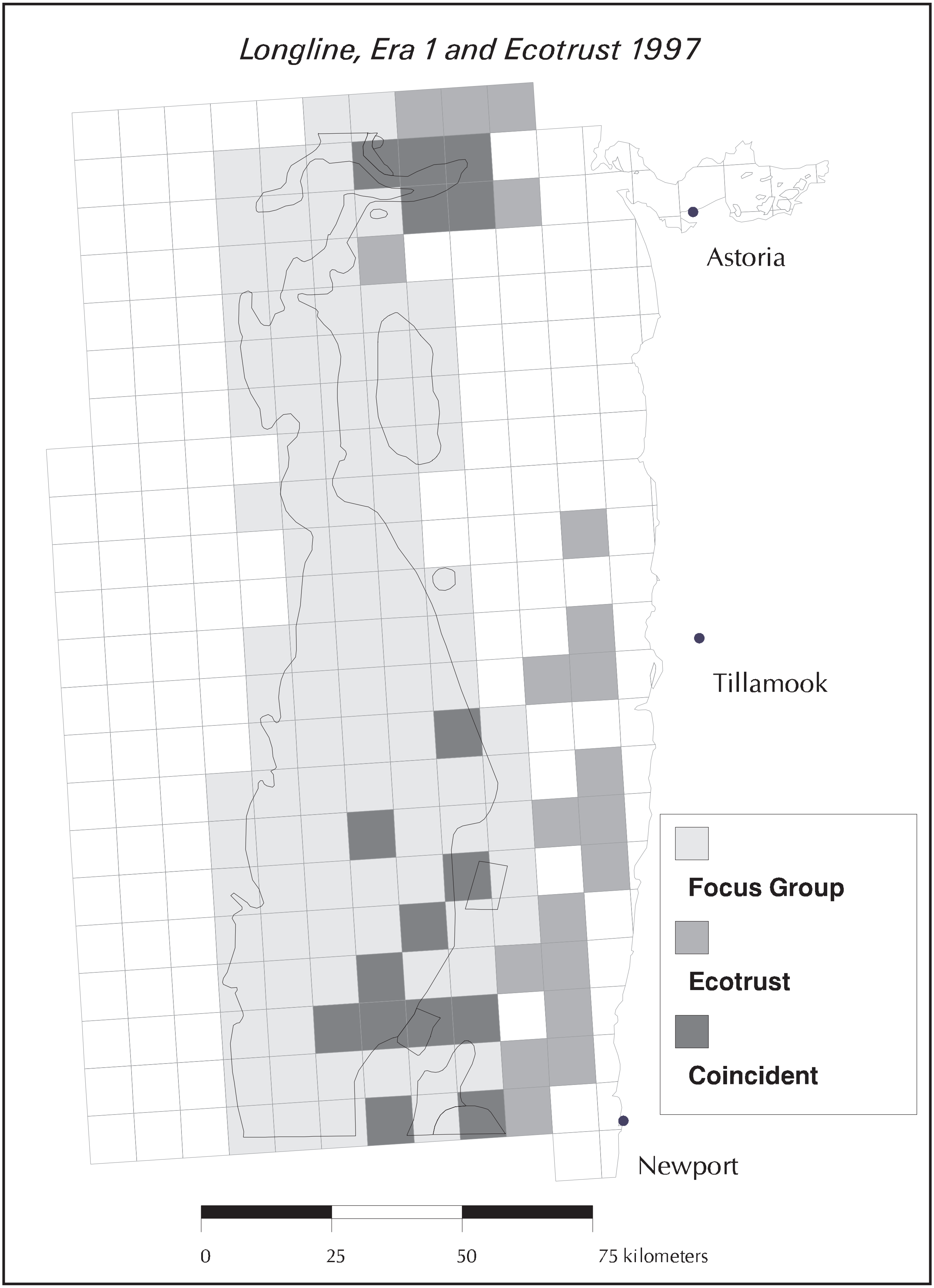

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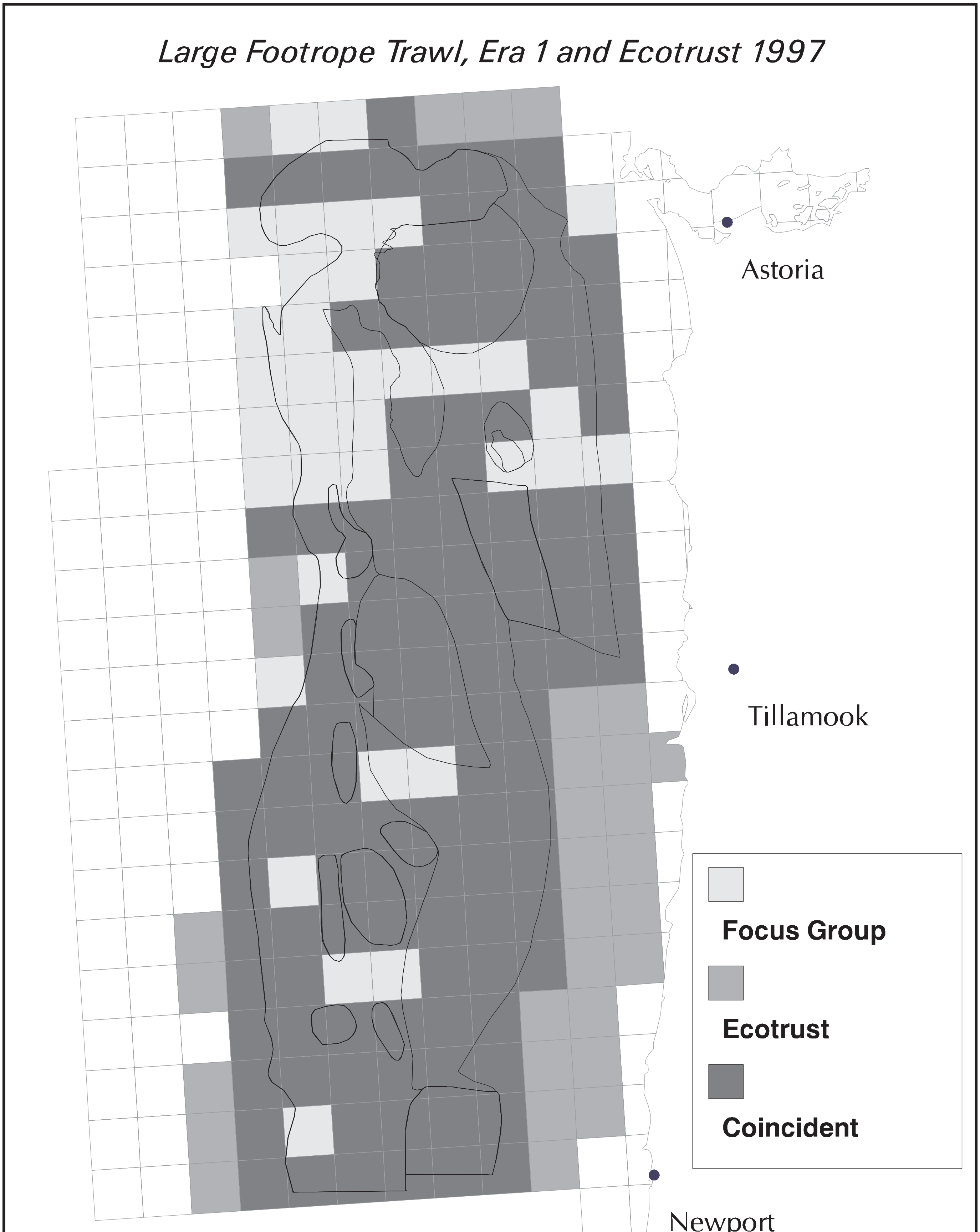
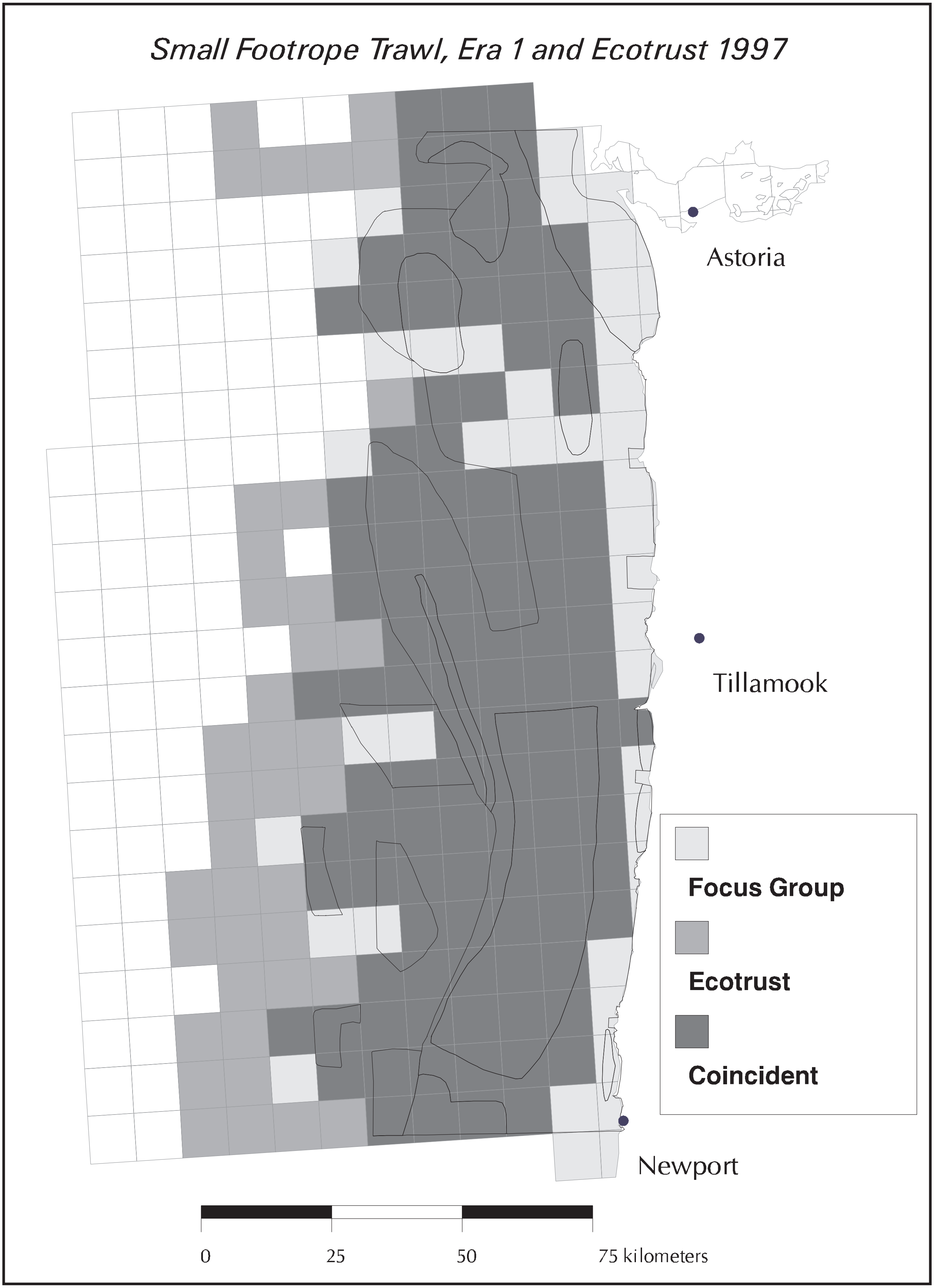


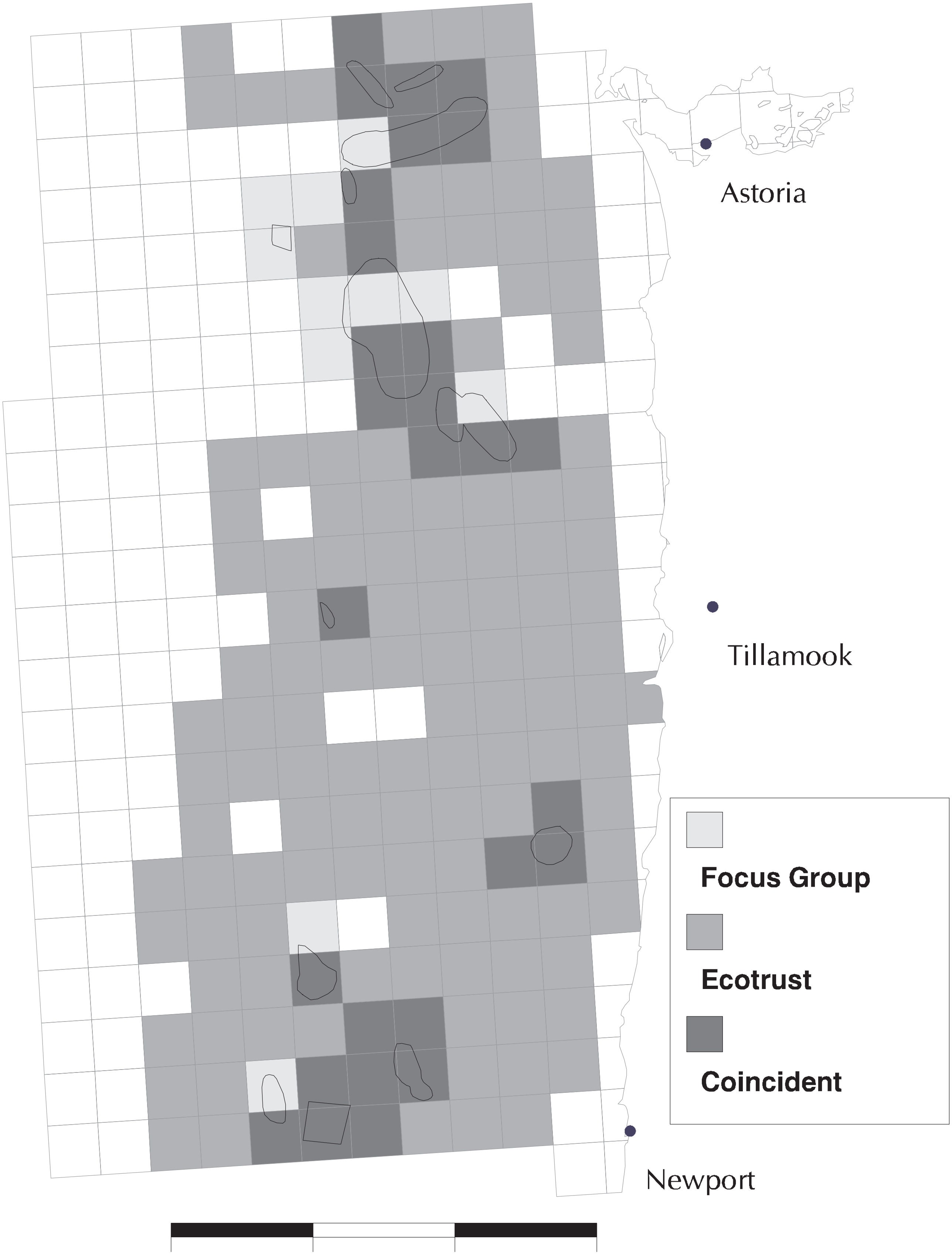
Coincidence of Focus Group and Ecotrust Effort

Small Footrope Trawl, Era 1 and Ecotrust 1997



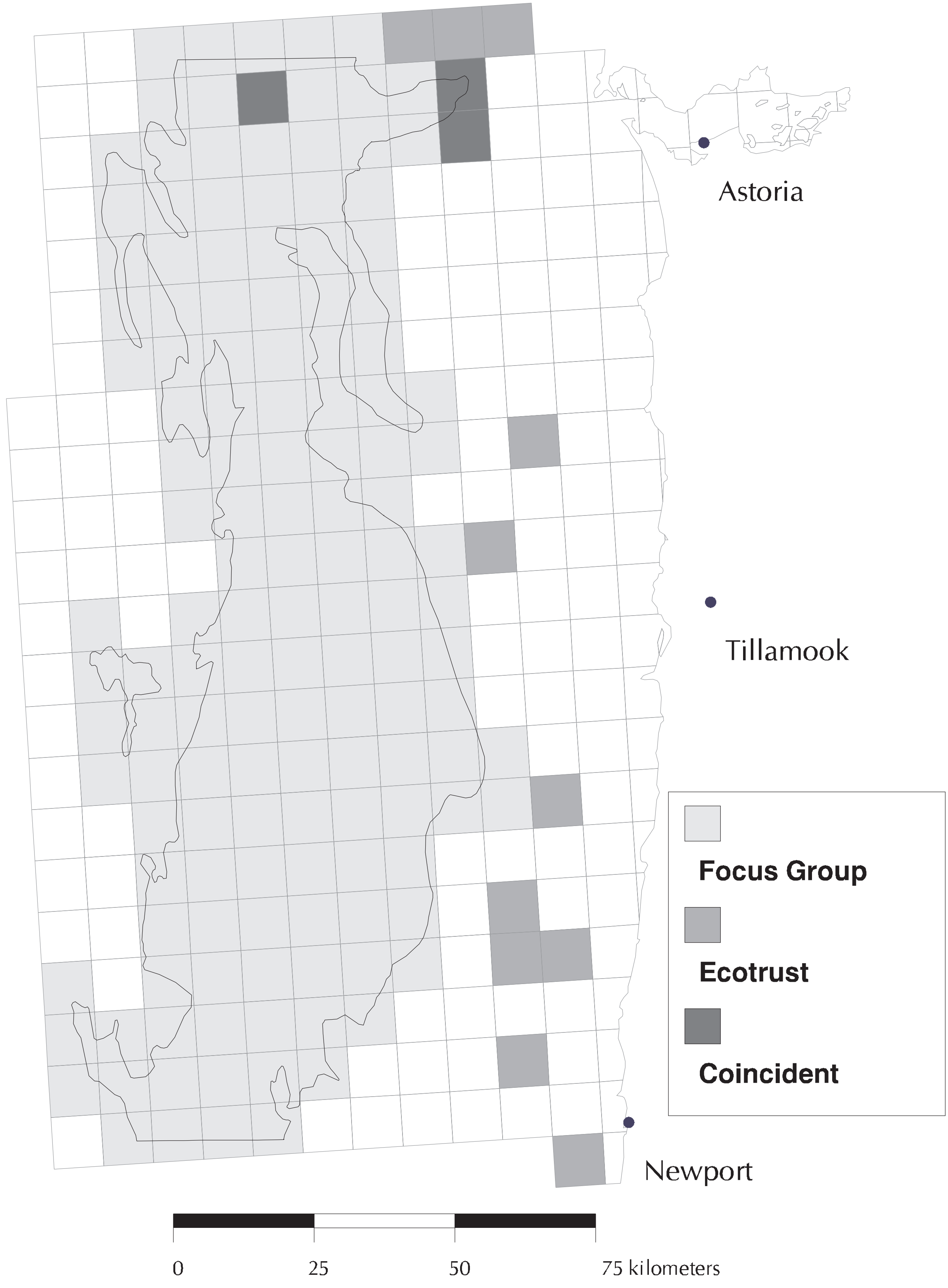
Coincidence of Focus Group and Ecotrust Effort

Pelagic Trawl, Era 1 and Ecotrust 1997



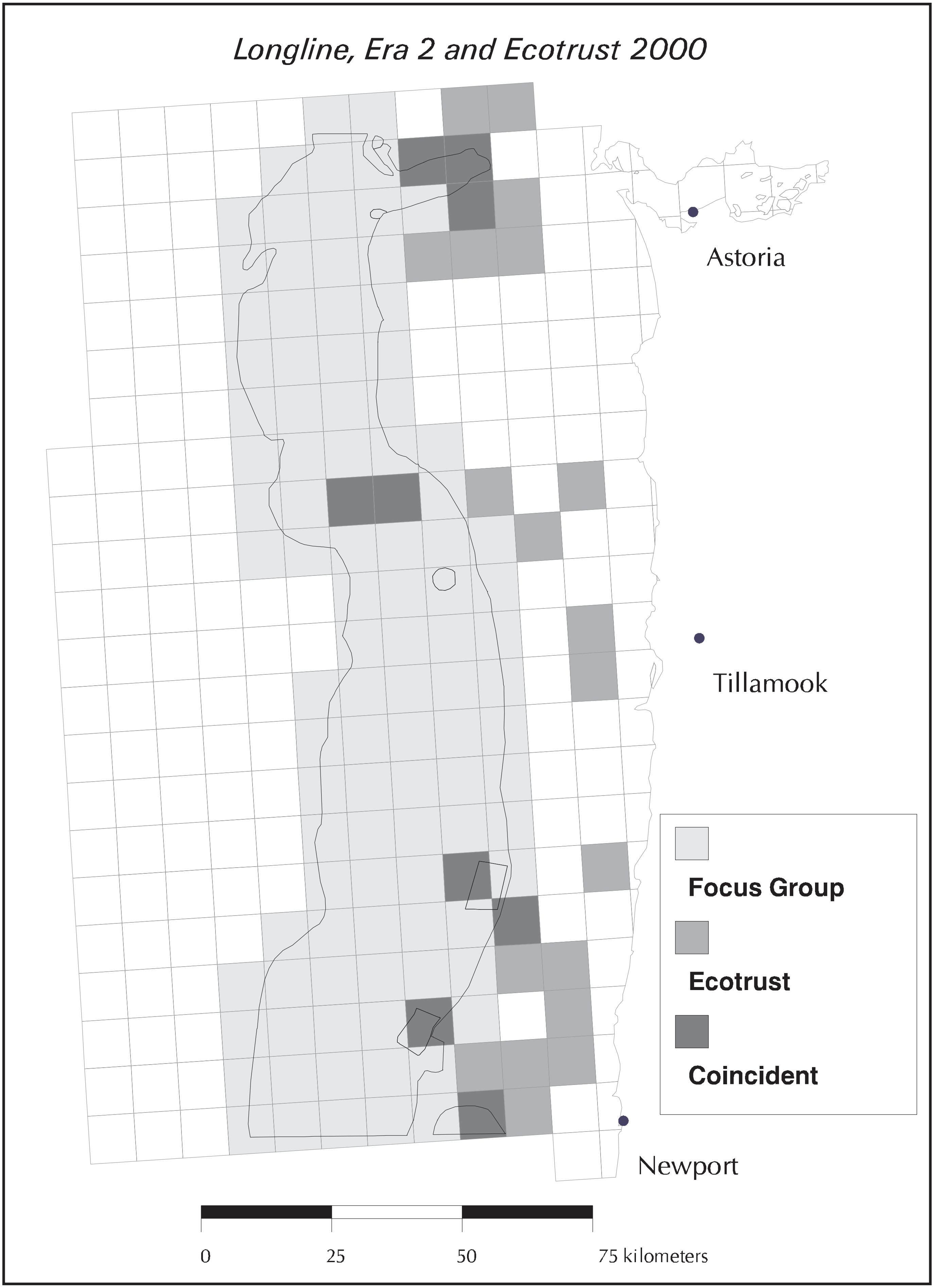
Coincidence of Focus Group and Ecotrust Effort

Groundfish Pot, Era 2 and Ecotrust 2000



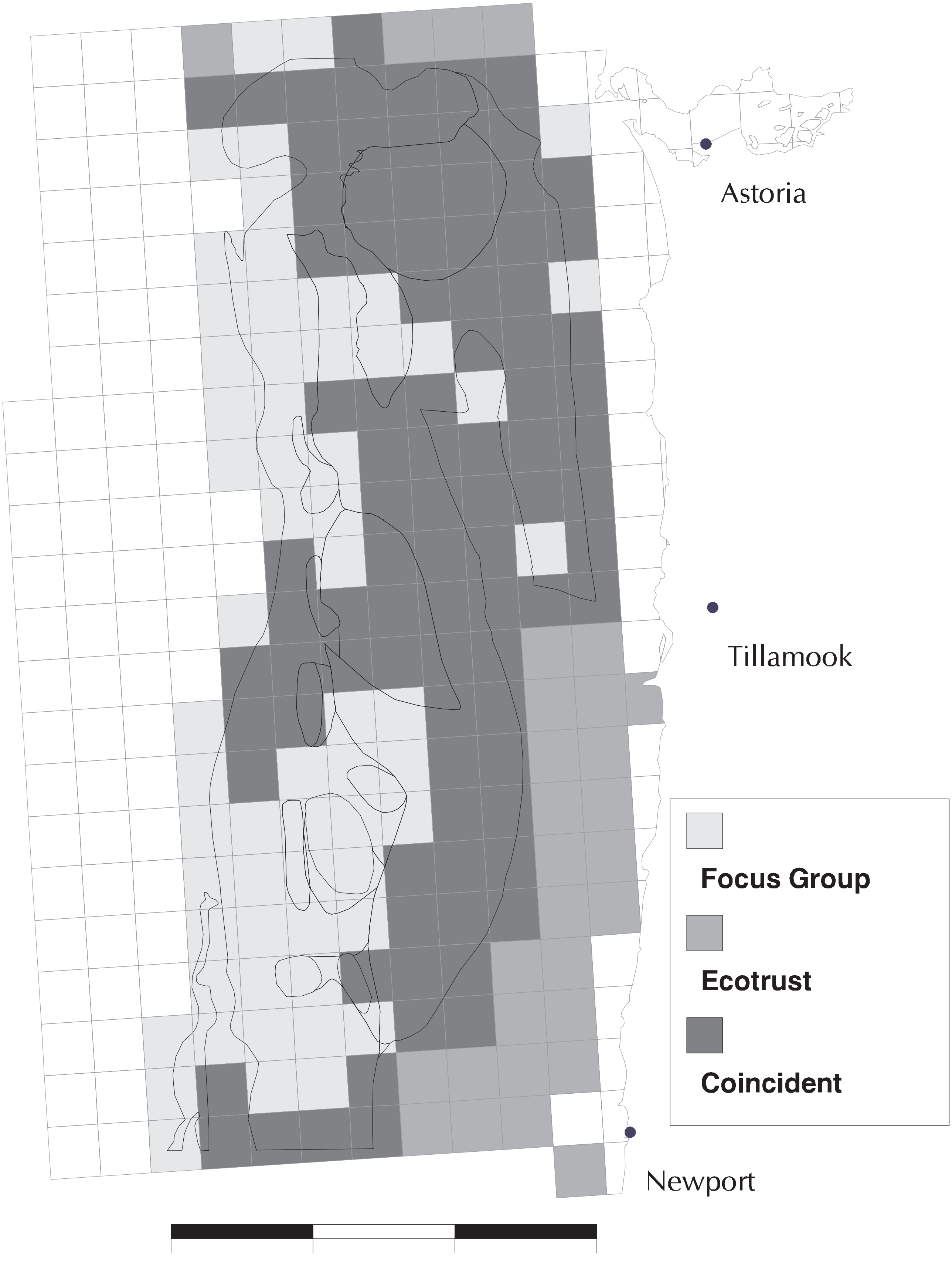
Coincidence of Focus Group and Ecotrust Effort

Longline, Era 2 and Ecotrust 2000



Coincidence of Focus Group and Ecotrust Effort

Large Footrope Trawl, Era 2 and Ecotrust 2000



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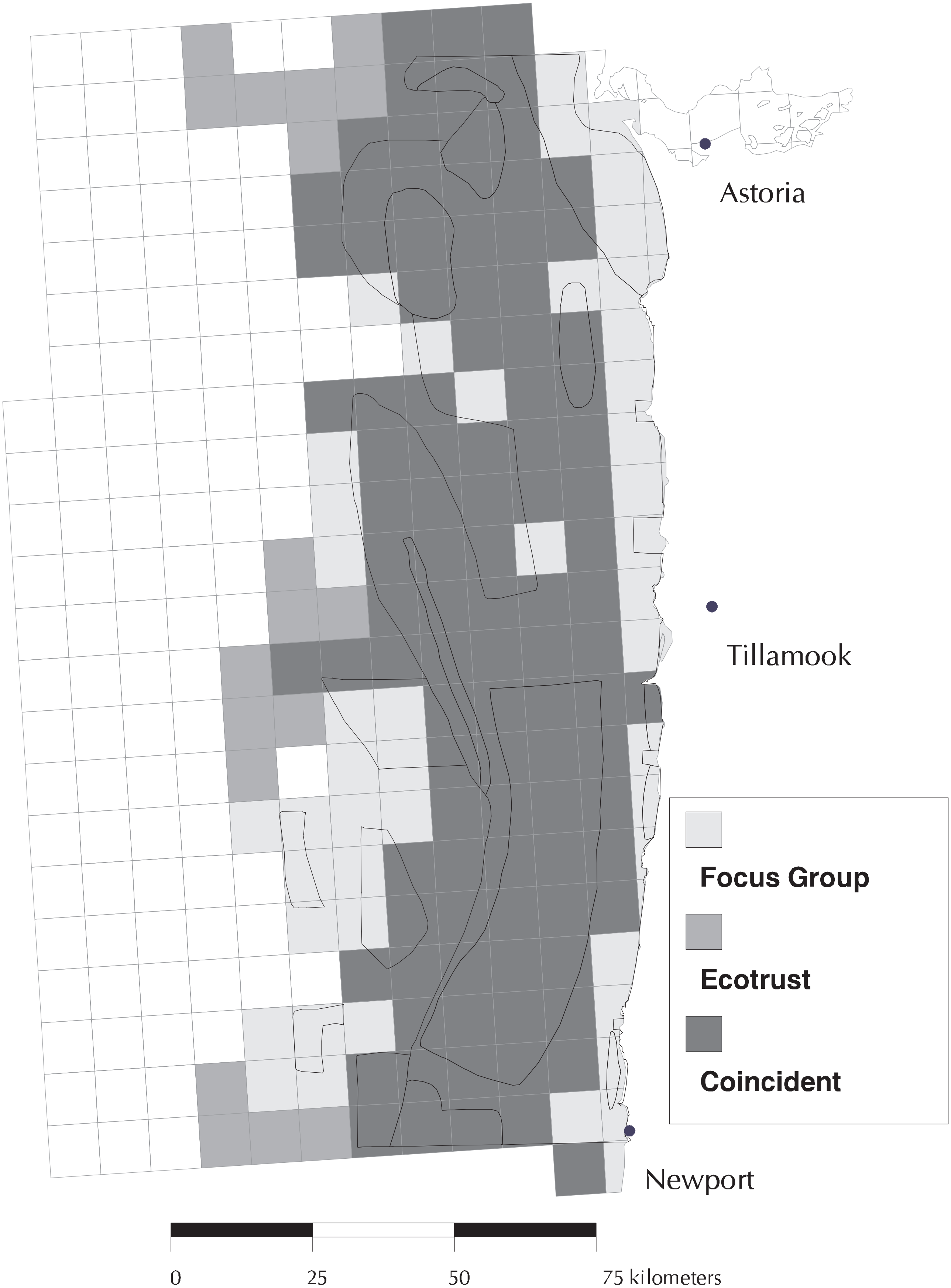

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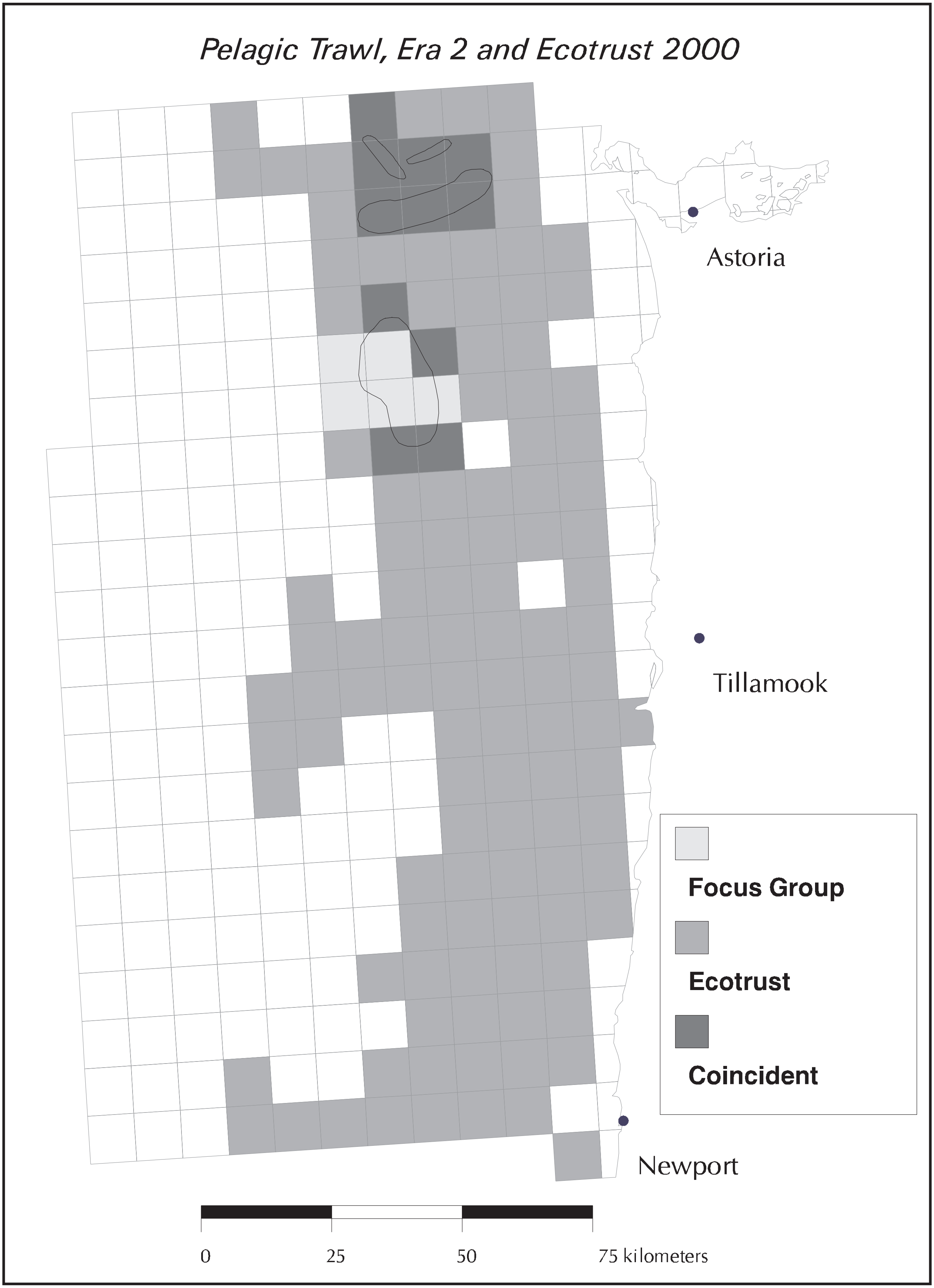
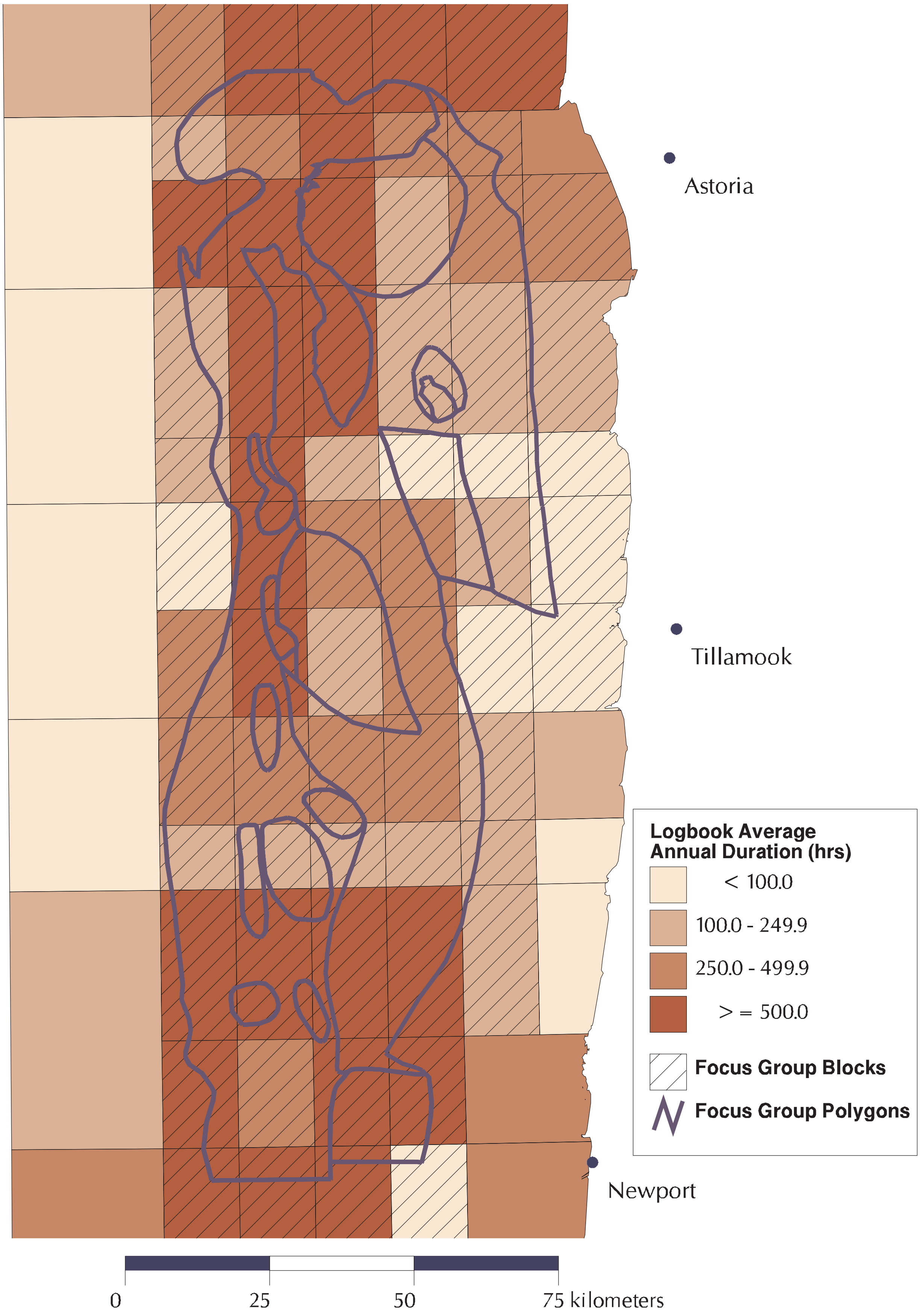


Appendix B

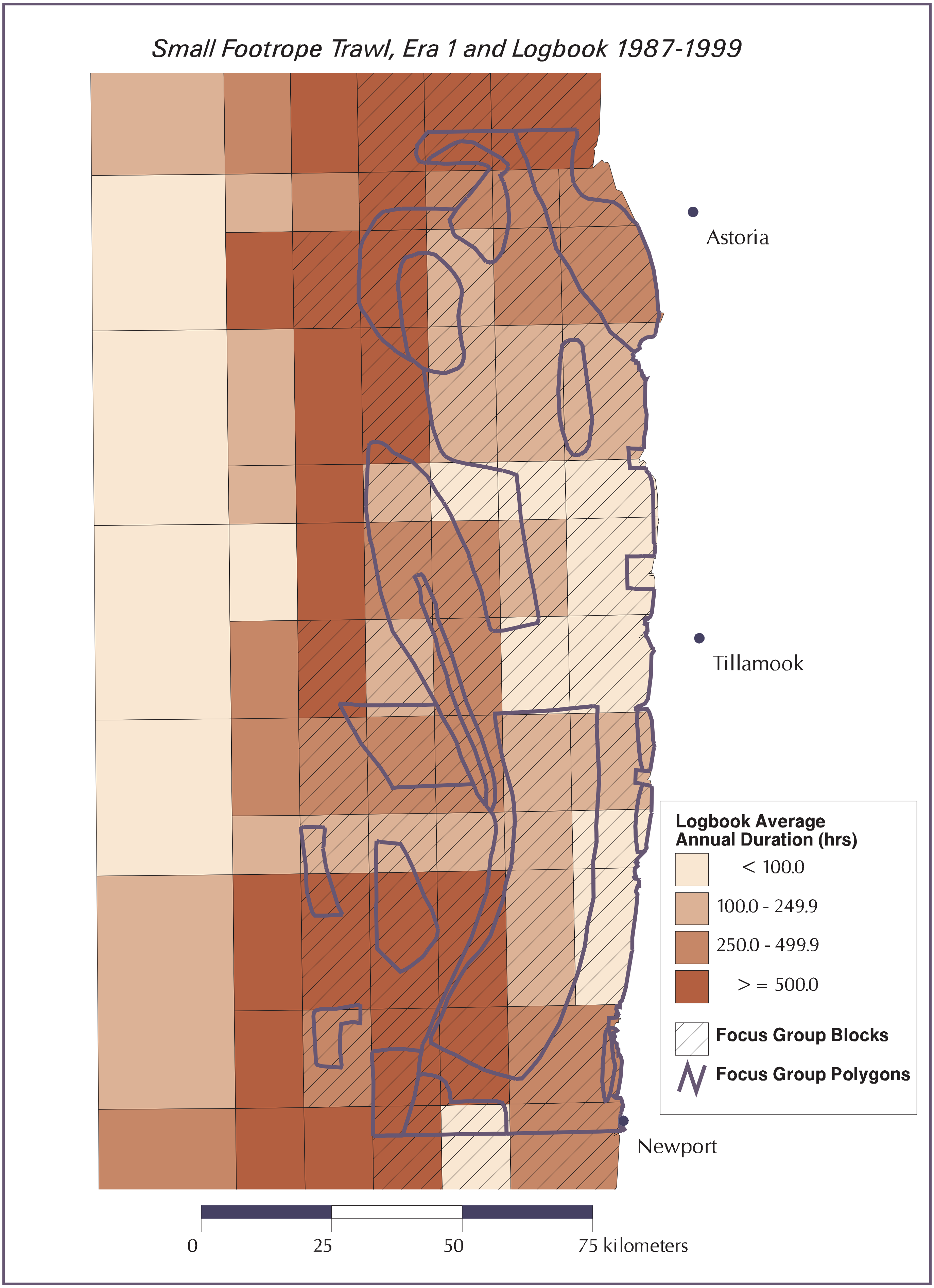
Focus Group and Trawl Logbook Comparison Maps

Coincidence of Focus Group and Logbook Effort

Large Footrope Trawl, Era 1 and Logbook 1987-1999

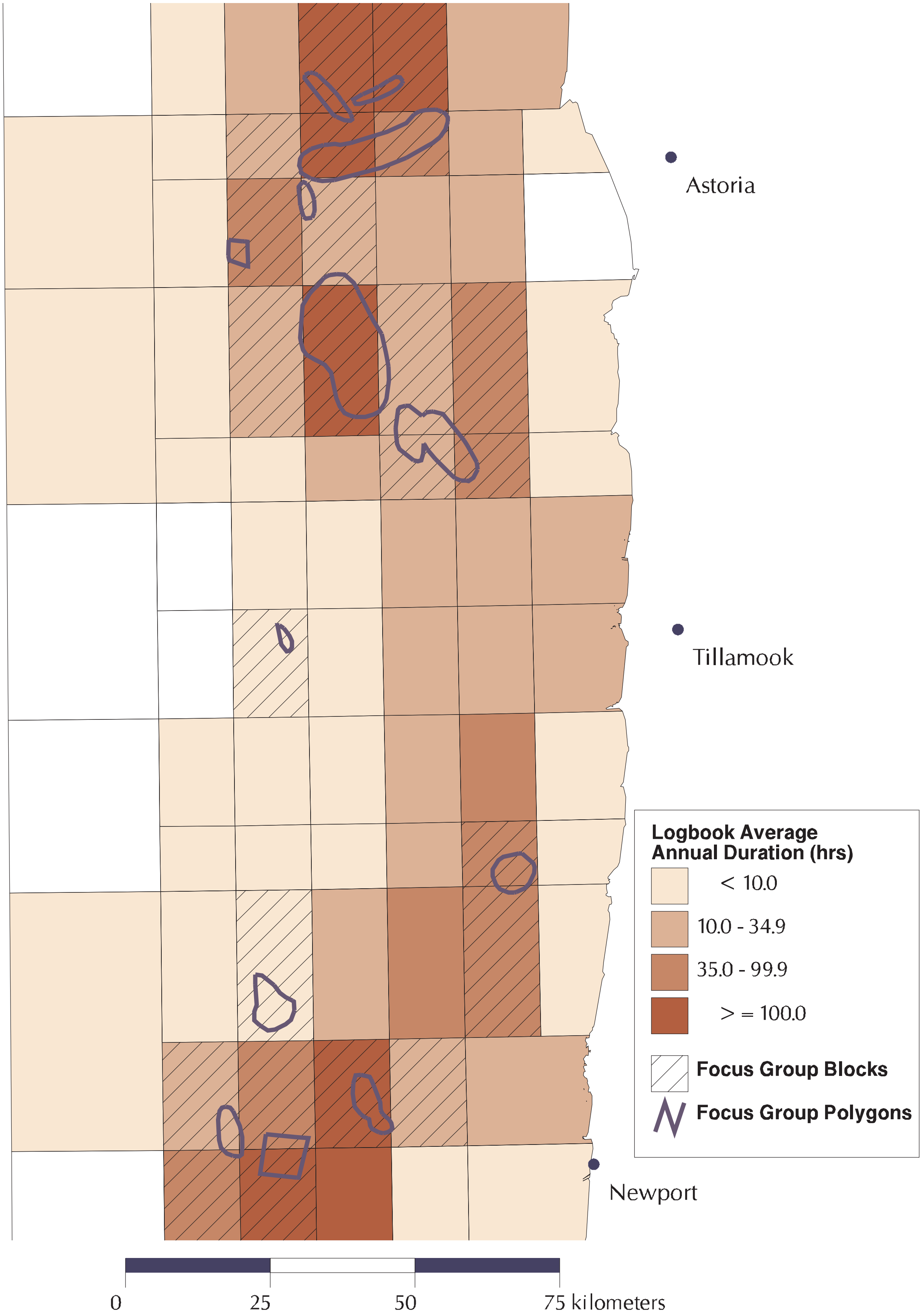


Coincidence of Focus Group and Logbook Effort



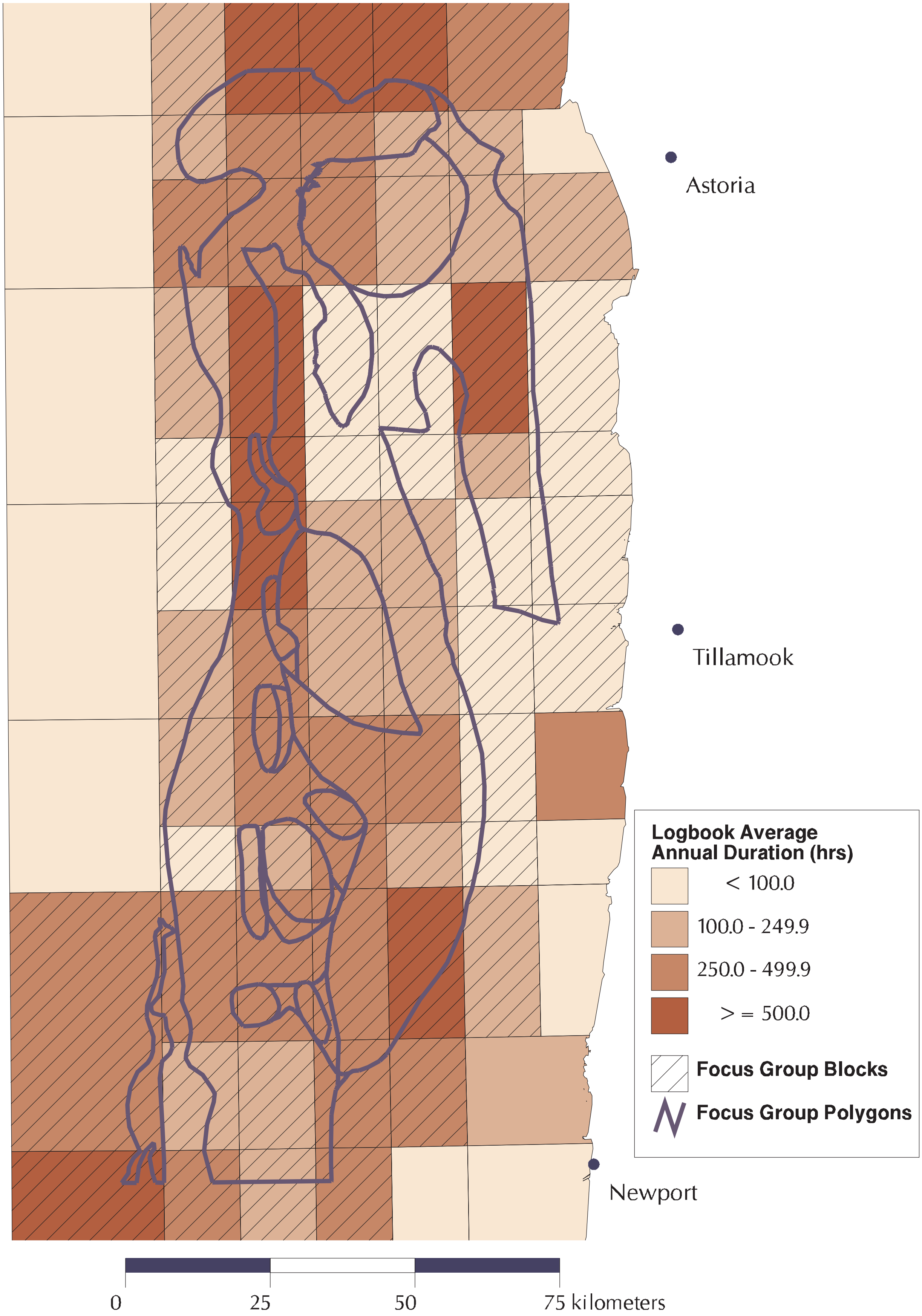
Coincidence of Focus Group and Logbook Effort

Pelagic Trawl, Era 1 and Logbook 1987-1999



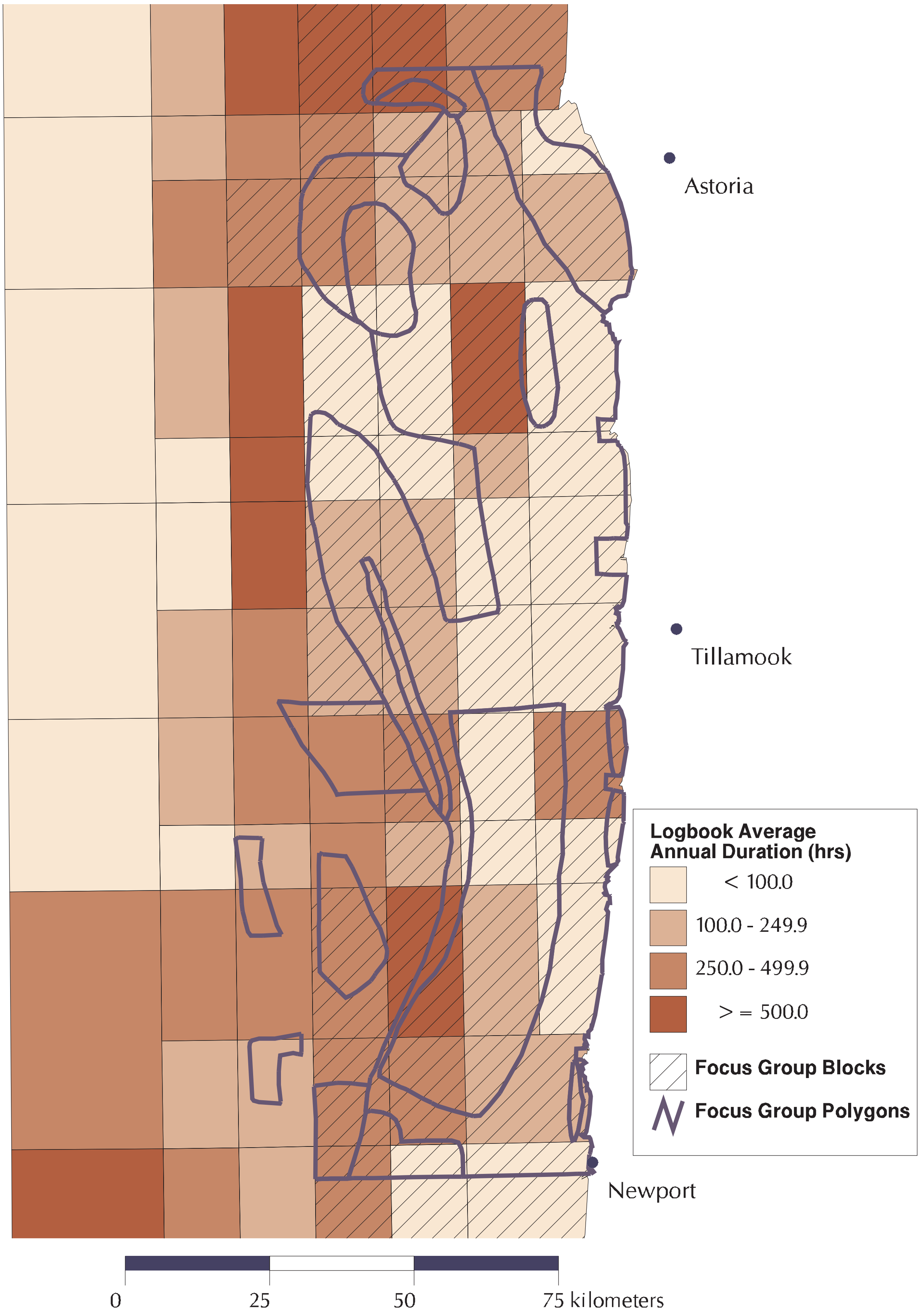
Coincidence of Focus Group and Logbook Effort

Large Footrope Trawl, Era 2 and Logbook 2000-2002



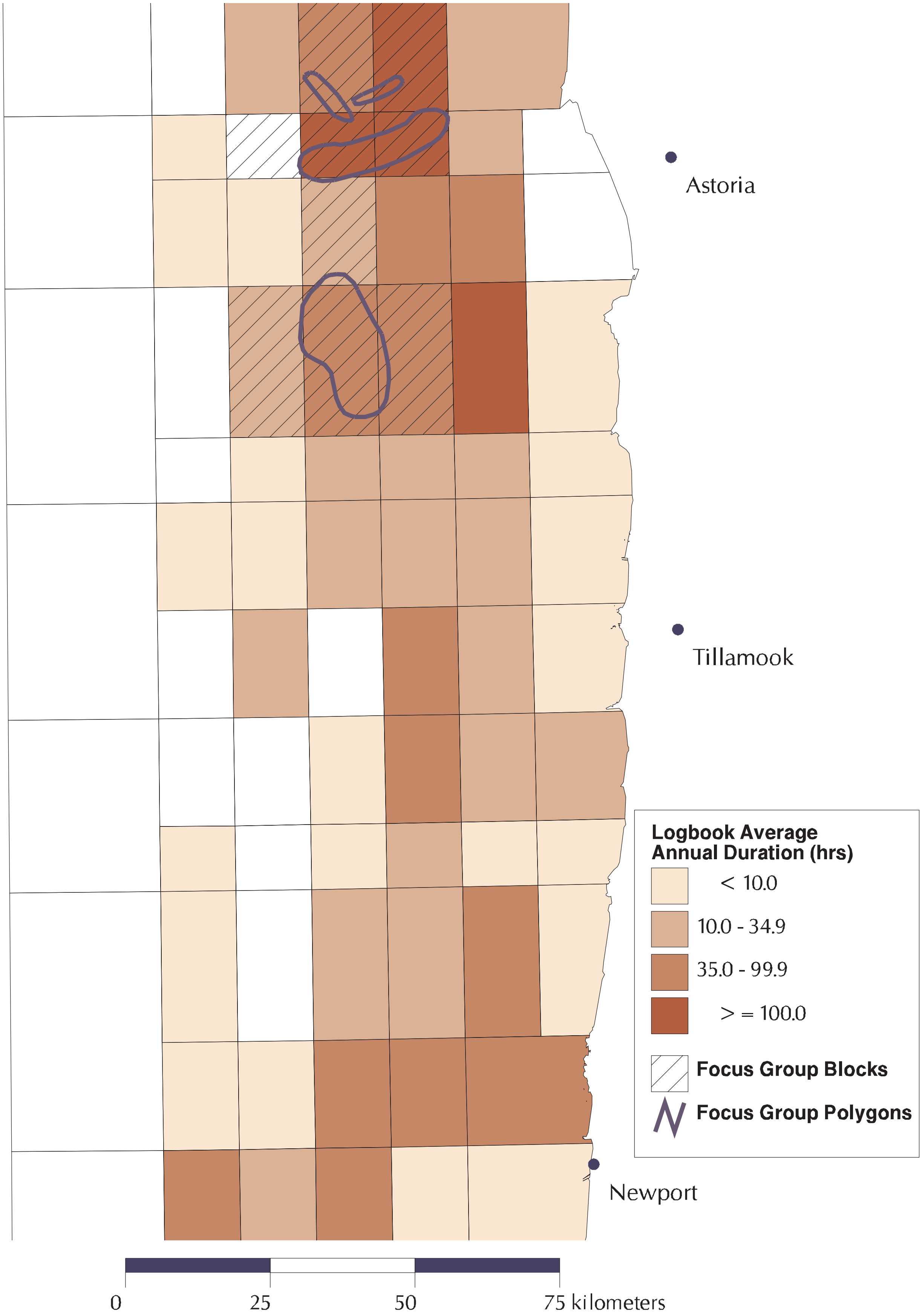
Coincidence of Focus Group and Logbook Effort

Small Footrope Trawl, Era 2 and Logbook 2000-2002



Coincidence of Focus Group and Logbook Effort

Pelagic Trawl, Era 2 and Logbook 2000-2002



Appendix 6

NON-FISHING IMPACTS TO ESSENTIAL FISH HABITAT AND RECOMMENDED CONSERVATION MEASURES

National Marine Fisheries Service (NOAA Fisheries)
Alaska Region
Northwest Region
Southwest Region

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Version 1

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[1] Listed in alphabetical order.

TABLE OF CONTENTS

ACRONYMS AND ABBREVIATIONS

AAPA	American Association of Port Authorities
ACZA	ammoniacal copper zinc arsenate
AFS	American Fisheries Society
ATTF	Alaska Timber Task Force
BMPs	best management practices
BOD	biochemical oxygen demand
BTA	best technology available
CCA	chromated copper arsenate
CSREEs	Cooperative State Research, Education, and Extension
CWA	Clean Water Act
dB	decibel
DoN	Department of the Navy
Ecology	Washington State Department of Ecology
EFH	Essential Fish Habitat
EPA	U.S. Environmental Protection Agency
ESA	Endangered Species Act
FC	fecal coliform (bacteria)
FERC	Federal Energy Regulatory Commission
FIFRA	Federal Institute, Fungicides, and Rodenticide Act
FL	fork length
FMCs	Fishery Management Councils
FREP	Futilizer Research and Education Program
GIS	geographical information system
GOA	Gulf of Alaska
Hz	Hertz
IPM	integrated pest management
LTF	log transfer facilities
LWD	large woody debris
m/s^2	meters per second squared
Magnuson-Stevens Act	Magnuson-Stevens Fishery Conservation and Management Act
NAWQA	National Water Quality Assessment
NEPA	National Environmental Policy Act
NMDMP	National Marine Debris Monitoring Program
NMFS	National Marine Fishery Service
NOAA	National Oceanic and Atmospheric Administration
NPDES	National Pollution Discharge Elimination System
NPFMC	North Pacific Fishery Management Council
NPPC	Northwest Power Planning Council
NRC	National Research Council
OCS	outer coastal shelf
OWRRI	Oregon Water Resources Research Institute
PAH	polyaromatic hydrocarbon
PBDE	polybrominated diphenyl ether
PFMC	Pacific Fishery Management Council
PNPCC	Pacific Northwest Pollution Control Council
RPWAST	Rich Passage Wave Action Study Team
SCS	Soil Conservation Service
SPL	sound pressure levels
SSC	suspended sediment concentration
TSS	total suspended solids

USACE	U.S. Army Corps of Engineers
USDA	U.S. Department of Agriculture
USFWS	U.S. Fish and Wildlife Service
USGS	U.S. Geological Survey
WCS	water control structure
WDFW	Washington State Department of Fish and Wildlife
ZOD	zone of deposit

1.0 INTRODUCTION

Background on Essential Fish Habitat

In 1996, the U. S. Congress added new habitat conservation provisions to the Magnuson-Stevens Fishery Conservation and Management Act (Magnuson-Stevens Act), the federal law that governs U.S. marine fisheries management. The renamed Magnuson-Stevens Act mandated the identification of Essential Fish Habitat[2] (EFH) for federally managed species and consideration of measures to conserve and enhance the habitat necessary for these species to carry out their life cycles.

The act also requires federal agencies to consult with National Oceanic and Atmospheric Administration (NOAA) Fisheries on all actions, or proposed actions, permitted, funded, or undertaken by the agency, that may adversely affect[3] EFH. Federal agencies do this by preparing and submitting an EFH Assessment to NOAA Fisheries. The EFH Assessment is a written assessment of the effects of the proposed federal action on EFH. Regardless of federal agency compliance to this directive, the act requires NOAA Fisheries to recommend conservation measures to federal as well as state agencies once it receives information or determines from other sources that EFH may be adversely affected. These EFH conservation recommendations are provided to conserve and enhance EFH by avoiding, minimizing, mitigating, or otherwise offsetting the adverse effects to EFH.

Activities proposed to occur in EFH areas do not automatically require consultation. Consultations are triggered only when the proposed action may adversely affect EFH, and then, only federal actions require consultation.

By providing EFH conservation recommendations before an activity begins, NOAA Fisheries may help prevent habitat damage before it occurs rather than restoring it after the fact, which is less efficient, unpredictable, and often more costly. This could ultimately save American taxpayers millions of dollars in habitat restoration funds and could save industries from having to remedy environmental problems down the road. Furthermore, EFH conservation will lead to more robust fisheries, providing benefits to coastal communities and commercial and recreational fishers alike (Benaka 1999).

This consultation process is usually integrated into existing environmental review procedures in accordance with the National Environmental Policy Act (NEPA), Endangered Species Act (ESA), or the Fish and Wildlife Coordination Act, for instance, to provide the greatest level of efficiency.

Within 30 days of receiving NMFS' conservation recommendations, federal action agencies must provide a detailed response in writing to NMFS. The response must include measures proposed for avoiding, mitigating, or offsetting the impact of a proposed activity on EFH. State agencies are not required to respond to EFH conservation recommendations. If the federal action agency chooses not to adopt NMFS' conservation recommendations, it must provide an explanation. Examples of federal action agencies that permit or undertake activities that may trigger the EFH consultation process include, but are not limited

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[2] EFH is defined as "those waters and substrate necessary to fish for spawning, breeding, feeding, or growth to maturity." *Waters* include aquatic areas and their associated physical, chemical, and biological properties. *Substrate* includes sediment underlying the waters. *Necessary* means the habitat required to support a sustainable fishery and the managed species' contribution to a healthy ecosystem. *Spawning, breeding, feeding, or growth to maturity* covers all habitat types utilized by a species throughout its life cycle.

[3] Adverse effect is any impact which reduces the quality and/or quantity of EFH. Adverse effects may include direct or indirect physical, chemical, or biological alterations of the waters or substrate and loss of, or injury to benthic organisms, prey species, and their habitat, and other ecosystem components. Adverse effects may be site-specific or habitat-wide impacts, including individual, cumulative, or synergistic consequences of actions [50 CFR 600.910(a)]

to, the U.S. Army Corps of Engineers (USACE), the U.S. Environmental Protection Agency (EPA), the Federal Energy Regulatory Commission, and the Department of the Navy (DoN). NOAA's Fishery Management Councils (FMCs) may also choose to comment on proposed actions that may adversely impact EFH.

Significance of Essential Fish Habitat

The waters and substrate that comprise EFH designations under the jurisdiction of the FMCs are diverse and widely distributed. They are also closely interconnected with other aquatic and terrestrial environments.

From a broad perspective, EFH is the geographic area where the species occurs at any time during its life. This area can be described in terms of ecological characteristics, location, and time. Ecologically, EFH includes waters and substrate that focus distribution (e.g., migration corridors, spawning areas, rocky reefs, intertidal salt marshes, or submerged aquatic vegetation) and other characteristics that are less distinct (e.g., turbidity zones, salinity gradients). Spatially, habitats and their use may shift over time due to climate change, human activities, geologic events, and other circumstances. The type of habitat available, its attributes, and its functions are important to species productivity, diversity, health, and survival.

The following discussion addresses non-fishing activities that may adversely impact EFH. They are grouped into four different systems in which the activities usually occur: upland, river or riverine, estuary or estuarine, and coastal or marine. Riverine habitats provide important habitat that serves multiple purposes for anadromous species such as salmon. These purposes include migration, feeding, spawning, nursery, and rearing functions. Protecting these functions is key to providing for a productive system and a healthy fishery. An important component of a river system also includes the riparian corridor. The term "riparian" refers to the land directly adjacent to a stream, lake, or estuary. A healthy riparian area has vegetation harboring prey items (e.g., insects), contributes necessary nutrients, provides large woody debris (LWD) that creates channel structure and cover for fish, and provides shade, which controls stream temperatures (Bilby and Ward 1991) . When vegetation is removed from riparian areas, waters are heated, and LWD is less common. This results in less refuge for fish, fundamental changes in channel structure (e.g., loss of pool habitats), instability of streambanks, and alteration of nutrient and prey sources within the river system.

Estuaries are the bays and inlets influenced by both the ocean and rivers, and they serve as the transition zone between fresh and salt water (Botkin et al. 1995). Estuaries support a community of plants and animals that are adapted to the zone where fresh and salt waters mix (Zedler et al. 1992). Estuarine habitats fulfill fish and wildlife needs for reproduction, feeding, refuge, and other physiological necessities (Simenstad et al. 1991, Good 1987, Phillips 1984). Healthy estuaries include eelgrass beds which protect young fish from predators, provide habitat for fish and wildlife, improve water quality, and control sediments (Thayer et al. 1984, Hoss and Thayer 1993, Phillips 1984). In addition, mud flats, high salt marsh, and saltmarsh creeks also provide productive shallow water habitat for epibenthic fishes and decapods (Sogard and Able 1991).

Coastal or marine habitats comprise a variety of broad habitat types for EFH managed species including sand bottoms, rocky reefs, and submarine canyons. When rock reefs support kelp stands, they become exceptionally productive. Relative to other habitats, including wetlands, shallow and deep sand bottoms, and rock bottom artificial reefs, giant kelp habitats are substantially more productive in the fish communities they support (Bond et al. 1999). Foster and Schiel (1985) reported that the net primary productivity of kelp beds may be the highest of any marine community. Lush kelp forest communities (e.g., giant kelp, bull kelp, elk kelp, and feather boa kelp) are found relatively close to shore along the open coast. These subtidal communities provide vertically structured habitat through the water column on the rocky shelf, made up of a canopy of tangled stipes from the water line to a depth of 10 feet; a mid-kelp, water-column region; and the bottom, holdfast region. The stands provide nurseries, feeding grounds, and/or shelter to a variety of groundfish species and their prey (Feder et al. 1974; Ebeling et al. 1980).

Non-fishing Impacts

The diversity, widespread distribution, and ecological linkages with other aquatic and terrestrial environments make the waters and substrates that comprise EFH susceptible to a wide array of human activities unrelated to fishing.

Non-fishing activities have the potential to adversely affect the quantity or quality of EFH designated areas in riverine, estuarine, and marine systems. Broad categories of such activities include, but are not limited to, mining, dredging, fill, impoundment, discharge, water diversions, thermal additions, actions that contribute to nonpoint source pollution and sedimentation, introduction of potentially hazardous materials, introduction of exotic species, and the conversion of aquatic habitat that may eliminate, diminish, or disrupt the functions of EFH. For each activity, known and potential adverse impacts to EFH are described in this document. The descriptions explain the mechanisms or processes that may cause the adverse effects and how these may affect habitat function.

The report also provides proactive conservation measures designed to minimize or avoid the adverse effects of these non-fishing gear activities on Pacific coast EFH. These measures should be viewed as options to avoid, minimize, or compensate for adverse impacts and promote the conservation and enhancement of EFH. Generally, non-water-dependent actions should not be located in EFH if such actions may have adverse impacts on EFH. Activities that may result in significant adverse affects on EFH should be avoided where less environmentally harmful alternatives are available. If there are no alternatives, the impacts of these actions should be minimized. Environmentally sound engineering and management practices should be employed for all actions that may adversely affect EFH. If avoidance or minimization is not possible, or will not adequately protect EFH, compensatory mitigation to conserve and enhance EFH is recommended.

Purpose of Document

It is of paramount importance that NOAA Fisheries' biologists review proposed projects under the EFH provisions to ensure that they provide appropriate EFH conservation recommendations. It is equally challenging during the consultation phase to consider all potential non-fishing impacts to EFH so that the appropriate mix of recommendations can be made. Because impacts that may adversely affect EFH can be direct, indirect, and cumulative, the biologist must consider and analyze these interrelated impacts. Consequently, it is not unusual for particular impacts to be overlooked or the most recent science on impacts not to be considered during the consultation. This reference document was prepared to assist NOAA Fishery biologists in reviewing proposed projects and considering potential impacts that may adversely affect EFH and to provide consistent and substantiated EFH conservation recommendations. The document should also be useful for federal action agencies undertaking EFH consultations and especially in preparing EFH assessments.

The document is organized by activities that may potentially impact EFH occurring in four discreet ecosystems. The separation of these ecosystems is artificial, and many of the impacts and their related activities are not exclusive to one system. For instance, sand and gravel mining activities often occur in riverine systems but also take place in estuarine systems. Because activities are located in the ecosystem where they initially occur in a watershed progression, the reader is encouraged to rely on the index at the end of this document to verify other systems where such activities may also take place. In addition, many types of impacts occur beyond just the primary activity. For example, pile driving creates its own set of unique impacts to EFH. However, while installing piles, other construction activities such as dredging may occur, and this secondary activity brings its own set of potential adverse impacts. Again, the biologist should rely on the index to ensure that all project activities are considered in the consultation.

The EFH conservation recommendations included with each activity present a series of site-specific measures that can be undertaken by the action agency to avoid, offset, or mitigate impacts to EFH. Not all of these suggested measures are necessarily applicable to any one project or activity that may adversely affect EFH. More specific or different measures based on the best and most current scientific information may be developed prior to, or during, the EFH consultation process and communicated to the appropriate agency. The conservation recommendations provided represent a short menu of general types of conservation actions that can contribute to the conservation and enhancement of properly functioning EFH.

2.0 UPLAND ACTIVITIES

2.1 Nonpoint Source Pollution

The information in this section is adapted from the following reference: EPA. 1993. Guidance for specifying management measures for sources of nonpoint pollution in coastal waters. EPA Office of Water. 840-B-92-002. 500+ pp.

Nonpoint source pollution generally results from land runoff, precipitation, atmospheric deposition, seepage, or hydrologic modification. Technically, the term ‘nonpoint source’ means anything that does not meet the legal definition of ‘point source’ in section 502(14) of the Clean Water Act, which refers to “discernable, confined and discrete conveyance” from which pollutants are or may be discharged. The major categories of nonpoint pollution are agricultural runoff, urban runoff, including developed and developing areas (see Section 2.2), silvicultural (forestry) runoff (see Section 2.1.2), marinas and recreational boating, road construction, and channel and streambank modifications, including channelization, channel modifications (see Section 4.7), and streambank and shoreline erosion.

Nonpoint source pollution is usually lower in intensity than an acute point source event, but may be more damaging to fish habitat in the long term. Nonpoint source pollution is often difficult to detect. It may affect sensitive life stages and processes, and the impacts may go unnoticed for a long time. When severe population impacts are finally noticed, they may not be tied to any one event and hence may be difficult to correct, clean up, or mediate.

2.1.1 Agricultural/Nursery Runoff

Substantial portions of croplands and commercial nursery operations are connected to inland and coastal waters where nonpoint pollution can have a direct adverse effect on aquatic habitats. Tillage aerates the upper soil, but compacts fine textured soils just below the depth of tillage, thus altering infiltration. Use of farm machinery on cropland and adjacent roads causes further compaction, reducing infiltration and increasing surface runoff. Agricultural lands are also characterized by poorly maintained dirt roads and ditches that, along with drains, route sediments, nutrients, and pesticides directly into surface waters. Natural channels filter and process pollutants. In many instances, roads, ditches and drains have replaced headwater streams, and these constructed systems deliver pollutants directly to surface waters (Larimore and Smith 1963).

Rangeland soils can also become compacted by livestock (Platts 1991, Heady and Child 1994) with similar effects on runoff. Compaction of rangelands generally increases with grazing intensity, although site-specific soil and vegetative conditions are important (Kauffman and Krueger 1984, Heady and Child 1994). Johnson (1992) reviewed studies related to grazing and hydrologic processes and concluded that heavy grazing nearly always decreases infiltration, reduces vegetative biomass, and increases bare soil. Primary runoff pollutants are nutrients, pesticides, sediment, salts, and animal wastes. Because the primary routes of pesticide transport to EFH include not only surface runoff events, but also direct application, aerial drift, and groundwater systems, pesticide contamination is addressed separately in Section 2.1.3.

Potential Adverse Impacts

Adverse impacts to EFH from agricultural and nursery runoff can result from 1) nutrient loading, 2) introduction of animal wastes, 3) erosion, and 4) sedimentation.

Nutrients are applied to agricultural land in several different forms and come from various sources, including commercial fertilizers, manure from animal production facilities (with bedding and other wastes added to the manure), municipal and industrial treatment plant effluent and sludge, legume and crop residues, irrigation water, and atmospheric deposition of nutrients such as nitrogen and sulfur.

Specifically, nitrogen and phosphorus are the two major nutrients from agricultural land that degrade water quality. Introduction of these nutrients into aquatic systems can dramatically increase aquatic plant productivity and decay (cultural eutrophication; Waldichuk 1993). This process can increase turbidity, temperature, and the accumulation of dead organic material, and it can decrease light penetration, oxygen, and the growth of submerged aquatic vegetation. These alterations can result in the destruction of habitat for small or juvenile fish and severely impair biological food chains.

Animal waste (manure) includes fecal and urinary wastes of livestock and poultry; process water (such as from a milking parlor); and the feed, bedding, litter, and soil with which they become intermixed. Because riparian areas are favored by cattle, nutrients consumed elsewhere are often excreted as waste in riparian zones (Heady and Child 1994). Pollutants contained in manure and associated bedding materials can be transported into marine environments by runoff and process wastewater from rangelands, pastures, or confined animal facilities. Theses pollutants may include oxygen-demanding substances such as nitrogen, phosphorus, and organic solids; salts; bacteria, viruses, and other microorganisms, as well as sediments that increase organic decomposition. Runoff of animal wastes can cause fish kills due to ammonia, and solids deposited into the marine environment can reduce productivity over extended periods of time due to the accelerated effects of cultural eutrophication. Runoff can be accelerated by grazing processes that remove or disturb riparian vegetation and soils.

Sediment is the result of erosion. Sheet, rill, and gully erosion all transport fine sediment, enriched with a wide variety of attached pollutants, from agricultural land into the aquatic environment. The presence of livestock in the riparian zone accelerates sediment transport rates by increasing both surface erosion and mass wasting (Platts 1991, Marcus et al. 1990, Heady and Child 1994). Likewise, grazing in uplands can result in increased sediment delivery through channelized flows. For example, the Soil Conservation Service (SCS) estimated that 92 percent of the total sediment yields in the Snake and Walla Walla River basins of southeastern Washington resulted from sheet and rill erosion from cropland accounting for only 43 percent of total land area (SCS et al. 1984). Increased sediment in aquatic systems can increase turbidity, reduce light penetration, smother fish spawning areas and food supplies, clog the filtering capacity of filter feeders, clog and harm the gills of fish, interfere with feeding behaviors, and significantly lower overall biological productivity.

Salts are a product of natural weathering of soil and geologic material. The movement and deposition of salts depend on the amount and distribution of rainfall and irrigation, the soil and underlying strata, evapotranspiration rates, and other environmental factors. Irrigation water, whether from ground or surface water sources, has a natural base load of dissolved mineral salts. As water is consumed by plants or lost to the atmosphere by evaporation, the remaining salts become concentrated in the soil (the “concentrating effect”). Thus, the total salt load carried by irrigation return flow is the sum of the salts remaining in the applied water plus any additional salt picked up from the irrigated land. Irrigation return flows convey the salt to the receiving streams or groundwater reservoirs. If the amount of salt in the return flow is low in comparison to the total stream flow, water quality may not be degraded to the extent that EFH functions are impaired. However, if the process of water diversion and the return flow of saline drainage water is repeated many times along a stream or river, downstream habitat quality can become progressively degraded.

Groundwater is also susceptible to nutrient contamination in agricultural lands composed of sandy or other coarse-textured soil (Franco et al. 1994, USGS 1999). Nitrate, a highly soluble form of nitrogen, can leach rapidly through the soil profile and accumulate in groundwater, especially in shallow zones (Jordan and Weller 1996, Brady and Weil 1996). This groundwater can be a significant source of nutrients in surface waters when discharged through seeps, drains, or by direct subsurface flow to water bodies (Lee and Taylor 2000).

Recommended Conservation Measures

1. Protect and restore soil quality with controls that affect soil’s ability to grow crops, partition and regulate water flow, and act as an environmental filter (e.g., permeability, water holding capacity, nutrient availability, organic matter content, and biological activity). Relevant practices include cover cropping, crop sequence, conservation tillage, crop residue management, grazing management, and use of low-

impact equipment (e.g., minimally sized, rubber tired).

2. Improve land use efficiencies for key agricultural inputs including nitrogen, phosphorus, pesticides, and irrigation water. Relevant practices are agronomic nutrient applications based upon nutrient testing, including manure, during clear weather, use of integrated pest management, and irrigation management.

3. Increase resistance to soil erosion and runoff. Sediment basins, contour farming, and grazing management are examples of key practices.

4. Protect and restore rangelands using practices such as rotational grazing systems or livestock distribution controls, exclusion from riparian and aquatic areas, livestock-specific erosion controls, reestablishment of vegetation, or extensive brush management correction.

5. Increase field and landscape buffers to provide cost-effective protection against the cumulative effects of many small, but unavoidable, pollutant discharges associated with an active agricultural enterprise and the kinds of catastrophic pollution that can be associated with the high energy flows and runoff associated with episodic storms. The full range of agricultural buffer practices (e.g., riparian forests, alley cropping, contour buffer strips, crosswind trap strips, field borders, filter strips, grassed waterways with vegetative filters, herbaceous wind barriers, vegetative barriers, and windbreak/shelterbelts) has to be systematically deployed, protected and managed across the agricultural landscape or overall aquatic habitat improvements will be minimal.

6. Optimize siting of new confined animal facilities or expansion of existing facilities by placing them away from riparian areas, surface water, and areas with high leaching potential to surface or groundwater. Ensure that adequate nutrient and wastewater collection facilities are in place. Ensure that sufficient cropland is available for agronomic application of animal wastes.

7. Consider using restored wetlands to reduce contamination from a variety of sources including nitrogen, phosphorus, suspended solids, biochemical oxygen demand (BOD), trace metals, trace organics, and pathogens. Larger wetland systems relative to the amount of land that is drained with longer retention times (at least 1 to 2 weeks) are most beneficial at improving water quality. Wetlands located within riparian buffer strips provide the most effective pollution removal by combining different treatment methods.

2.1.2 Silviculture/Timber Harvest

The harvest and cultivation of timber and other forestry products are major activities that can have both short- and long-term impacts throughout many coastal watersheds and estuaries. Timber harvest removes the dominant vegetation, converts mature and old-growth upland and riparian forests to tree stands or forests of early seral stage, reduces permeability of soils and increases the area of impervious surfaces, increases sedimentation from surface runoff and mass wasting processes, results in altered hydrologic regimes, and impairs fish passage through inadequate design, construction, and/or maintenance of stream crossings.

Deforestation associated with timber harvest can alter or impair instream habitat structure and watershed function. Timber harvest may result in inadequate or excessive surface and stream flows, increased stream bank and stream bed erosion, loss of complex instream habitats, sedimentation of riparian habitat, and increased surface runoff with associated contaminants (e.g., herbicides, fertilizers, fine sediments). Hydrologic characteristics, (e.g., water temperature, annual hydrograph) change, and greater variation in stream discharge is associated with timber harvest. Alterations in the supply of LWD and sediment can have negative effects on the formation and persistence of instream habitat features. Excess debris in the form of small wood and silt can smother benthic habitat and reduce dissolved oxygen levels.

Potential Adverse Impacts

Four major categories of activities can adversely affect EFH: 1) construction of logging roads, 2) creation of barriers, 3) removal of streamside vegetation, and 4) disturbance associated with log transfer facilities

(LTFs) (see Section 4.9).

Logging road construction can destabilize slopes and increase erosion and sedimentation (see Road Building and Maintenance, Section 2.3). Two major types of erosion occur: mass wasting and surface erosion. Mass movement of soils, commonly referred to as landslides or debris slides, is associated with timber harvest and road building on high hazard soils and unstable slopes. Both frequency and size of debris slides are increased when logging roads are built on, or timber is harvested from, these unstable land forms. The result is increased erosion and sediment deposition in downslope waterways. Erosion from roadways is most severe when poor construction practices are employed that do not include properly located, sized, and installed culverts; proper ditching; and ditch blocker water bars (Furniss et al. 1991).

Stream crossings (bridges and culverts) on forest roads are often inadequately designed, installed, and maintained, and they frequently result in full or partial barriers to both the upstream and downsteam migration of adult and juvenile fish. Perched and undersized culverts can accelerate stream flows to the point that these structures become velocity barriers for migrating fish. Blocked culverts result from installation of undersized culverts or inadequate maintenance to remove debris. Blocked culverts can result in displacement of the stream from the downstream channel to the roadway or roadside ditch, resulting in dewatering of the downstream channel and increased erosion of the roadway. Culverts and bridges deteriorate structurally over time. Failure to replace or remove them at the end of their useful life may cause partial or total blockage of fish passage. Caution should be used, however, when removing culverts. Channel incision can often occur downstream of a culvert and generally moves upstream. An existing culvert can act as a grade control, halting the upstream progression of a headcut and causing further channel regrade (Castro 2003). The unchecked upstream progression of a headcut can cause further damage to EFH.

Removing streamside vegetation increases the amount of solar radiation reaching the stream and can result in warmer water temperatures, especially in small, shallow streams of low velocity. In southeast Alaska, Meehan et al. (1969) found that maximum temperature in logged streams without riparian buffers exceeded that of unlogged streams by up to 5ºC, but did not reach lethal temperatures. However, the increased water temperatures often exceeded optimum temperatures for pink and chum salmon (Reiser and Bjornn 1979). Logged streams have been associated with higher water temperatures, lower base flows and higher peak flows, and low oxygen levels that have resulted in significant mortalities of pink and chum salmon (Flanders and Cariello 2000). In cold climates, the removal of riparian vegetation can result in lower water temperatures during winter, increasing the formation of ice and damaging and delaying the development of incubating fish eggs and alevins.

By removing vegetation, timber harvest reduces transpiration losses from the landscape and decreases the absorptive capability of the groundcover. These changes result in increased surface runoff during periods of high precipitation and decreased base flows during dry periods. Reduced soil strength results in destabilized slopes and increased sediment and debris input to streams (Swanston 1974). Sediment deposition in streams can reduce benthic community production (Culp and Davies 1983), cause mortality of incubating salmon eggs and alevins, and reduce the amount of habitat available for juvenile salmon (Heifetz et al. 1996). Cumulative sedimentation from logging activities can significantly reduce the egg-to-fry survival of coho and chum salmon (Cederholm and Reid 1987, Myren and Ellis 1984.) Reductions in the supply of LWD also result when old-growth forests are removed, with resulting loss of habitat complexity that is critically important for successful salmonid spawning and rearing. (Bisson et al. 1988).

Recommended Conservation Measures

1. Set best management practices (BMPs) for impacts affecting particular habitats and resulting from specific types of silviculture-related activities provided in the "Additional Resources" section.

2. Avoid timber operations to the extent practicable near streams with EFH. For the Alaska region, see the following link: Fish: Forest-Wide Standards and Guides:
http://www.fs.fed.us/r10/TLMP/F_PLAN/FPCHAP4.PDF;
http://www.or.blm.gov/ForestPlan/newsandga.pdf

3. Avoid timber operations to the extent practicable in wetlands contiguous with anadromous fish streams. See the following link: Wetlands: Forest-Wide Standards and Guides: http://www.fs.fed.us/r10/TLMP/F_PLAN/FPCHAP4.PDF

4. Avoid timber operations to the extent practicable near estuary and beach habitats. See the following link: Beach and Estuary Fringe: Forest-Wide Standards and Guides: http://www.fs.fed.us/r10/TLMP/F_PLAN/FPCHAP4.PDF

5. Maintain riparian buffers along all streams. In the Alaska region, buffer width is site-specific and dependent on stream process type. Stream process groups are described in the following link: http://www.fs.fed.us/r10/TLMP/F_PLAN/APPEND_D.PDF. Standards and guidelines for riparian buffers for the Alaska region are described in the following link: Riparian: Forest-Wide Standards and Guides: http://www.fs.fed.us/r10/TLMP/F_PLAN/FPCHAP4.PDF .

6. Incorporate watershed analysis into timber and silviculture projects. Particular attention should be given to the cumulative effects of past, present, and future timber sales within the watershed. See the following link on watershed analysis: http://www.fs.fed.us/r10/TLMP/F_PLAN/APPEND_J.PDF

7. Follow BMPs. See the following link on BMPs: http://www.fs.fed.us/r10/TLMP/F_PLAN/APPEND_C.PDF

8. For forest roads, see Section 2.3, Road Building and Maintenance. For the Alaska region, also see the following links: 1) transportation: forest-wide standards and guides http://www.fs.fed.us/r10/TLMP/F_PLAN/FPCHAP4.PDF and 2) soils and water: forest-wide standards and guides: http://www.fs.fed.us/r10/TLMP/F_PLAN/FPCHAP4.PDF

2.1.3 Pesticide Application

More than 800 different pesticides are currently registered for use in the United States. Legal mandates covering pesticides are the Clean Water Act (CWA) and the Federal Insecticide, Fungicide, and Rodenticide Act (FIFRA). Water quality criteria for the protection of aquatic life have only been developed for a few of the currently used chemicals (EPA, Office of Pesticide Programs). Collectively, these substances are designed to repel, kill, or regulate the growth of undesirable biological organisms. This diverse group includes fungicides, herbicides, insecticides, nematicides, molluscicides, rodenticides, fumigants, disinfectants, repellents, wood preservatives, and antifoulants. The most common pesticides are insecticides, herbicides, and fungicides. These are used for pest control on forested lands, agricultural crops, tree farms and nurseries, highways and utility rights of way, parks and golf courses, and residences. Pesticides can enter the aquatic environment as single chemicals or complex mixtures. Direct applications, surface runoff, spray drift, agricultural return flows, and groundwater intrusions are all examples of transport processes that deliver pesticides to aquatic ecosystems.

Pesticides are frequently detected in freshwater and estuarine systems that provide EFH. Nationwide, the most comprehensive environmental monitoring efforts have been conducted by the USGS as part of the National Water Quality Assessment (NAWQA) Program. A variety of human activities such as fire suppression on forested lands, forest site preparation, noxious weed control, right-of-way maintenance (roads, railroads, power lines, etc.), algae control in lakes and irrigation canals, various agricultural practices, riparian habitat restoration, and urban and residential pest control results in contamination from these substances. It is important to note that the term “pesticide” is a collective description of hundreds of chemicals with different sources, different fates in the aquatic environment, and different toxic effects on fish and other aquatic organisms. Despite these variations, all current use pesticides are 1) specifically designed to kill, repel, or regulate the growth of biological organisms and 2) intentionally released into the environment. Habitat alteration from pesticides is different from more conventional water quality parameters such as temperature, suspended solids, or dissolved oxygen because, unlike temperature or dissolved oxygen, the presence of pesticides can be difficult to detect due to limitation in proven methodologies. This monitoring may also be expensive. However, as analytical methodologies have improved in recent years, the number of pesticides documented in fish and their habitats has increased.

Potential Adverse Impacts

There are three basic ways that pesticides can adversely affect EFH. These are 1) a direct toxicological impact on the health or performance of exposed fish, 2) an indirect impairment of the productivity of aquatic ecosystems, and 3) a loss of aquatic vegetation that provides physical shelter for fish.

Fish kills are rare when pesticides are used according to their labels. For fish, the vast majority of effects from pesticide exposures are sublethal. Sublethal effects are a concern if they impair the physiological or behavioral performance of individual animals in ways that will decrease their growth or survival, alter migratory behavior, or reduce reproductive success. In addition to early development and growth, key physiological systems affected include the endocrine, immune, nervous, and reproductive systems. Many pesticides have been shown to impair one or more of these physiological processes in fish (Moore and Waring 2001). In general, however, the sublethal impacts of pesticides on fish health are poorly understood. Accordingly, this is a focus of recent and ongoing NOAA research (Scholz et al. 2000, Van Dolah et al. 1997).

The effects of pesticides on ecosystem structure and function can be a key factor in determining the cascading impacts of that chemical on fish and other aquatic organisms at higher trophic levels (Preston 2002). This includes impacts on primary producers (Hoagland et al. 1996) and aquatic microorganisms (DeLorenzo et al. 2001), as well as macroinvertebrates that are prey species for fish. For example, many pesticides are specifically designed to kill insects. Not surprisingly, these chemicals are relatively toxic to insects and crustaceans that inhabit river systems and estuaries. Overall, pesticides will have an adverse impact on fish habitat if they reduce the productivity of aquatic ecosystems. Finally, some herbicides are toxic to aquatic plants that provide shelter for various fish species. A loss of aquatic vegetation could damage nursery habitat or other sensitive habitats such as eelgrass beds and emergent marshes.

Recommended Conservation Measures

1. Incorporate integrated pest management (IPM) and BMPs as part of the authorization or permitting process to ensure the reduction of pesticide contamination in EFH (Scott et al. 1999).
2. Carefully review labels and ensure that application is consistent. Follow local, supplemental instructions such as county use bulletins where they are available.
3. Avoid the use of pesticides in and near EFH designated waters.
4. Refrain from areal spraying of pesticides on windy days.

2.2 Urban/Suburban Development

The information in this section is adapted from the following reference: NOAA Fisheries. 1998. Draft Document - Non-fishing threats and water quality: A reference for EFH consultation.

Urban growth and development in the United States continues to expand in coastal areas at a rate approximately four times greater than in other areas. The construction of urban, suburban, commercial, and industrial centers and corresponding infrastructure results in land use conversions typically resulting in vegetation removal and the creation of additional impervious surfaces. This runoff from impervious surfaces and storm sewers is the most widespread source of pollution into the Nation’s waterways (EPA 1995).

Potential Adverse Impacts

Development activities within watersheds and in coastal marine areas often impact the EFH of managed species on both long-term and short-term scales. Many of the impacts listed here are discussed in greater detail in other sections of this documents. However, primary impacts include 1) the loss of riparian and shoreline habitat and vegetation and 2) runoff. The removal of upland and shoreline vegetation removal can increase stream water temperatures, reduce supplies of LWD, and reduce sources of prey and nutrients to the water system. An increase in impervious surfaces, such as the addition of new roads (see also Section 2.3), roofs, bridges, and parking facilities, results in a decreased infiltration to groundwater and increased runoff volumes. This also has the potential to adversely affect water quality and water quantity/timing in downstream water bodies (i.e. estuaries and coastal waters).

The loss of riparian and shoreline habitat and vegetation can increase water temperatures and remove sources of cover. Such impacts can alter the structure of benthic and fish communities, resulting in an expected reduction in diversity and abundance of EFH species. Shoreline stabilization projects (see Section 4.7) that affect reflective wave energy can impede or accelerate natural movements of shoreline substrates, thereby impacting intertidal and sub-tidal habitats. Channelization of rivers cause loss of floodplain connectivity and simplification of habitat. The resulting sediment runoff can also restrict tidal flows and tidal elevations, resulting in losses of important fauna and flora (e.g., submerged aquatic vegetation).

Due to the intermittent nature of rainfall and runoff, the large variety of pollutant source types, and the variable nature of source loadings, urban runoff is difficult to control (Safavi 1996). The National Water Quality Inventory (EPA 2002) reports that runoff from urban areas is the leading source of impairment to surveyed estuaries and the third largest source of impairment to surveyed lakes. These include construction sediments, oil from autos, bacteria from failing septic systems, road salts, and heavy metals. Urban areas have an insidious pollution potential that one-time events such as oil spills do not. Pollutant increases gradually result in gradual declines in habitat quality.

Storm drains are often built to move water quickly away from roads, resulting in increased water input to streams. This greater volume and velocity erodes streambanks, increasing sediment loads and often temperatures. In a simulation model comparing an urban watershed with a forested watershed, Corbett et al. (1997) demonstrated that urban runoff volume and sediment yield were 5.5 times greater than forest runoff.

Also waterborne polyaromatic hydrocarbon (PAH) levels have been found to be significantly higher in an urbanized watershed when compared to a non-urbanized watershed (Fulton et al. 1993). Petroleum-based contaminants (such as fuel, oil, and some hydraulic fluids) contain PAHs which can cause acute toxicity to EFH species and their prey at high levels of exposure and can also cause chronic lethal as well as acute and chronic sublethal toxicity (Neff 1985).

Failing septic systems are an outgrowth of urban development. EPA estimates that 10 to 25 percent of all individual septic systems are failing at any one time, introducing excrement, detergents, endocrine disruptors, and chlorine into the environment. Even treated wastewater from urban areas can alter the physiology of intertidal organisms (Moles, A. and N. Hale. in press). Sewage discharge is a major source of coastal pollution, contributing 41 percent, 16 percent, 41 percent, and 6 percent of the total pollutant load for nutrients, bacteria, oils and toxic metals, respectively (Kennish 1998). Nutrients such as phosphorus concentrations, in particular, are indicative of urban stormwater runoff (Holler 1990). Sewage wastes may also contain significant amounts of organic matter that exert a biochemical oxygen demand (Kennish 1998). Organic contamination contained within urban runoff can also cause immuno suppression (Arkoosh et al. 2000) (NOAA Fisheries Draft 1998).

Recommended Conservation Measures

See also Section 2.3, Recommended Conservation Measures for Roads.

1. Implement BMPs (EPA 1993) for sediment control during construction and maintenance operations. These can include avoiding ground disturbing activities during the wet season; minimizing exposure time of disturbed lands; using erosion prevention and sediment control methods; minimizing the spatial extent of vegetation disturbance; maintaining buffers of vegetation around wetlands, streams, and drainage ways; and avoiding building activities in areas of steep slopes and areas prone to mass wasting events with highly erodible soils. Use methods such as sediment ponds, sediment traps, bioswales, or other facilities designed to slow water runoff and trap sediment and nutrients.
2. Avoid using hard engineering structures for shoreline stabilization and channelization when possible. Use bioengineering approaches (i.e., using vegetation approaches with principles of geomorphology, ecology, and hydrology) to protect shorelines and river banks. Naturally stable shorelines and river banks should not be altered (see Section 4.7).

3. Encourage comprehensive planning for watershed protection so as to avoid filling and building in floodplain areas affecting EFH. Development sites should be planned to minimize clearing and grading, cut-and-fill, and new impervious surfaces.
4. Where feasible, remove impervious surfaces such as abandoned parking lots and buildings from riparian and shoreline areas, and reestablish wetlands and native vegetation.
5. Protect and restore vegetated buffer zones of appropriate width along all streams, lakes, and wetlands that include or influence EFH.
6. Manage stormwater to duplicate the natural hydrologic cycle, maintaining natural infiltration and runoff rates to the maximum extent practicable.
7. Where in-stream flows are insufficient to maintain water quality and quantity needed for EFH, establish conservation guidelines for water use permits and encourage the purchase or lease of water rights and the use of water to conserve or augment instream flows in accordance with state and federal water law.
8. Encourage municipalities to use the best available technologies in upgrading their wastewater systems to avoid combined sewer overflow problems and chlorinated sewage discharges into rivers, estuaries, and the ocean.
9. On-site disposal systems should be properly designed and installed. They should be located away from open waters, wetlands, and floodplains.

2.3 Road Building and Maintenance

The building and maintenance of roads can affect aquatic habitats by increasing rates of natural processes such as debris slides or landslides and sedimentation, introducing exotic species, and degrading water quality and chemical contamination (e.g., petroleum-based contaminants; see Section 2.2). Paved and dirt roads introduce an impervious or semi-pervious surface into the landscape. This surface intercepts rain and creates runoff carrying soil, sand and other sediments, and oil-based materials quickly downslope. If roads are built near streams, wetlands, or other sensitive areas, these may be affected by the increased sedimentation that occurs both from maintenance and use and during storm and snowmelt events. Even carefully designed and constructed roads can become sources of sediment and pollutants if they are not properly maintained.

Potential Adverse Impacts

The effects of roads on aquatic habitat can be profound and include 1) increased deposition of fine sediments, 2) changes in water temperature, 3) elimination or introduction of migration barriers such as culverts, 4) changes in streamflow, 5) introduction of non-native plant species, and 6) changes in channel configuration.

Poorly surfaced roads can substantially increase surface erosion, and the rate of erosion is primarily a function of storm intensity, surfacing material, road slope, and traffic levels. This surface erosion results in an increase in fine sediment deposition (Bilby et al. 1989, MacDonald et al. 2001, Ziegler et al. 2001). An increase of fine-sediment deposition in stream gravels has been linked to decreased fry emergence, decreased juvenile densities, loss of winter carrying capacity, and increased predation of fishes (Koski 1981). Increased sediment fines can reduce benthic production or alter the composition of the benthic community. For example, embryo-to-emergent fry survival of incubating salmonids is negatively affected by increases in fine sediments in spawning gravels (Chapman 1988, Everest et al. 1987, Scrivener and Brownlee 1989, Weaver and Fraley 1993, Young et al. 1991).

Roads built adjacent to streams result in changes in water temperature and increased sunlight reaching the stream as riparian vegetation is removed and/or altered in composition. Beschta et al. (1987) and Hicks et al. (1991) document some of the negative effects of road construction on fish habitat, including elevation of stream temperatures beyond the range of preferred rearing, inhibition of upstream migrations, increased disease susceptibility, reduced metabolic efficiency, and shifts in species assemblages.

Roads can also degrade aquatic habitat through improperly placed culverts at road-stream crossings that reduce or eliminate fish passage (Belford and Gould 1989, Clancy and Reichmuth 1990, Evans and Johnston 1980, Furniss et al. 1991). In a large river basin in Washington, 13 percent of the historical coho habitat was lost due to improper culvert design and placement. (Beechie et al. 1994). Road crossings also affect benthic communities of stream invertebrates. Roads have a negative effect on the biotic integrity of both terrestrial and aquatic ecosystems (Trombulak and Frissell 2000). Studies indicate that populations of non-insect invertebrates tend to increase the farther from a road they are measured (Luce and Crowe 2001).

Roads may be the first point of entry into a virgin landscape for non-native grass species that are seeded along road cuts or introduced from seeds transported by tires and shoes. Roads can serve as corridors for such species allowing plants to move further into the landscape (Greenberg et al. 1997, Lonsdale and Lane 1994). Some non-native plants may be able to move away from the roadside and into aquatic sites of suitable habitat, where they may out-compete native species and have significant biological and ecological effects on the structure and function of the ecosystem.

Roads have three primary effects on hydrologic processes. First, they intercept rainfall directly on the road surface, in road cutbanks, and as subsurface water moving down the hillslope. Second, they concentrate flow, either on the road surfaces or in adjacent ditches or channels. Last, they divert or reroute water from flowpaths that would otherwise be taken if the road were not present (Furniss et al. 1991).

Road drainage and transport of water and debris, especially during heavy rains and snow melt periods, are primary reasons why roads fail, often with major structural, ecological, economic, or other social consequences. The effects of roads on peak streamflow depend strongly on the size of the watershed and the density of roads. Some of the effects are 1) changes in flood flows (Wemple et al. 1996) but mainly in smaller basins and for smaller floods (Beschta et al. 2000), and 2) increased channel erosion and mass wasting (Montgomery 1994, Madej 2001, Wemple et al. 2001). For example, capture and rerouting of water can dewater one small stream and cause major channel adjustments in the stream receiving the additional water. In large watersheds with low road density, properly located and maintained roads may constitute a small proportion of the land surface and have relatively insignificant effects on peak flow.

Roads can lead to increased rates of natural processes such as debris or landslides and sedimentation when slopes are destabilized and surface erosion and soil mass movement increases. Erosion is most severe when poor construction practices are allowed, combined with inadequate attention to proper road drainage and maintenance practices. Mass movement risks increase when roads are constructed on high-hazard soils and overly steep slopes. In steep areas prone to landslides, rates of mass soil movements affected by roads include shallow debris slides, deep-seated slumps and earthflows, and debris flows. Accelerated erosion rates from roads because of debris slides range from 30 to 300 times the natural rate in forested areas, but vary with terrain in the Pacific Northwest (Sidle et al. 1985). The magnitude of road-related mass erosion varies by climate, geology, road age, construction practices, and storm history. Road-related mass failures result from various causes, including improper placement and construction of road fills and stream crossings; inadequate culvert sizes to pass water, sediment, and wood during floods; poor road siting; modification of surface or subsurface drainage by the road surface or prism; and diversion of water into unstable parts of the landscape (Burroughs et al. 1976, Clayton 1983, Hammond et al. 1988, Furniss et al. 1991, Larsen and Parks 1997).

Recommended Conservation Measures

1. Avoid locating roads near fish-bearing streams. Roads should be sited to avoid sensitive areas such as streams, wetlands, and steep slopes.
2. Incorporate erosion control and stabilization measures into road construction plans to reduce erosion potential.
3. Build bridges when possible. If culverts are to be used, they should be sized, constructed, and maintained to match the gradient and width of the stream, so as to accommodate 100-year flood flows, but equally to provide for migratory passage of adult and juvenile fishes. Utilize guidelines provided in the document: “Guidelines for Salmonid Passage at Stream Crossing,” NOAA Fisheries, Southwest Region, October 2001 (http://swr.nmfs.noaa.gov/hcd/NMFSSCG.PDF).
4. Locate stream crossings in stable stream reaches.
5. Design bridge abutments to minimize disturbances to streambanks and place abutments outside of the

floodplain whenever possible.

6. Avoid road construction across alluvial floodplains, mass wastage areas, or braided stream bottom lands unless site-specific protection can be implemented to ensure protection of soils, water, and associated resources.
7. Avoid side-casting of road materials into streams year-round.
8. Use only native vegetation in stabilization plantings.
9. Maintenance practices should not cause existing problems to worsen.

3.0 RIVERINE ACTIVITIES

3.1 **Mining** (see Section 5.6 - Marine Mining)

Mining and mineral extraction activities take many forms such as commercial dredging and recreational suction dredging, placer, area surface removal, and contour operations. Activities include exploration, site preparation, mining, milling, waste management, decommissioning or reclamation, and even mine abandonment (American Fisheries Society [AFS] 2000). Mining and its associated activities have the potential to cause environmental impacts from exploration through post-closure. These impacts may include adverse effects to EFH. The operation of metal, coal, rock quarries, and gravel pit mining has caused varying degrees of environmental damage in urban, suburban, and rural areas. Some of the most severe damage, however, occurs in remote areas, where some of the most productive fish habitat is often located (Sengupta 1993). Regulations have been designed to control and manage these changes to the landscape to avoid and minimize impacts. These regulations are updated as new technologies are developed to improve mineral extraction, reclaim mined lands, and limit environmental impacts. However, while environmental regulations may avoid, limit, control, or offset many of these potential impacts, mining will, to some degree, always alter landscapes and environmental resources (National Research Council [NRC] 1999).

3.1.1 Mineral Mining

Potential Adverse Impacts

Potential impacts from mining include 1) adverse modification of hydrologic conditions so as to cause erosion of desirable habitats, 2) removal of substrates that serve as habitat for fish and invertebrates, 3) conversion of habitats, 4) release of harmful or toxic materials, and 5) creation of harmful turbidity levels.

The effects of mineral mining on EFH depend on the type, extent, and location of the activities. Minerals are extracted using several methods. Surface mining involves suction dredging, hydraulic mining, panning, sluicing, strip mining, and open-pit mining (including heap leach mining). Underground mining uses tunnels or shafts to extract minerals by physical or chemical means. Surface mining probably has a greater potential to affect aquatic ecosystems, though specific effects will depend on the extraction and processing methods and the degree of disturbance (Spence et al. 1996). Surface mining has the potential to eliminate vegetation, permanently alter topography, permanently and drastically alter soil and subsurface geological structure, and disrupt surface and subsurface hydrologic regimes (AFS 2000). While mining may not be as geographically pervasive as other sediment-producing activities, surface mining typically increases sediment delivery much more per unit of disturbed area than other activities because of the level of disruption of soils, topography, and vegetation. Erosion from surface mining and spoils may be one of the greatest threats to salmonid habitats in the western United States (Nelson et al. 1991).

Mining and placement of spoils in riparian areas can cause the loss of riparian vegetation and changes in heat exchange, leading to higher summer temperatures and lower winter stream temperatures (Spence et al. 1996). Bank instability can also lead to altered width-to-depth ratios, which further influence temperature (Spence et al. 1996). Mining efforts can also bury productive habitats near mine sites.

Mining operations can release harmful or toxic materials and their byproducts, either in association with actual mining, or in connection with machinery and materials used for mining. Mining can also introduce levels of heavy metals and arsenic that are naturally found within the stream bed sediments. Tailings and discharge waters from settling ponds can result in loss of EFH and life stages of managed species. The impact degrades water quality and levels can become high enough to prove lethal (North Pacific Fishery Management Council [NPFMC] 1999).

Commercial operations may also involve road building (see Section 2.3), tailings disposal (Section 4.2), and leaching of extraction chemicals, all of which may create serious impacts to EFH. Cyanide, sulfuric acid, arsenic, mercury, heavy metals, and reagents associated with such development are a threat to EFH. Improper or in-water disposal of tailings may be toxic to managed species or their prey downstream. Upland disposal of tailings in unstable or landslide prone areas can cause large quantities of toxic compounds to be released into streams or to contaminate groundwater (NPFMC 1999). Indirectly, the sodium cyanide solution used in heap leach mining is contained in settling ponds from which groundwater and surface waters may become contaminated (Nelson et al. 1991).

Water pollution by heavy metals and acid is also often associated with mineral mining operations, as ores rich in sulfides are commonly mined for gold, silver, copper, iron, zinc, and lead. When stormwater comes in contact with sulfide ores, sulfuric acid is commonly produced (West et al. 1995). Abandoned pit mines can also cause severe water pollution problems.

Recreational gold mining with such equipment as pans, motorized or nonmotorized sluice boxes, concentrators, rockerboxes, and dredges can adversely affect EFH on a local level. Commercial mining is likely to involve activities at a larger scale with much disturbance and movement of the channel involved (OWRRI 1995).

Recommended Conservation Measures

The following suggested measures are adapted from recommendations in Spence et al. (1996), NMFS (1996), and Washington Department of Fish and Wildlife (WDFW) (1998).

1. Avoid mineral mining in waters and streams containing EFH.
2. Schedule necessary in-water activities when the fewest species/least vulnerable life stages of federally managed species will be present.
3. Use an integrated environmental assessment, management, and monitoring package in accordance with state and federal law. Allow for adaptive operations to minimize adverse effects on EFH.
4. Avoid spills of dirt, fuel, oil, toxic materials, and other contaminants into EFH. Prepare a spill prevention plan and maintain appropriate spill containment and water repellent/oil absorbent cleanup materials on hand.
5. Treat wastewater (acid neutralization, sulfide precipitation, reverse osmosis, electrochemical, or biological treatments) and recycle on site to minimize discharge to streams. Test wastewater before discharge for compliance with federal and state clean water standards.
6. Minimize opportunities for sediments to enter or affect EFH. Use methods such as contouring, mulching, and construction of settling ponds to control sediment transport. Monitor turbidity during operations, and cease operations if turbidity exceeds predetermined threshold levels. Use turbidity/sediment curtains to limit the spread of suspended sediments and minimize the area affected.
7. Reclaim, rather than bury, mine waste that contains heavy metals, acid materials, or other toxic compounds if leachate can enter EFH through groundwater.
8. Restore natural contours and plant native vegetation on site after use to restore habitat function to the extent practicable. Monitor the site for an appropriate period of time to evaluate performance and implement corrective measures if necessary.
9. Minimize the aerial extent of ground disturbance (e.g., through phasing of operations), and stabilize disturbed lands to reduce erosion.

3.1.2 Sand and Gravel Mining

Potential Adverse Impacts

Mining of sand and gravel is extensive and occurs by several methods. These include wet-pit mining (i.e., remove material from below the water table), dry-pit mining on beaches, exposed bars and ephemeral streambeds, and subtidal mining. Sand and gravel mining in riverine, estuarine, and coastal environments can create EFH impacts including 1) turbidity plumes and resuspension effects, 2) removal of spawning habitat, and 3) alteration of channel morphology.

Mechanical disturbance of EFH spawning habitat by mining equipment can also lead to high mortality rates in early life stages. One result is the creation of turbidity plumes (Section 4.1) which can move several kilometers downstream. Sand and gravel mining in riverine, estuarine, and coastal environments can also suspend materials at the sites (Section 5).

Sedimentation may be a delayed effect, because gravel removal typically occurs at low flow when the stream has the least capacity to transport fine sediments out of the system. Another delayed sedimentation effect results when freshets inundate extraction areas that are less stable than before. In addition, for species such as salmon, gravel operations can also interfere with migration past the site if they create physical or thermal changes at the work site or downstream from the site (OWRRI 1995).

Additionally, extraction of sand and gravel in riverine ecosystems can directly eliminate the amount of gravel available for spawning if the extraction rate exceeds the deposition rate of new gravel in the system. Gravel excavation also locally reduces the supply of gravel to downstream habitats. The extent of suitable spawning habitat may be reduced where degradation reduces gravel depth or exposes bedrock (Spence et al. 1996).

Mining can also alter channel morphology by making the stream channel wider and shallower. Consequently, the suitability of stream reaches as rearing EFH may be decreased, especially during summer low-flow periods when deeper waters are important for survival. Similarly, a reduction in pool frequency may adversely affect migrating adults that require holding pools (Spence et al. 1996). Changes in the frequency and extent of bedload movement and increased erosion and turbidity can also remove spawning substrates, scour redds (resulting in a direct loss of eggs and young), or reduce their quality by deposition of increased amounts of fine sediments. Other effects that may result from sand and gravel mining include increased temperatures (from reduction in summer base flows and decreases in riparian vegetation), decreased nutrients (from loss of floodplain connection and riparian vegetation), and decreased food production (loss of invertebrates) (Spence et al. 1996).

Examples of using gravel removal to improve habitat and water quality are limited and isolated (OWRRI 1995). Deep pools created by material removal in streams appear to attract migrating adult salmon for holding. These concentrations of fish may result in high losses as a result of increase in predation or recreational fishing pressure.

Recommended Conservation Measures

The following suggested measures are adapted from NMFS (1996) and OWRRI (1995).

1. Avoid sand/gravel mining in waters containing EFH. Many factors influence site selection for a gravel or sand mining site. Because of the need to incorporate technical, economic and environmental factors, siting decisions should be considered on a case-by-case basis (USFWS 1980).
2. Identify upland or off-channel (where channel will not be captured) gravel extraction sites as alternatives to gravel mining in or adjacent to EFH, if possible.
3. Design, manage, and monitor sand and gravel mining operations to minimize potential direct and indirect impacts to EFH if operations in EFH cannot be avoided. This includes, but is not limited to, migratory corridors, foraging and spawning areas, stream/river banks, intertidal areas, etc.
4. Minimize the areal extent and depth of extraction.
5. Include restoration, mitigation, and monitoring plans in sand/gravel extraction plans.

3.2 Debris Removal

3.2.1 Organic Debris

Natural occurring flotsam such as LWD and macrophyte wrack (i.e., kelp) is often removed from streams, estuaries, and coastal shores. This debris is removed for a variety of reasons including dam operations, aesthetic concerns, and commercial and recreational uses. Because the debris affects habitat function and provides habitat for aquatic and terrestrial organisms, removing it may change the ecological balance among riverine, estuarine, and coastal ecosystems.

Potential Adverse Impacts

LWD and macrophyte wrack promote habitat complexity and structure to various aquatic and shoreline habitats. The structure provides cover for managed species, creates habitats and microhabitats (e.g., pools, riffles, undercut banks, side channels), and retains gravels and can maintain the underlying channel structure (Abbe and Montgomery 1996, Montgomery et al. 1995, Ralph et al. 1994, Spence et al. 1996) in riverine systems. Its removal reduces these habitat functions. Reductions in LWD input to estuaries have reduced the spatially complex and diverse channel systems that provide for productive salmon habitat (NRC 1996). Woody debris also plays a significant role in salt marsh ecology (Maser and Sedell 1994). Reductions in woody debris input to the estuaries may affect the ecological balance of the estuary. LWD also plays a significant role in benthic ocean ecology, where deep-sea wood borers convert the wood to fecal matter, providing terrestrial based carbon to the ocean food chain (Maser and Sedell 1994). Dams and commercial in-river harvest of large woody debris have dwindled the supply of wood, jeopardizing the ecological link between the forest and the sea (Collins et al. 2002, Collins et al. 2003, Maser and Sedell 1994).

Species richness, abundance, and biomass of macrofauna (e.g., sand crabs, isopods, amphipods and polychaetes) associated with beach wrack are higher compared to beach areas with lower amounts of wrack or that are groomed(Dugan et al. 2000). The input and maintenance of wrack can strongly influence the structure of macrofauna communities including the abundance of sand crabs (*Emerita analoga)* (Dugan et al. 2000), an important prey species to some EFH managed species. Beach grooming can substantially alter the macrofaunal community structure of exposed sand beaches (Dugan et al. 2000). In addition, there are concerns that beach grooming efforts to remove wrack may also harm the eggs of the grunion (*Leuresthes tenuis*), an important prey item of EFH managed species.

Recommended Conservation Measures

1. Remove woody debris only when it presents a threat to life or property. Leave LWD wherever possible. Reposition, rather than remove woody debris that must be moved.
2. Encourage appropriate federal, state, and local agencies to prohibit or minimize commercial removal of woody debris from rivers, estuaries, and beaches.
3. Encourage appropriate federal, state, and local agencies to aid in the downstream movement of LWD around dams, rather than removing it from the system.
4. Educate landowners and recreationalists about the benefits of maintaining LWD.
5. Localize beach grooming practices and minimize it whenever possible.
6. Conduct beach grooming only above the semilunar high tide as soon as the grunion spawning period begins in the spring, and continue 2 weeks after the last grunion spawning runs are observed in the summer.
7. Familiarize beach maintenance staff with the importance of such practices.

3.2.2 Inorganic Debris

Marine debris is a problem along much of U.S. coastal waters, littering shorelines, fouling estuaries, and creating hazards in the open ocean. Marine debris consists of a huge variety of man-made materials such as general litter, dredged materials, hazardous wastes, and discarded or lost fishing gear. It enters waterways either indirectly through rivers and storm drains or by direct ocean dumping. Marine debris can have serious negative effects on EFH. Although several legislative laws and regulatory programs exist to prevent or control the problem, marine debris continues to severely impact our waters.

Congress has passed numerous legislative acts intended to prevent the disposal of marine debris in U.S. ocean waters. These include the Marine Protection, Research, and Sanctuaries Act, Titles I and II (also known as the Ocean Dumping Act), The Federal Water Pollution Control Act (Clean Water Act), and the Comprehensive Environmental Response, Compensation, and Liability Act. The International Convention for the Prevention of Pollution from Ships, commonly known as MARPOL Annex V (33 CFR 151), is intended to protect the marine environment from various types of garbage by preventing ocean dumping if the ship is less than 25 nautical miles from shore. Dumping of unground food waste and other garbage is prohibited within 12 nautical miles from shore, and ground non-plastic or food waste may not be dumped within 3 nautical miles of shore. The Ocean Dumping Act implements the Convention on the Prevention of Marine Pollution by Dumping of Wastes and Other Matter (London Dumping Convention) for the United States. Section 311 of the Federal Water Pollution Control Act makes it unlawful for any person to discharge any pollutant into the waters of the United States except as authorized by law. The Comprehensive Environmental Response, Compensation, and Liability Act stipulates that releases of hazardous substances in reportable quantities must be reported, and the release must be removed by the responsible party. Regulations implementing these acts are intended to control marine debris from ocean sources, including galley waste and other trash from ships, recreational boaters and fishermen, and offshore oil and gas exploration and facilities.

Land-based sources of marine debris account for about 80 percent of the marine debris on beaches and in our waters. Debris from these sources can originate from combined sewer overflows and storm drains, storm-water runoff, landfills, solid waste disposal, poorly maintained garbage bins, floating structures, and general littering of beaches, rivers and open waters. Typical debris from these land-based sources includes raw or partially treated sewage, litter, hazardous materials, and discarded trash. Legislation and programs that address these land-based sources of pollution include the BEACH Act, the National Marine Debris Monitoring Program (NMDMP), the Shore Protection Act of 1989, and the Clean Water Act. The BEACH Act authorizes the EPA to fund state, territorial, Tribal, and local government programs that test and monitor coastal recreational waters near public access sites for microbial contaminants and to assess and monitor floatable debris. The NMDMP is a 5-year study designed to provide statistically valid estimates of marine debris affecting the entire U.S. coastline and to determine the main sources of the debris. The Shore Protection Act contains provisions to ensure that municipal and commercial solid wastes are not deposited in coastal waters during vessel transport from source to the waste receiving station. The Clean Water Act requires the EPA to develop and enforce regulations that treat storm water and combined sewer overflows as point source discharges requiring National Pollution Discharge Elimination System (NPDES) permits that prohibit non-storm water discharges into storm sewers.

Potential Adverse Impacts

Land- and ocean-based marine debris is a very diverse problem and adverse effects to EFH are likewise diverse. Floating or suspended trash can directly affect fish who consume or are entangled in the debris. Toxic substances in plastics can kill or impair fish and invertebrates that use habitat polluted by these materials which persist in the environment and can bioaccumulate through the food web. Once floatable debris settles to the bottom of estuaries, coastal, and open ocean areas, it may continue to cause environmental problems. Plastics and other materials with a large surface area can cover and suffocate immobile animals and plants, creating large spaces devoid of life. Currents can carry suspended debris to underwater reef habitats where the debris can become snagged, damaging these sensitive habitats. The typical floatable debris from combined sewer overflows includes street litter, sewage containing viral and bacterial pathogens, pharmaceutical by-products from human excretion, and pet wastes. It may contain condoms, tampons, and contaminated hypodermic syringes, all of which can pose physical and biological threats to EFH. Suspended organic matter has a high biological oxygen demand, and its reduction can cause algal blooms and anoxia that are detrimental to productive marine habitats. Pathogens can also contaminate shellfish beds.

Recommended Conservation Measures

1. Encourage proper trash disposal in coastal and ocean settings.
2. Advocate and participate in coastal cleanup activities.
3. Encourage enforcement of regulations addressing marine debris pollution and proper disposal.
4. Provide resources and technical guidance for development of studies and solutions addressing the problem of marine debris.
5. Provide resources to the public on the impact of marine debris and guidance on how to reduce or eliminate the problem.

3.3 Dam Operation

The construction and operation of dams provide a source of hydropower, a reservoir for water storage, and a means to control flood control. Their operation, however, can affect water quality and quantity in riverine systems.

Potential Adverse Impacts

The effects of dam construction and operation on EFH can include 1) migratory impediments, 2) water flow and current pattern shifts, 3) thermal impacts, and 4) limits on sediment and woody debris transport.

One of the major impacts from dam construction and operation is that it impedes or completely creates impassable barriers to anadromous fish migrations in streams and rivers. Unless proper fish passage devices are in place, dams can either prevent access to productive upstream spawning habitat upstream or can alter downstream juvenile movements. The passage of salmon through turbines, sluiceways, bypass systems, and fish ladders also affects the quality of EFH (Pacific Fishery Management Council [PFMC] 1999).

In addition, dam operations also reduce downstream water velocities and change current patterns (PFMC 1999). These modifications can increase migration times (Raymond 1979). Water-level fluctuations, altered seasonal and daily flow regimes, reduced water velocities, and discharge volumes can affect the migratory behavior of juvenile salmonids and reduce the availability of shelter and foraging habitat (PFMC 1999).

Dams can also affect the thermal regimes of streams by raising water temperatures. Changes in water temperature can affect the development and smoltification of salmonids (PFMC 1999) and adult migration (Spence et al. 1996).

Dams also limit or alter natural sediment and LWD transport processes by impeding the high flows needed to scour fine sediments and move woody debris downstream (PFMC 1999). Curtailing these resources will affect the availability of spawning gravels and change channel morphology (Spence et al. 1996).

Recommended Conservation Measures (Adapted from PFMC 1999)

1. Operate facilities to create flow conditions that provide for passage, water quality, proper timing of life history stages, and properly functioning channel conditions, and to avoid strandings and redd dewatering.
2. Develop water and energy conservation guidelines for integration into dam operation plans and into regional and watershed-based water resource plans.
3. Provide mitigation (including monitoring and evaluation) for nonavoidable adverse effects on EFH.

3.4 Commercial and Domestic Water Use

Commercial and domestic water use demands to support the needs of homes, farms, and industries require a constant supply of water. Freshwater is diverted directly from lakes, streams, and rivers by means of pumping facilities or is stored in impoundments. Because human populations are expected to continue increasing along most of the West Coast, it is reasonable to assume that water uses, including water impoundments and diversion, will similarly increase (Gregory and Bisson 1997).

Potential Adverse Impacts

The information in this section is adapted from the following reference: NOAA Fisheries. 1998. Draft Document - Non-fishing threats and water quality: A reference for EFH consultation.

The withdrawal of water can affect EFH by 1) altering natural flows and the process associated with flow rates, 2) affecting shoreline riparian habitats, 3) affecting prey bases, 4) affecting water quality, and 5) entraping fishes. Water diversions can involve either withdrawals, thus reducing flow, or discharges, thus increasing flow. Water withdrawal will alter natural flow and stream velocity and channel depth and width. It can also change sediment and nutrient transport characteristics (Christie et al. 1993, Fajen and Layzer 1993), increase deposition of sediments, reduce depth, and accentuate diel temperature patterns

(Zale et al. 1993). Loss of vegetation along stream banks and coastlines due to fluctuating water levels can decrease the availability of fish cover and reduce stability (Christie et al. 1993). Changes in the quantity and timing of stream flow alters the velocity of streams, which, in turn, affects the composition and abundance of both insect and fish populations (Spence et al. 1996). Returning irrigation water to a stream, lake, or estuary can substantially alter and degrade habitat (NRC 1989). Problems associated with return flows include increased water temperature, increased salinity, introduction of pathogens, decreased dissolved oxygen, increased toxic contaminants from pesticides and fertilizers, and increased sedimentation (NPPC 1986). Diversions can also physically divert or entrap EFH managed species (see Section 5.3).

Recommended Conservation Measures

1. Design projects to create flow conditions adequate to provide for passage, water quality, proper timing of life history stages, and avoidance of juvenile stranding and redd dewatering, as well as to maintain and restore properly functioning channel, floodplain, riparian, and estuarine conditions.
2. Establish adequate instream flow conditions for anadromous fish.
3. Screen water diversions on fish-bearing streams, as needed.
4. Incorporate juvenile and adult fish passage facilities on all water diversion projects (e.g., fish bypass systems).
5. Ensure that mitigation is provided for non-avoidable impacts.

4.0 ESTUARINE ACTIVITIES

4.1 Dredging

Dredging navigable waters is a continuous impact primarily affecting benthic and water-column habitats in the course of constructing and operating marinas, harbors, and ports. Routine dredging, that is, the excavation of soft bottom substrates, is used to create deepwater navigable channels or to maintain existing channels that periodically fill with sediments. In addition, port expansion has become an almost continuous process due to economic growth, competition between ports, and significant increases in vessel size (see Section 4.3). Elimination or degradation of aquatic and upland habitats is commonplace since port expansion almost always affects open water, submerged bottoms, and, possibly, riparian zones.

Potential Adverse Impacts

The environmental effects of dredging on EFH can include 1) direct removal/burial of organisms; 2) turbidity/siltation effects, including light attenuation from turbidity; 3) contaminant release and uptake, including nutrients, metals, and organics; 4) release of oxygen consuming substances; 5) entrainment; 6) noise disturbances; and 6) alteration to hydrodynamic regimes and physical habitat.

Many EFH species forage on infaunal and bottom-dwelling organisms. Dredging may adversely affect these prey species at the site by directly removing or burying immobile invertebrates such as polychaete worms, crustacean, and other EFH prey types (Newell et al. 1998, Van der Veer et al. 1985). Similarly, the dredging activity may also force mobile animals such as fish to migrate out of the project area. Recolonization studies suggest that recovery may not be quite as straightforward. Physical factors including particle size distribution, currents, and compaction/stabilization processes following deposition reportedly can regulate recovery after dredging events. Rates of recovery listed in the literature range from several months for estuarine muds to up to 2 to 3 years for sands and gravels. Recolonization can also take up to 1 to 3 years in areas of strong current but up to 5 to 10 years in areas of low current. Thus, forage resources for benthic feeders may be substantially reduced.

The use of certain types of dredging equipment can result in greatly elevated levels of fine-grained mineral particles or suspended sediment concentration (SSC), usually smaller than silt, and organic particles in the water column. The associated turbidity plumes of suspended particulates may reduce light penetration and lower the rate of photosynthesis for subaquatic vegetation (Dennison 1987) and the primary productivity of an aquatic area if suspended for extended periods of times (Cloern 1987). If suspended sediments loads remain high, fish may suffer reduced feeding ability (Benfield and Minello 1996) and be prone to fish gill injury (Nightingale and Simenstad 2001a).

Sensitive habitats such as submerged aquatic vegetation beds, which provide food and shelter also may be damaged. Eelgrass beds are critical to nearshore food web dynamics (Wyllie-Echeverria and Phillips 1994, Murphy et al. 2000). Studies have shown seagrass beds to be among the areas of highest primary productivity in the world (Herke and Rogers 1993, Hoss and Thayer 1993). This primary production, combined with other nutrients, provide high rates of secondary production in the form of fish (Herke and Rogers 1993, Good 1987, Sogard and Able 1991).

The contents of the suspended material may react with the dissolved oxygen in the water and result in short-term oxygen depletion to aquatic resources (Nightingale and Simenstad 2001a). Dredging can also disturb aquatic habitats by resuspending bottom sediments and, thereby, recirculate toxic metals (e.g., lead, zinc, mercury, cadmium, copper etc.), hydrocarbons (e.g., polyaromatics) hydrophobic organics (e.g., dioxins), pesticides, pathogens, and nutrients into the water column (EPA 2000). Toxic metals and organics, pathogens, and viruses, absorbed or adsorbed to fine-grained particulates in the material, may become biologically available to organisms either in the water column or through food chain processes.

Direct uptake of fish species by hydraulic dredging at the proposed borrow site is also an issue.

Definitive information in the literature shows that elicit avoidance responses to the suction dredge entrainment occurs for both benthic and water column oriented species (Larson and Moehl 1990, McGraw and Armstrong 1990).

Dredging, as well as the equipment used in the process such as pipelines (see Section 4.10), may damage or destroy spawning, nursery, and other sensitive habitats such as emergent marshes and subaquatic vegetation, including eelgrass beds and kelp beds. Dredging may also modify current patterns and water circulation of the habitat by changing the direction or velocity of water flow, water circulation, or dimensions of the water body traditionally used by fish for food, shelter, or reproductive purposes.

Recommended Conservation Measures

1. Avoid new dredging to the maximum extent practicable. Activities that would likely require dredging (such as placement of piers, docks, marinas, etc.) should, instead, be sited in deep water areas or designed to alleviate the need for maintenance dredging. Projects should be permitted only for water dependent purposes and only when no feasible alternatives are available.
2. Incorporate adequate control measures to minimize turbidity where the dredging equipment used is expected to create significant turbidity.
3. Undertake multi-season, pre-, and post-dredging biological surveys to assess impacts to animal and submerged aquatic vegetation communities.
4. Provide appropriate compensation for significant impacts (short-term, long-term and cumulative) to benthic environments resulting from dredging.
5. Perform dredging during the time frame when impacts due to entrainment of EFH managed species or their prey are least likely to be entrained. Dredging should be avoided in areas with submerged aquatic vegetation.
6. Reference all dredging latitude-longitude coordinates at the site so that information can be incorporated into a geographical information system (GIS) format. Inclusion of aerial photos may be useful to identify precise locations for long-term evaluation.
7. Test sediments for contaminants as per EPA and USACE requirements.
8. Address cumulative impacts of past and current dredging operations on EFH by considering them as part of the permitting process.
9. Identify excess sedimentation in the watershed that prompts excessive maintenance dredging activities and implement appropriate management techniques to ensure that actions are taken to curtail those causes.
10. Ensure that bankward slopes of the dredged area are slanted to acceptable side slopes (e.g., 3:1) to ensure that sloughing does not occur.
11. Avoid placing pipelines and accessory equipment used in conjunction with dredging operations to the maximum extent possible close to kelp beds, eelgrass beds, estuarine/salt marshes, and other high value habitat areas.

4.2 Disposal/Landfills

The discharge of dredged materials subsequent to dredging operations or the use of fill material in the construction/development of harbors results in sediments (e.g., dirt, sand, mud) covering or smothering existing submerged substrates. Usually these covered sediments are of a soft-bottom nature as opposed to rock or hard-bottom substrates.

4.2.1 Disposal of Dredged Material

Potential Adverse Impacts

The disposal of dredged material can adversely affect EFH by 1) impacting or destroying benthic communities, 2) affecting adjacent habitats; 3) creating turbidity plumes and introducing contaminants and/or nutrients.

Disposing dredged materials result in varying degrees of change in the physical, chemical, and biological characteristics of the substrate. Discharges may adversely affect infaunal and bottom-dwelling organisms at the site by smothering immobile organisms (e.g., prey invertebrate species) or forcing mobile animals (e.g., benthic-oriented fish species) to migrate from the area. Infaunal invertebrate plants and animals present prior to a discharge are unlikely to recolonize if the composition of the discharged material is drastically different.

Erosion, slumping, or lateral displacement of surrounding bottom of such deposits can also adversely affect substrate outside the perimeter of the disposal site by changing or destroying benthic habitat. The bulk and composition of the discharged material and the location, method, and timing of discharges may all influence the degree of impact on the substrate.

The discharge of material can result in greatly elevated levels of fine-grained mineral particles, usually smaller than silt, and organic particles in the water column (i.e., turbidity plumes). These suspended particulates may reduce light penetration and lower the rate of photosynthesis and the primary productivity of an aquatic area if suspended for lengthy intervals. Aquatic vegetation such as eelgrass beds and kelp beds may also be affected. Managed fish species may suffer reduced feeding ability, leading to limited growth and lowered resistance to disease if high levels of suspended particulates persist. The contents of the suspended material may react with the dissolved oxygen in the water and result in oxygen depletion. Toxic metals and organics, pathogens, and viruses absorbed or adsorbed to fine-grained particulates in the material may become biologically available to organisms either in the water column or through food chain processes.

The discharge of dredged or fill material can change the chemistry and the physical characteristics of the receiving water at the disposal site by introducing chemical constituents in suspended or dissolved form. Reduced clarity and excessive contaminants can reduce, change or eliminate the suitability of water bodies for populations of groundfish, other fish species and their prey. The introduction of nutrients or organic material to the water column as a result of the discharge can lead to a high biochemical oxygen demand (BOD), which in turn can lead to reduced dissolved oxygen, thereby potentially affecting the survival of many aquatic organisms. Increases in nutrients can favor one group of organisms such as polychaetes or algae to the detriment of other types.

4.2.2 Fill Material

Potential Adverse Impacts

Adverse impacts to EFH from the introduction of fill material included 1) loss of habitat function and 2) changes in hydrologic patterns.

Aquatic habitats sustain remarkably high levels of productivity and support various life stages of fish species and their prey. Many times these habitats are used for multiple purposes including habitat necessary for spawning, breeding, feeding, or growth to maturity. The introduction of fill material eliminates those functions and permanently removes the habitat from production.

The discharge of dredged or fill material can modify current patterns and water circulation by obstructing flow, changing the direction or velocity of water flow and circulation, or otherwise changing the dimensions of a water body. As a result, adverse changes can occur in the location, structure, and dynamics of aquatic communities; shoreline and substrate erosion and deposition rates; the deposition of suspended particulates; the rate and extent of mixing of dissolved and suspended components of the water body; and water stratification (NMFS 1998).

Recommended Conservation Measures

1. Study all options for disposal of dredged materials, including disposal sites and methods used. Upland dredge disposal sites should be considered as an alternative to offshore disposal sites.
2. The cumulative impacts of past and current fill operations on EFH should be addressed by federal, state, and local resource management and permitting agencies and considered in the permitting process.
3. Disposal of dredge material in EFH should meet or exceed applicable state and/or federal quality standards for such disposal.
4. State and federal agencies should identify the direct and indirect impacts open-water disposal permits

for dredged material may have on EFH during proposed project reviews. Benthic productivity should be determined by sampling prior to any discharge of fill material. Sampling design should be developed with input from state and federal natural resource agencies.

5. The areal extent of any disposal site in EFH should be avoided or minimized. However, in some cases, thin layer disposal may be less deleterious. All non-avoidable adverse impacts should be mitigated.
6. All spoil disposal permits should reference latitude-longitude coordinates of the site so information can be incorporated into GIS systems. Inclusion of aerial photos or benthic photos may also be required to identify precise locations and determine long-term effects.
7. Fills in estuaries and bays for development of commercial enterprises should be avoided.
8. Identify and characterize EFH habitat functions/services in the project areas.
9. Adequate compensatory mitigation should be provided for unavoidable impacts.

4.3 Vessel Operations/Transportation/Navigation

The demand by port districts to increase infrastructure capacity to accommodate additional vessel operations for cargo handling activities and marine transportation is predicted to continue. Population growth and demands for international business trade along the Pacific Rim exert pressure to expand coastal towns and port facilities, resulting in net estuary losses (Kagan 1991, Fawcett and Marcus 1991). Port expansion has become an almost continuous process due to economic growth, competition between ports, and significant increases in vessel size (NPFMC 1999). In addition, with increased population growth comes the steady demand for providing new and expanded water transit services. Finally, providing additional recreational opportunities by constructing and enlarging recreational marinas is also foreseen.

Potential Adverse Impacts

The expansion of port facilities, vessel/ferry operations, and recreational marinas can bring additional impacts to EFH. Additional land needed to improve shipping efficiency can only be accommodated by changing land-use operations or adding new land by filling aquatic habitats. New wharves and piers decrease photic penetration in the water and decreases primary production (see Section 4.6). More hard surface increases nonpoint surface discharges (see Section 2.2), adds debris sources, and reduces buffers between land use and the aquatic ecosystem. These will include direct, indirect, and cumulative impacts on shallow subtidal, deep subtidal, eelgrass beds, mudflats, sand shoals, rock reefs, and salt marsh habitats. Such impacts would be site-specific. Some activities impacting these habitats, including new channel deepening and maintenance dredging (see Section 4.1), disposal of dredged material (see Section 4.2), reduced water quality from resuspension of contaminated sediments, ballast water discharge (see Section 4.4), and shading from overwater structures (see Section 4.6), have been addressed in other sections. Additional impacts include vessel groundings, modification of water circulation (breakwaters, channels, and fill), vessel wake generation, pier lighting, anchor scour and prop scour, and the discharge of contaminants and debris.

Potential adverse impacts to EFH can occur during both the construction and operation phases. Direct impacts include permanent or temporary loss of productive forage habitat resulting from new channel deepening and maintenance dredging (see Section 4.1), turbidity-related impacts due to both dredging and disposal of dredged material (see Section 4.2), and reduced water quality from resuspension of contaminated sediments (see Section 4.1). In addition, dredging in tidal wetland areas could result in the spread of nonnative invasive plant species (see Section 4.4).

An increase in the number and size of vessels can generate more wave and surge effects on shorelines. These vessel-wake, wash events can affect shorelines depending on the wake wave energy, the water depth, and the type of shoreline. Vessel wakes can cause a significant increase in shoreline erosion, impact wetland habitat, and increase water turbidity. Vessel prop wash can also damage aquatic vegetation and disturb sediments which may increase turbidity and suspend contaminants (Klein 1997, Warrington 1999). Changes in prey communities under ferry terminals have been attributed, in part, to prop wash from ferries (Blanton et al. 2001, Haas et al. 2002).

Impacts can also occur from anchor scour. Mooring buoys, when anchored in shallow nearshore waters, can drag the anchor chain across the bottom, destroying submerged vegetation and creating a circular scour hole (Walker et al. 1989, cited in Shafer 2002). A study by Hastings et al. (1995) (cited in Shafer 2002) in Australia found that up to 18 percent of total seagrass cover was lost to mooring buoy scour.

Vessel discharges, engine operations, bottom paint sloughing, boat washdowns, painting and other vessel maintenance activities can deliver debris, nutrients and contaminants to waterways and may degrade water quality and contaminate sediments.

Inadequate flushing of marinas also results in water quality problems (U.S. Army Corps of Engineers 1993, Klein 1997). Poor flushing in marinas in Puget Sound resulted in increases in temperature, increased phytoplankton populations with nocturnal dissolved oxygen level declines resulting in organism hypoxia, and pollutant inputs (Cardwell et al. 1980). An exchange of at least 30 percent of the water in the marina during a tidal change should minimize temperature increases and dissolved oxygen problems (Cardwell et al. 1980).

Recommended Conservation Measures

1. Locate marinas in areas of low biological abundance and diversity, for example, avoiding dense beds of eelgrass or other submerged aquatic vegetation including macroalgae.
2. Excavate uplands to create marina basins rather than converting intertidal or shallow subtidal to deeper subtidal for basin creation.
3. Avoid the disturbance of beds, mudflats and wetlands as part of the project design. In situations where such impacts are unavoidable, appropriate compensatory mitigation should be incorporated into the project with the approval of appropriate regulatory agencies. Specific habitat types such as eelgrass beds need to be mitigated in-kind. For other habitat types where in-kind mitigation is unavailable, the habitat values or functions of these threatened habitats should be calculated and appropriate mitigation be provided to ensure no net loss of habitat functions. This also includes the habitat value of traditional shoreline protection materials (e.g., revetments and breakwaters). Other dredging-related conservation measures are provided in Section 4.1.
4. Leave marine riparian buffers in place to enhance intertidal microclimate and nutrient input.
5. Adequate monitoring on the success of mitigation efforts should be included as part of the project and incorporated into a mitigation and monitoring plan.
6. Conduct preconstruction surveys by qualified biologists/botanists to identify and map areas of invasive plant species existing within potential project construction areas. Eradication of non-native species should be conducted well in advance of construction.
7. Include low-wake vessel technology, appropriate routes, and best management practices for wave attenuation structures as part of the design and permit process. Vessels should be operated at sufficiently low speeds to reduce wake energy, and no-wake zones should be designated near sensitive habitats.
8. Incorporate best management practices to prevent or minimize contamination from ship bilge waters, antifouling paints, shipboard accidents, shipyard work, maintenance dredging and disposal, and nonpoint source contaminants from upland facilities related to vessel operations and navigation.
9. Locate mooring buoys in water deep to avoid grounding and minimize affects of prop wash. Use subsurface floats or other methods to prevent contact of the anchor line with the substrate.
10. Collect and treat runoff from parking lots and other impervious surfaces to remove contaminants prior to delivery to any receiving waters
11. Locate facilities in areas with sufficient water velocities to dissipate fuels and pollutants from vessels and maintain temperature and dissolved oxygen levels within acceptable ranges.
12. Locate marinas where they do not interfere with drift sectors determining the structure and function of adjacent habitats.

4.4 Introduction of Exotic Species

The introductions of exotic species into estuarine and marine habitats has been well documented (Rosecchi et al. 1993, Kohler and Courtenay 1986, Spence et al. 1996) and can be intentional (e.g., for the purpose of stock or pest control) or unintentional (e.g., fouling organisms). Exotic fish, shellfish, pathogens, and plants can enter the environment from industrial shipping (e.g., as ballast), recreational boating, aquaculture (see Section 4.11), biotechnology, and aquariums. The transportation of nonindigenous organisms to new environments can have many severe impacts on habitat (Omori et al. 1994).

Potential Adverse Impacts

Long-term impacts of the introduction of nonindigenous and reared species can change the natural community structure and dynamics, lower the overall fitness and genetic diversity of natural stocks, and pass and/or introduce exotic lethal disease. Overall, exotic species introductions create five types of negative impacts: 1) habitat alteration, 2) trophic alteration, 3) gene pool alteration, 4) spatial alteration, and 5) introduction of diseases. Habitat alteration includes the excessive colonization of exotic species (e.g., *Spartina* grasses) which preclude the growth of endemic organisms (e.g., eelgrass). The introduction of exotic species may alter community structure by predation on native species or by population explosions of the introduced species. Spatial alteration occurs when territorial introduced species compete with and displace native species. Although hybridization is rare, it may occur between native and introduced species and can result in gene pool deterioration.

Non-native plants and algae can degrade coastal and marine habitats by changing natural habitat qualities. Introduced organisms increase competition with indigenous species or forage on indigenous species, which can reduce fish and shellfish populations. Long-term impacts from the introduction of nonindigenous and reared species can change the natural community structure and dynamics, lower the overall fitness and genetic diversity of natural stocks, and pass and/or introduce exotic lethal diseases. The introduction of exotic organisms also threatens native biodiversity and could lead to changes in relative abundances of species and individuals that are of ecological and economic importance.

The introduction of bacteria, viruses, and parasites is another severe threat to EFH as it may reduce habitat quality. New pathogens or higher concentrations of disease can be spread throughout the environment resulting in deleterious habitat conditions.

Recommended Conservation Measures

1. Encourage vessels to perform a ballast water exchange in marine waters (in accordance with the U.S. Coast Guard's voluntary regulations) to minimize the possibility of introducing exotic estuarine species into similar habitats. Ballast water taken on in marine waters will contain fewer organisms and these will be less likely to become invasive in estuarine conditions than species transported from other estuaries.
2. Discourage vessels that have not performed a ballast water exchange from discharging their ballast water into estuarine receiving waters.
3. Require vessels brought from other areas over land via trailer to clean any surfaces that may harbor non-native plant or animal species (propellers, hulls, anchors, fenders, etc.). Bilges should be emptied and cleaned thoroughly using hot water or a mild bleach solution. These activities should be performed in an upland area to prevent introduction of non-native species during the cleaning process.
4. Exclude exotic species from aquaculture operations until a thorough scientific evaluation and risk assessment is performed (see Section 4.11).
5. Aquaculture facilities rearing non-native species should be located upland and use closed-water circulation systems whenever possible.
6. Treat effluent from public aquaria displays, and laboratories, and educational institutes using exotic species prior to discharge to prevent the introduction of viable animals, plants, reproductive material, pathogens, or parasites into the environment.

4.5 Pile Installation and Removal

Pilings are an integral component of many overwater and in-water structures. They provide support for the decking of piers and docks, function as fenders and dolphins to protect structures, support navigation markers, and are used to construct breakwaters and bulkheads. Materials used in pilings include steel, concrete, wood (both treated and untreated), plastic or a combination thereof. Piles are usually driven into the substrate using one of two types of hammer: impact hammers and vibratory hammers. Impact hammers consist of a heavy weight that is repeatedly dropped onto the top of the pile, driving it into the substrate. Vibratory hammers utilize a combination of a stationary, heavy weight and vibration, in the plane perpendicular to the long axis of the pile, to force the pile into the substrate. The type of hammer used depends on a variety of factors, including pile material and substrate type. Impact hammers can be used to drive all types of piles, while vibratory hammers are generally most efficient at driving piles with a cutting edge (e.g., hollow steel pipe) and are less efficient at driving "displacement" piles (those without a cutting edge that must displace the substrate). Displacement piles include solid concrete, wood, and closed-end steel pipe. While impact hammers are able to drive piles into most substrates (including hardpan, glacial till, etc.), vibratory hammers are limited to softer, unconsolidated substrates (e.g., sand, mud, gravel). Since vibratory hammers do not use force to drive the piles, the bearing capacity is not known and the piles must often be "proofed" with an impact hammer. This involves striking the pile a number of times with the impact hammer to ensure that it meets the designed bearing capacity. Under certain circumstances, piles may be driven using a combination of vibratory and impact hammers. The vibratory hammer makes positioning and plumbing of the pile easier; therefore, it is often used to drive the pile through the soft, overlying material. Once the pile stops penetrating the sediment, the impact hammer is used to finish driving the pile to final depth. An additional advantage of this method is that the vibratory hammer can be used to extract and reposition the pile, while the impact hammer cannot.

Overwater structures must often meet seismic stability criteria, requiring that the supporting piles are attached to, or driven into, the underlying hard material. This requirement often means that at least some impact driving is necessary. Piles that do not need to be seismically stable, including temporary piles, fender piles, and some dolphin piles, may be driven with a vibratory hammer, providing the type of pile and sediments are appropriate.

Piles can be removed using a variety of methods, including vibratory hammer, direct pull, clam shell grab, or cutting/breaking the pile below the mudline. Vibratory hammers can be used to remove all types of pile, including wood, concrete, and steel. However, old, brittle piles may break under the vibrations and necessitate another method. The direct pull method involves placing a choker around the pile and pulling upward with a crane or other equipment. Broken stubs are often removed with a clam shell and crane. In this method, the clam shell grips the pile near the mudline and pulls it out. In other instances, piles may be cut or broken below the mudline, leaving the buried section in place.

4.5.1 Pile Driving

Potential Adverse Impacts

Pile driving can generate intense underwater sound pressure waves that may adversely affect the ecological functioning of EFH. These pressure waves have been shown to injure and kill fish (e.g., CalTrans 2001, Longmuir and Lively 2001, Stotz and Colby 2001, Stadler, pers. obs. 2002). Injuries associated directly with pile driving are poorly studied, but include rupture of the swimbladder and internal hemorrhaging (CalTrans 2001; Abbott and Bing-Sawyer 2002; Stadler, pers. obs. 2002). Sound pressure levels (SPL) 100 decibels (dB) above the threshold for hearing is thought to be sufficient to damage the auditory system in many fishes (Hastings 2002).

The type and intensity of the sounds produced during pile driving depend on a variety of factors, including, but not limited to, the type and size of the pile, the firmness of the substrate into which the pile is being driven, the depth of water, and the type and size of the pile-driving hammer. SPLs are positively correlated with the size of the pile, as more energy is required to drive larger piles. Wood and concrete piles appear to produce lower sound pressures than hollow steel piles of a similar size, although it is not yet clear if the sounds produced by wood or concrete piles are harmful to fishes. Hollow steel piles as small as 14-inch diameter have been shown to produce SPLs that can injure fish (Reyff 2003). Firmer substrates require more energy to drive piles, and produce more intense sound pressures. Sound attenuates more rapidly with distance from the source in shallow than in deep water (Rogers and Cox 1988).

Driving hollow steel piles with impact hammers produce intense, sharp spikes of sound which can easily reach levels that injure fish. Vibratory hammers, on the other hand, produce sounds of lower intensity, with a rapid repetition rate. A key difference between the sounds produced by impact hammers and those produced by vibratory hammers is the responses they evoke in fish. When exposed to sounds which are similar to those of a vibratory hammer, fish consistently displayed an avoidance response (Enger et al. 1993, Dolat 1997, Knudsen et al. 1997, Sand et al. 2000), and did not habituate to the sound, even after repeated exposure (Dolat 1997, Knudsen et al. 1997). Fishes may respond to the first few strikes of an impact hammer with a "startle" response. After these initial strikes, the startle response wanes and the fishes may remain within the field of a potentially harmful sound (Dolat 1997, NOAA Fisheries 2001). The differential responses to these sounds are due to the differences in the duration and frequency of the sounds. When compared to impact hammers, the sounds produced by vibratory hammers are of longer duration (minutes vs. msec) and have more energy in the lower frequencies (15-26 Hz vs 100-800 Hz) (Würsig, et al. 2000, Carlson et al. 2001). Studies have shown that fish respond to particle acceleration of 0.01 m/s^2 at infrasound frequencies, that the response to infrasound is limited to the nearfield (< 1 wavelength), and the fish must be exposed to the sound for several seconds (Enger et al. 1993, Knudsen et al. 1994, Sand et al. 2000). Impact hammers, however, produce such short spikes of sound with little energy in the infrasound range, that fish fail to respond to the particle motion (Carlson et al. 2001). Thus, impact hammers may be more harmful than vibratory hammers because they produce more intense pressure waves and because the sounds produced do not elicit an avoidance response in fishes, which exposes them for longer periods to those harmful pressures.

The degree to which an individual fish exposed to sound will be affected is dependent upon a number of variables, including 1) species of fish, 2) fish size, 3) presence of a swimbladder, 4) physical condition of the fish, 5) peak sound pressure and frequency, 6) shape of the sound wave (rise time), 7) depth of the water around the pile, 8) depth of the fish in the water column, 9) amount of air in the water, 10) size and number of waves on the water surface, 11) bottom substrate composition and texture, 12) effectiveness of bubble curtain sound/pressure attenuation technology, 13) tidal currents, and 14) presence of predators.

Depending on these factors, effects on fish can range from changes in behavior to immediate mortality. There is little data on the SPL required to injure fish. Short-term exposure to peak SPL above 190 dB (re:1 μPa) are thought to injure physical harm on fish (Hastings 2002). However, 155 dB (re: 1 μPa) may be sufficient to temporarily stun small fish (J. Miner, pers. comm. 2002). Stunned fish, while perhaps not physically injured, are more susceptible to predation. Small fish are more prone to injury by intense sound than are larger fish of the same species (Yelverton et al. 1975). For example, a number of surfperches (*Cymatogaster aggregata* and *Embiotoca lateralis*) were killed during impact pile driving (Stadler, pers. obs. 2002). Most of the dead fish were the smaller *C. aggregata* and similar sized specimens of *E. lateralis*, even though many larger *E. lateralis* were in the same area. Dissections revealed that the swimbladder of the smallest fish (80 mm forklength [FL]) were completely destroyed, while those of the largest individual (170 mm FL) was nearly intact, indicating a size-dependent effect. The SPLs that killed these fish are not yet known. Of the reported fish kills associated with pile driving, all have occurred during use of an impact hammer on hollow steel piles (Longmuir and Lively 2001, NOAA Fisheries 2001, Stotz and Colby 2001, NOAA Fisheries 2003).

Systems successfully designed to reduce the adverse effects of underwater SPLs on fish have included the use of air bubbles. Both confined (i.e., metal or fabric sleeve) and unconfined air bubble systems have been shown to attenuate underwater sound pressures up to 28 dB (Wursig et al. 2000, Longmuir and Lively 2001, Christopherson and Wilson 2002, Reyff and Donovan 2003). When using an unconfined air bubble system in areas of strong currents, it is critical that the pile is fully contained within the bubble curtain. To accomplish this, adequate air flow and ring spacing both vertically and distance from the pile are factors that should be considered when designing the system.

Recommended Conservation Measures

1. Install hollow steel piles with an impact hammer at a time of year when larval and juvenile stages of fish species with designated EFH are not present. If this is not possible, then the following measures should be incorporated to minimize adverse effects.
2. Drive piles during low tide periods when located in intertidal and shallow subtidal areas.
3. Use a vibratory hammer when driving hollow steel piles. Under those conditions where impact hammers are required for reasons of seismic stability or substrate type, it is recommended that the pile be driven as deep as possible with a vibratory hammer prior to the use of the impact hammer.
4. Monitor peak SPLs during pile driving to ensure that they do not exceed the 190 dB re:1 μPa threshold

for injury to fish.

5. Implement measures to attenuate the sound should SPLs exceed the 180 dB re: 1 μPa threshold. If sound pressure levels exceed acceptable limits, implement mitigative measures. Methods to reduce the sound pressure levels include, but are not limited to, the following:
   a) Surround the pile with an air bubble curtain system or air-filled coffer dam.
   b) Since the sound produced has a direct relationship to the force used to drive the pile, use of a smaller hammer should be used to reduce the sound pressures.
   c) Use a hydraulic hammer if impact driving cannot be avoided. The force of the hammer blow can be controlled with hydraulic hammers; reducing the impact force will reduce the intensity of the resulting sound.
6. Drive piles when the current is reduced (i.e., centered around slack current) in areas of strong current to minimize the number of fish exposed to adverse levels of underwater sound.

4.5.2 Pile Removal

Potential Adverse Impacts

The primary adverse effect of removing piles is the suspension of sediments, which may result in harmful levels of turbidity and release of contaminants contained in those sediments (see Section 4.1). Vibratory pile removal tends to cause the sediments to slough off at the mudline, resulting in relatively low levels of suspended sediments and contaminants. Vibratory removal of piles is gaining popularity because it can be used on all types of piles, providing that they are structurally sound. Breaking or cutting the pile below the mudline may suspend only small amounts of sediment, providing the stub is left in place and little digging is required to access the pile. Direct pull or use of a clamshell to remove broken piles, however, may suspend large amounts of sediment and contaminants. When the piling is pulled from the substrate using these two methods, sediments clinging to the piling will slough off as it is raised through the water column, producing a potentially harmful plume of turbidity and/or contaminants. The use of a clamshell may suspend additional sediment if it penetrates the substrate while grabbing the piling.

While there is a potential to adversely affect EFH during the removal of piles, many of those removed are old creosote-treated timber piles. In some cases, the long-term benefits to EFH obtained by removing a consistent source of contamination may outweigh the temporary adverse effects of turbidity.

Recommended Conservation Recommendations

1. Remove piles completely rather than cutting or breaking off if the pile is structurally sound.
2. Minimize the suspension of sediments and disturbance of the substrate when removing piles. Measures to help accomplish this include, but are not limited to, the following:
   a) When practicable, remove piles with a vibratory hammer, rather than the direct pull or clamshell method.
   b) Remove the pile slowly to allow sediment to slough off at, or near, the mudline.
   c) The operator should first hit or vibrate the pile to break the bond between the sediment and pile to minimize the potential for the pile to break, as well as reduce the amount of sediment sloughing off the pile during removal.
   d) Place a ring of clean sand around the base of the pile. This ring will contain some of the sediment that would normally be suspended.
   e) Encircle the pile, or piles, with a silt curtain that extends from the surface of the water to the substrate.
3. Complete each pass of the clamshell to minimize suspension of sediment if pile stubs are removed with a clamshell.
4. Fill all holes left by the piles with clean, native sediments if possible.
5. Place piles on a barge equipped with a basin to contain all attached sediment and runoff water after removal. Creosote-treated timber piles should be cut into short lengths to prevent reuse, and all debris, including attached, contaminated sediments, should be disposed of in an approved upland facility.
6. Drive broken/cut stubs using a pile driver, sufficiently below the mudline to prevent release of contaminants into the water column as an alternative to their removal.

4.6 Overwater Structures

Overwater structures include commercial and residential piers and docks, floating breakwaters, barges, rafts, booms, and mooring buoys. These structures are typically located in intertidal areas out to about 15 meters below the area exposed by the mean lower low tide (i.e., the shallow subtidal zone). Light, wave energy, substrate type, depth and water quality are the primary factors controlling the plant and animal assemblages found at a particular site. Overwater structures and associated activities can alter these factors and interfere with key ecological functions such as spawning, rearing, and refugia. Site-specific factors (e.g., water clarity, current, depth, etc.) and the type and use of a given overwater structure determine the occurrence and magnitude of these impacts.

Potential Adverse Impacts

Overwater structures and associated developments may adversely affect EFH in a variety of ways, primarily by changes in ambient light conditions, alteration of the wave and current energy regime, and through activities associated with the use and operation of the facilities (Nightingale and Simenstad 2001b).

Overwater structures create shade which reduces the light levels below the structure. The size, shape and intensity of the shadow cast by a particular structure depends upon its height, width, construction materials, and orientation. High and narrow piers and docks produce narrower, more diffuse shadows than do low and wide structures. Increasing the numbers of pilings used to support a given pier increases the shade cast by pilings on the under-pier environment. In addition, less light is reflected underneath structures built with light-absorbing materials (e.g., wood) than from structures built with light-reflecting materials (e.g., concrete or steel). Structures that are oriented north-south produce a shadow that moves across the bottom throughout the day, resulting in a smaller area of permanent shade than those that are oriented east-west.

The shadow cast by an overwater structure affects both the plant and animal communities below the structure. Distributions of plants, invertebrates, and fishes have been found to be severely limited in under-dock environments when compared to adjacent, unshaded vegetated habitats. Light is the single most important factor affecting aquatic plants. Under-pier light levels have been found to fall below threshold amounts for the photosynthesis of diatoms, benthic algae, eelgrass, and associated epiphytes and other autotrophs. These photosynthesizers are an essential part of nearshore habitat and the estuarine and nearshore foodwebs that support many species of marine and estuarine fishes. Eelgrass and other macrophytes can be reduced or eliminated, even through partial shading of the substrate, and have little chance to recover.

Fishes rely on visual cues for spatial orientation, prey capture, schooling, predator avoidance, and migration. The reduced-light conditions found under an overwater structure limit the ability of fishes, especially juveniles and larvae, to perform these essential activities. Shading from overwater structures may also reduce prey organism abundance and the complexity of the habitat by reducing aquatic vegetation and phytoplankton abundance (Kahler et al. 2000, Haas et al. 2002). Glasby (1999) found that epibiotic assemblages on pier pilings at marinas subject to shading were markedly different than in surrounding areas. Other studies have shown shaded epibenthos to be reduced relative to that in open areas. These factors are thought to be responsible for the observed reductions in juvenile fish populations found under piers and the reduced growth and survival of fishes held in cages under piers, when compared to open habitats (Able et al. 1998, Duffy-Anderson and Able 1999).

The shadow cast by an overwater structure may increase predation on EFH managed species by creating a light/dark interface that allows ambush predators to remain in a darkened area (barely visible to prey) and watch for prey to swim by against a bright background (high visibility) (Helfman 1981). Prey species moving around the structure are unable to see predators in the dark area under the structure and are more susceptible to predation. Furthermore, the reduced vegetation (i.e., eelgrass) densities associated with overwater structures decrease the available refugia from predators.

In addition to piscivorous predation, in-water structures (e.g., pilings) also provide perching platforms for avian predators such as double-crested cormorants (*Phalacrocorax auritis*), from which they can launch feeding forays or dry their plumage.

Wave energy and water transport alterations from overwater structures can impact the nearshore detrital foodweb by altering the size, distribution, and abundance of substrate and detrital materials. Disruption of longshore transport can alter substrate composition and can present potential barriers to the natural processes that build spits and beaches and provide substrates required for plant propagation, fish and shellfish settlement and rearing, and forage fish spawning.

Pilings can alter adjacent substrates with increased shell deposition from piling communities and changes to substrate bathymetry (see Section 4.5). Changes in substrate type can alter the nature of the flora and fauna native to a given site. In the case of pilings, native dominant communities typically associated with sand, gravel, mud, and eelgrass substrates are replaced by communities associated with shell hash substrates.

Treated wood used for pilings and docks releases contaminants into saltwater environs. Poly-aromatic hydrocarbons (PAHs) are commonly released from creosote-treated wood. PAHs can cause a variety of deleterious effects (cancer, reproductive anomalies, immune dysfunction, and growth and development impairment) to exposed fish (Johnson et al. 1999, Johnson 2000, Stehr et al. 2000). Wood also is commonly treated with other chemicals such as ammoniacal copper zinc arsenate (ACZA) and chromated copper arsenate (CCA) (Poston 2001). These preservatives are known to leach into marine waters for a relatively short period of time after installation, but the rate of leaching is highly variable and dependent on many factors. Concrete or steel, on the other hand, are relatively inert and do not leach contaminants into the water.

Construction and maintenance of overwater structures often involves driving of pilings (see Section 4.5) and dredging of navigation channels (see Section 4.1). Both activities may also adversely affect EFH.

While the effect of some individual overwater structures on EFH may be minimal, the overall impact may be substantial when considered cumulatively. The additive effects of these structures increases the overall magnitude of impact and reduces the ability of the EFH to support native plant and animal communities.

Recommended Conservation Measures

1. Use upland boat storage whenever possible to minimize need for overwater structures.
2. Locate overwater structures in sufficiently deep waters to avoid intertidal and shade impacts, to minimize or preclude dredging, to minimize groundings, and to avoid displacement of submerged aquatic vegetation, as determined by a pre-construction survey.
3. Design piers, docks, and floats to be multi-use facilities in order to reduce the overall number of such structures and the nearshore habitat that is impacted.
4. Incorporate measures that increase the ambient light transmission under piers and docks. These measures include, but are not limited to, maximizing the height of the structure and minimizing the width of the structure to decrease shade footprint; grated decking material; using solar tubes to direct light under the structure and glass blocks to direct sunlight under the structure; illuminating the under-structure area with metal halide lamps and use of reflective paint or materials (e.g., concrete or steel instead of materials that absorb light such as wood) on the underside of the dock to reflect ambient light; using the fewest number of pilings necessary to support the structures to allow light into under-pier areas and minimize impacts to the substrate; and aligning piers, docks and floats in north-south orientation to allow arc of sun to cross perpendicular to structure and reduce duration of light limitation.
5. Use floating breakwaters whenever possible and remove them during periods of low dock use. Encourage seasonal use of docks and off-season haul-out.
6. Use waveboards to minimize effects on littoral drift and benthic habitats.
7. Locate floats in deep water to avoid light limitation and grounding impacts to the intertidal zone, and maintain at least one foot of water between the substrate and the bottom of the float.
8. Conduct in-water work during the time of year when EFH-managed species and prey species are least likely to be impacted.

9. Avoid use of treated wood timbers or pilings to the extent practicable. Use of alternative materials such as untreated wood, concrete, or steel is recommended.
10. Fit all pilings and navigational aids, such as moorings and channel markers, with devices to prevent perching by piscivorous bird species.
11. Orient night lighting such that illumination of the surrounding waters is avoided.
12. Mitigate for unavoidable impacts to benthic habitats that is adequately provided, properly monitoried, and adaptively managed.

4.7 Flood Control/Shoreline Protection

The protection of riverine and estuarine communities from flooding events can result in varying degrees of change in the physical, chemical, and biological characteristics of existing shoreline and riparian habitat. The use of dikes and berms can also have long-term adverse effects in tidal marsh and estuarine habitats. Tidal marshes are highly variable, but typically have freshwater vegetation at the landward side, saltwater vegetation at the seaward side, and a gradient of species in between that are in equilibrium with the prevailing climatic, hydrographic, geological, and biological features of the coast. These systems normally drain through highly dendritic tidal creeks that empty into the bay or estuary. Freshwater entering along the upper edges of the marsh drain across the surface and enter the tidal creeks. Structures placed for coastal shoreline protection include, but are not limited to, concrete or wood seawalls; rip-rap revetments (sloping piles of rock placed against the toe of the dune or bluff in danger of erosion from wave action); dynamic cobble revetments (natural cobble placed on an eroding beach to dissipate wave energy and prevent sand loss); vegetative plantings; and sandbags.

Potential Adverse Impacts

Dikes, levees, ditches, or other water controls at the upper end of a tidal marsh can cut off all tributaries feeding the marsh, preventing freshwater flushing and annual flushing, annual renewal of sediments and nutrients, and the formation of new marshes. Water controls within the marsh proper intercept and carry away freshwater drainage, block freshwater from flowing across seaward portions of the marsh, increase the speed of runoff of freshwater to the bay or estuary, lower the water table, permit saltwater intrusion into the marsh proper, and create migration barriers for aquatic species. In deeper channels where reducing conditions prevail, large quantities of hydrogen sulfide are produced that are toxic to marsh grasses and other aquatic life. Acid conditions of these channels can also result in release of heavy metals from the sediments

Long-term effects on the tidal marsh include land subsidence (sometimes even submergence), soil compaction, conversion to terrestrial vegetation, greatly reduced invertebrate populations, and general loss of productive wetland characteristics. Loss of these low-salinity environments reduces estuarine fertility, restricts suitable habitat for aquatic species, and creates abnormally high salinity during drought years. Low-salinity environments form a barrier that prevents the entrance of many marine species, including competitors, predators, parasites and pathogens.

Armoring of shorelines to prevent erosion and maintain or create shoreline real estate simplifies habitats, reduces the amount of intertidal habitat, and affects nearshore processes and the ecology of a myriad of species (Williams and Thom 2001). Hydraulic effects to the shoreline include increased energy seaward of the armoring, reflected wave energy, dry beach narrowing, substrate coarsening, beach steepening, changes in sediment storage capacity, loss of organic debris, and downdrift sediment starvation (Williams and Thom 2001). Installation of breakwaters and jetties can result in community changes from burial or removal of resident biota; changes in cover and preferred prey species; and predator attraction (Williams and Thom 2001). As with armoring, breakwaters and jetties modify hydrology and nearshore sediment transport as well as movement of larval forms of many species (Williams and Thom 2001).

Recommended Conservation Measures

1. Minimize the loss of riparian habitats as much as possible.
2. The diking and draining of tidal marshlands and estuaries should not be undertaken unless a satisfactory compensatory mitigation plan is in effect and monitored.

3. Wherever possible, "soft" approaches (such as beach nourishment, vegetative plantings, and placement of large woody debris) to shoreline modifications should be utilized.
4. Include efforts to preserve and enhance EFH by providing new gravel for spawning areas; removing barriers to natural fish passage; and using weirs, grade control structures, and low flow channels to provide the proper depth and velocity for fish.
5. Construct a low-flow channel to facilitate fish passage and help maintain water temperature in reaches where water velocities require armoring of the riverbed.
6. Replace in-stream fish habitat by providing rootwads, deflector logs, boulders, rock weirs and by planting shaded riverine aquatic cover vegetation.
7. Use an adaptive management plan with ecological indicators to oversee monitoring and ensure mitigation objectives are met. Take corrective action as needed.

4.8 Water Control Structures

Many coastal areas of the Pacific Northwest utilize Water Control Structures (WCSs), such as pumping stations and tidegates, to regulate water levels in nearshore and estuary settings. WCSs enable certain agricultural crops to survive through floods, maintain high water tables, and manage the threat of saltwater intrusion. In some cases, infrastructures such as roads, industrial and residential developments, and sewer treatment plants have been built because of the enhanced drainage. These structures have been installed within streams, blind and distributary sloughs, and marsh/wetlands within estuarine and nearshore areas.

Tide gates have typically been installed on culverts passing through levees, dikes, and berms to prevent tidal inundation in areas landward of the berms. As the tide backs up and closes the tide gate, fish passage upstream is blocked. As the tide turns and begins to flow out or the river level drops, a conventional tide gate opens a little but often not enough to allow upstream passage or with such velocity as to constitute a complete or partial blockage (Charland 1998). Pump stations are used to maintain more consistent control of water levels in nearshore and estuary settings. Some pumps are also used in conjunction with tide gates; many act as dams by stopping tidal or river stage levels, thus extending the capacity of the drainage system. While there is variability in the design and operation of these structures, they generally pump surface water from the drainage system to the respective receiving body.

Potential Adverse Impacts

Adverse effects to EFH from the installation and operation of WCSs can occur through 1) partially or completely blocked habitat, 2) altered water chemistry composition through suppressed mixing of fresh and saltwater, 3) decreased sediment and nutrient delivery, and 4) degraded water quality through thermal loading.

Various life stages of some EFH-managed species utilize nearshore and estuarine habitats, and food produced from these areas in the form of small fish and other aquatic organisms are important for overall food web function (PFMC 1998, PFMC 2003). WCSs can limit or eliminate habitat access to areas that may be important for food sources and refuge from predators of these species.

Depending on their location, WCSs alter the normal circulation and mixing of fresh and saltwater. Estuaries are biologically rich and productive areas, partly because of the complex gradient of fresh and salt water mixing process. Estuaries accumulate nutrients such as potassium and nitrogen, which are concentrated and recycled in a repeating interactive process by which the incoming tidal water resuspends nutrients at the fresh-saltwater interface while moving them back up the estuary to meet the seaward moving land-based nutrients (Day 1989). Estuarine food chains are extremely complex and sensitive to alterations in the physical and chemical range of stresses (Day 1989). Loss or disruption of one element can have a cascading effect on species presence and productivity. The inhibition of the gradual mixing of salt and fresh water and nutrients over the original volume of habitat can decrease the overall productivity of the estuary and may cause prey community changes.

Often WCSs impound water for various amounts of time, which can lead to premature sediment and nutrient deposition and cause a subsequent need to dredge behind the structure. Sediment deposition within estuarine and nearshore areas is important for beach nourishment, and sediments often serve as absorptive surfaces for nutrients.

Impounded water can result in increased thermal loading which, in turn, can interfere with physiological processes, behavioral changes, and disease enhancement (Bell 1986). Increased thermal loading can also cause increased microbial activity and vegetative growth, which in turn can deplete levels of dissolved oxygen (Waldichuk 1993, Spence et al. 1996). These impacts may combine to affect entire aquatic systems by changing primary and secondary productivity, community respiration, species composition, biomass, and nutrient dynamics (Hall et al. 1978). These effects, while perhaps more acute in the regulated watercourse, can nonetheless be manifested in the receiving body as well, particularly in areas where much of the historic estuary habitat is regulated by WCSs.

Recommended Conservation Measures

1. Avoid installing new WCSs. In some cases, tidegates that replace dams or pump stations (those which completely block habitat) can improve habitat conditions by enhancing fish passage and water circulation.
2. Design WCSs to enhance habitat access and water circulation.
3. Assess habitat potential or value behind the WCS by investigating current and potential aquatic vegetation, the volume and depth of the water body, the amount and timing of freshwater inflow, the presence of upland rearing and spawning habitat, and the relative salinity of the water body.
4. Assess the hydrology of the regulated land's tolerance for increased water exchange. The assessment should account for active management of the WCS to allow increased water exchange during critical periods. Existing programs that compensate landowners for lost production of land can be investigated (such as the Conservation Reserve Enhancement Program administered by the United States Department of Agriculture) if appropriate.
5. Design WCSs to mimic natural water exchange velocities. This can be done by maximizing the conveyance of water through increased width, thus reducing flow velocities during periods the gates are open.
6. Utilize WCS materials that are nontoxic and noncorrosive. Treated wood should not be used.
7. Stabilize associated banks through bio-engineered means, minimizing the use of riprap and incorporating native materials as appropriate.
8. Install WCS during low flow periods and tidal stage; incorporate appropriate erosion and sediment control BMPs, and have an equipment spill and containment plan and appropriate materials onsite.
9. Monitor WCS operations to assess impacts on water temperatures, dissolved oxygen, and other applicable parameters. Adaptive management should be designed to minimize impacts.

4.9 Log Transfer Facilities/In-water Log Storage

Using rivers, estuaries, and bays to transport logs was the primary means of transportation and storage historically in the Pacific Northwest. Log storage within the bays and estuaries remains an issue in several Pacific Northwest bays. Using estuaries and bays and nearby uplands for storage of logs is common in Alaska, with most of Alaska's LTFs existing in Southeast Alaska and a few in Prince William Sound.

Potential Adverse Impacts

Log handling and storage in the estuary and intertidal zones of rivers can result in water quality degradation and modifications to habitat. An LTF is a facility which is constructed in whole or part in waters of the United States and which is utilized for the purpose transferring commercially harvested logs to or from a vessel or log raft, including the formation of a log raft. (EPA 2000). LTFs may include a crane, an A-frame structure, conveyor, slide or ramp, and are used move logs into the water. Logs can also be placed in the water at the site by helicopters and barges. The physical adverse impacts from these structures are similar in many ways to those of floating docks and other "over-water" structures (see Section 4.6).

EFH may also be physically impacted from activities associated with LTFs. Bark and wood debris may impact EFH as a result of the abrasion of log surfaces from transfer equipment. After the logs have entered the water, they are usually bundled into rafts and hooked to a tug for shipment. In the process, bark and other wood debris can pile up on the ocean floor. The piles can "smother" clams, mussels, some seaweed, kelp and grasses, with the bark sometimes remaining for decades. Accumulation of bark debris in shallow and deep water environments has resulted in locally decreased epifaunal macrobenthos richness and abundance (Kirkpatrick et al. 1998, Jackson 1986), which can ultimately impact various life-stages of groundfish.

Storage of logs may also result in significant release soluble, organic compounds. Log bark may affect groundfish by significantly increasing oxygen demand within the area of accumulation (PNPCC 1971). High oxygen demand can lead to an anaerobic zone where toxic sulfide compounds are generated, particularly in brackish and marine waters. Leaching of soluble organic compounds also leads to cumulative oxygen demand and reduced visibility. Reduced oxygen levels, anaerobic conditions, and the presence of toxic sulfide compounds are presumed to lead to reduced production of groundfish species and their forage base. Anaerobic areas reduce available habitat. In addition, soils at onshore facilities where logs are decked are often contaminated with gasoline, diesel fuel, solvents, etc., from trucks and heavy equipment. These contaminants can leach into nearshore EFH.

The physical, chemical, and biological impacts of LTF operations can be substantially reduced by adherence to appropriate siting and operational constraints. In 1985, the Alaska Timber Task Force (ATTF) developed guidelines to "delineate the physical requirements necessary to construct a log transfer and associated facilities, and in context with requirements of applicable law and regulations, methods to avoid or control potential impacts from these facilities on water quality, aquatic and other resources." Since 1985, the ATTF Guidelines have been applied to new LTFs through the requirements of National Pollutant Discharge Elimination System (NPDES) permits and other state and federal programs (EPA 1996). Adherence to guidelines such as the ATTF operational and siting guidelines and BMPs in the NPDES General Permit will reduce the 1) amount of bark and wood debris which enters the marine and coastal environment, 2) the potential for displacement or harm to aquatic species, and 3) accumulation of bark and wood debris on the ocean floor. The following conservation measures reflect those guidelines.

Recommended Conservation Measures

1. Storage and handling of logs should be restricted or eliminated from waters where state and federal water quality standards cannot be met at all times.
2. Minimize potential impacts of log storage by employing effective bark and wood debris controls, collection, and disposal methods at log dumps, raft building areas, and mill-side handling zones; avoiding the free-fall dumping of logs; using easy let-down devices for placing logs in the water; and bundling logs prior to water storage (bundles should not be broken except on land and at millside).
3. Storage of logs should not take place where they will ground at any time or shade aquatic vegetation.
4. Avoid siting log storage areas and LTFs in sensitive habitat and areas important for specified species.
5. Site log storage areas and LTFs in areas with good currents and tidal exchanges.
6. Recommend land-based storage sites with the goal of eliminating in-water storage of logs.
7. For the Alaska region, also see the following link: Log Transfer Facility (LTF) Guidelines: http://www.fs.fed.us/r10/TLMP/F_PLAN/APPEND_G.PDF.

4.10 Utility Line/Cables/Pipeline Installation

With the continued development of coastal regions comes greater demand for the installation of cables, utility lines for power and other services, and pipelines for water, sewage, etc. The installation of pipelines, utility lines, and cables can have direct and indirect impacts on the offshore, nearshore, estuarine, wetland, beach, and rocky shore coastal zone habitats. The coastal zone can be as narrow as a few feet in some areas to hundreds of miles inland in others, and it is not just development in the nearshore coastal regions that can cause impacts. Many of the primary and direct impacts occur during the construction phase of installation, such as with the ground disturbance in the clearing of the right-of-way, access roads, and equipment staging areas. Indirect impacts can include increased turbidity, saltwater intrusion, accelerated erosion, and the introduction of urban and industrial pollutants.

Potential Adverse Impacts

Adverse effects to EFH from the installation of pipelines, utility lines, and cables can occur through 1) destruction of organisms and habitat, 2) turbidity impacts, 3) resuspension of contaminants, and 4) changes in hydrology.

Destruction of organisms and habitats can occur in the right-of-way of pipeline or cable. This destruction can lead to long-term or permanent damage depending on the degree and type of habitat disturbance and the mitigation measures employed. Shallow water environments, rocky reefs, nearshore and offshore rises, salt, and freshwater marshes (wetlands), and estuaries are more likely to be adversely impacted than open-water habitats. This is due to their higher sustained biomass and lower water volumes, which decrease their ability to dilute and disperse suspended sediments (Gowen 1978).

Because vegetated coastal wetlands provide forage and protection to commercially important invertebrates and fish, marsh degradation due to plant mortality, soil erosion, or submergence will eventually decrease productivity. Vegetation loss and reduced soil elevation within pipeline construction corridors should be expected with the continued use of current double-ditching techniques (Polasek 1997).

Increased water turbidity from higher than normal sediment loading can result in decreased primary production. Depending on the time of year of the construction, adverse impacts can occur, such as during highly productive spring phytoplankton blooms or times when organisms are already under stressed conditions. Changes in turbidity can temporarily alter phytoplankton communities. Depending upon the severity of the turbidity, these changes in water clarity can affect the EFH habitat functions of species higher in the food chain.

Another impact is resuspension of contaminants such as heavy metals and pesticides from the sediment, which can have lethal effects (Gowen 1978). Spills of petroleum products, solvents, and other construction-related material can also adversely affect habitat.

Pipeline canals have the potential to change the hydrology of coastal areas by 1) facilitating rapid drainage of interior marshes during low tides or low precipitation, 2) reducing or interrupting freshwater inflow and associated littoral sediments, and 3) allowing saltwater to move father inland during periods of high tides (Chabreck 1972). Saltwater intrusion into freshwater marsh often causes loss of salt-intolerant emergent and submerged aquatic plants (Chabreck 1972, Pezeshki 1987), erosion, and net loss of soil organic matter (Craig et al. 1979).

Recommended Conservation Measures

1. Align crossings along the least environmentally damaging route. Sensitive habitats such as hard-bottom (e.g., rocky reefs), submerged aquatic vegetation, oyster reefs, emergent marsh, sand and mud flats, should be avoided. If unavoidable, compensatory mitigation should be implemented.
2. Use horizontal directional drilling where cables or pipelines would cross salt marsh, vegetated inter-tidal zones, or steep erodible bluff areas adjacent to the inter-tidal zone, to avoid surface disturbances.
3. Avoid construction of permanent access channels since they disrupt natural drainage patterns and destroy wetlands through excavation, filling, and bank erosion.
4. Store and contain excavated material on uplands. If storage in wetlands or waters cannot be avoided, alternate stockpiles should be used to allow continuation of sheet flow. Stockpiled materials should be stored on construction cloth rather than bare marsh surfaces, sea grasses, or reefs.
5. Backfill excavated wetlands with either the same or comparable material capable of supporting similar wetland vegetation. Original marsh elevations should be restored. Topsoil and organic surface material such as root mats should be stockpiled separately and returned to the surface of the restored site. Adequate material should be used so that following settling and compaction of the material, the proper preproject elevation is attained. If excavated materials are insufficient to accomplish this, similar grain size material should be used to restore the trench to the required elevation. After backfilling, erosion protection measures should be implemented where needed.
6. Use existing rights-of-way whenever possible to lessen overall encroachment and disturbance of wetlands.
7. Bury pipelines and submerged cables where possible. Unburied pipelines or pipelines buried in areas

where scouring or wave activity eventually exposes them run a much greater risk of damage leading to leaks or spills.
8. Remove inactive pipelines and submerged cables unless they are located in sensitive areas (e.g., marsh, reefs, sea grass, etc.) or located in areas that present no safety hazard. If allowed to remain in place, pipelines should be properly pigged, purged, filled with seawater, and capped prior to abandonment in place.
9. Use silt curtains or other type barriers to reduce turbidity and sedimentation if sea grass or oyster reefs occur at or near the project site. These silt barriers should extend at least 100 feet beyond the limits of the sea grass beds or oyster reefs. If sea grasses and oyster reefs cannot be avoided, pre- and post-construction surveys should be completed to determine project impacts and mitigation needs.
10. Access for equipment should be limited to the immediate project area. Tracked vehicles are preferred over wheeled vehicles. Consideration should be given to the use of mats and boards to avoid sensitive areas. Equipment operators should be informed to avoid sensitive areas. Sensitive areas should be clearly marked to ensure that equipment operators do not traverse them.
11. Limit construction equipment to the minimum size necessary to complete the work. Shallow-draft equipment should be employed so as to minimize impacts and eliminate the necessity of temporary access channels. The size of the pipeline trench proper should also be minimized. The push-ditch method, in which the trench is immediately backfilled, reduces the impact duration, and should therefore be employed when possible.
12. Conduct construction during the time of year that will have the least impact on sensitive habitats and species.
13. Suspend transmission lines beneath existing bridges or directional boring under streams to reduce the environmental impact. If transmission lines span streams, site towers a minimum of 200 feet from streams.

Activities on the continental shelf

14. Shunt drill cuttings through a conduit and discharge near the sea floor, or transport ashore.
15. Locate drilling and production structures, including pipelines, at least one mile from the base of a hard-bottom habitat.
16.a) Bury pipelines to a minimum of three feet beneath the sea floor, whenever possible. Particular considerations (i.e., currents, ice scour) may require deeper burial or weighting to maintain adequate cover. Buried pipeline and cables should be examined periodically for maintenance of adequate earthen cover. b) Where burial is not possible, such as in hard-bottomed areas, pipelines and cables should be attached to substrate to avoid unnecessary conflicts with fishing gear. Wherever possible the route should be marked by lighted buoys and/or lighted ranges on platforms to reduce the risk of damage to fishing gear and the pipelines. c) Alignments should be located along routes that minimize damage to marine and estuarine habitat. Avoid laying cable over high relief bottom habitat and across “live” bottom habitats such as coral and sponge. If coral or sponge habitats are encountered, NMFS would be interested in position and description information. d) Where user conflicts are likely, consult and coordinate with fishing stakeholder groups through the appropriate Fishery Management Council during the route-planning process in order to minimize conflict.
17. Avoid all natural reefs and banks, as well as artificial reef areas. Hard-bottom areas should be avoided to permit cable or pipeline burial. If unavoidable, compensatory mitigation should be mitigated.

4.11 Commercial Utilization of Habitat

Productive embayments are often used for commercial culturing and harvesting operations. These locations provide a source of warmer water temperatures and protected waters, thereby providing excellent growout sites for oyster and mussel culturing. These operations may occur in areas of productive eelgrass beds. The commercial harvest of nearshore giant kelp is another habitat type that is used. Giant kelp forest canopies serve as nursery, feeding grounds, and/or shelter to a variety of groundfish species and their prey (Cross and Allen 1993, Feder et al. 1974, Foster and Schiel 1985). In addition, when kelp plants are naturally broken free of their holdfasts, drift kelp is produced. Kelp detritus supports high secondary production and prey for many fishes (Vetter 1995).

Potential Adverse Impacts

Adverse impacts to EFH by operations that directly or indirectly utilize habitat include 1) discharge of organic waste/contaminants, 2) impacts to the seafloor bed, 3) risk if introducing undesirable species, 4) impacts on estuarine food webs, and 5) impacts on kelp forest communities.

The culture of estuarine and marine species in estuarine areas can reduce or degrade habitats used by native species, depending on the location and operation of these facilities. A major concern of culture operations is the discharge of organic waste. The introduction of antibiotics and other drugs in medicated feeds is also a concern. Wastes are composed primarily of feces and excess feed. The buildup of waste products into the receiving waters will depend upon water depths and circulation patterns. The release of these wastes can introduce nutrients or organic materials into the surrounding water body and lead to a high BOD leading to lower dissolved oxygen levels, thereby potentially affecting the survival of many aquatic organisms in the area. Nutrient overloads at the discharge site can also induce changes in community composition and structure, potentially favoring one group of organisms to the detriment of other.

In the case of cage mariculture operations for grow-out operations, impacts to the seafloor below the cages or pens can occur. The build-up of organic materials on the sea floor can impact the composition and diversity of the bottom-dwelling community (e.g., prey organisms for EFH species). Growth of submerged aquatic vegetation, which can provide shelter and nursery habitat for a number of fish species and their prey, can be inhibited by shading effects. Disruption of eelgrass habitat by management activities (e.g., the dumping of shell with spawn on eelgrass beds, damage to eelgrass due to subsequent water or wind shear against the sharp oyster shells, repeated mechanical raking or trampling) associated with this category are also of concern, though few studies have documented impacts. It is known that hydraulic dredges used to harvest oysters in coastal bays with eelgrass habitat can cause long-term adverse impacts to eelgrass beds, reducing or eliminating the beds (Phillips 1984).

The rearing of non-native, ecologically undesirable species may pose a risk of escape or accidental release into areas adversely affecting the ecological balance. Escape or other release into the environment can result in competition with native, wild fish for food, mates, spawning sites, which, if followed by successful interbreeding with wild stocks, can result in genetic dilution. Escapees can also pose a risk of transmission of disease to wild stocks.

Concern has also been expressed about extensive shellfish culture in estuaries and their impacts on estuarine food webs. Oysters are efficient filter feeders and can change the trophic structure by removal of the microalgae and zooplankton that are also the food source for salmon prey species. However, the extent of this effect, if any, is unknown, especially in light of the fact that native oysters were once present in large quantities co-existing with other species. Some effects might also be offset by the structure that oyster shells create, which creates shelter for a diverse biota.

Kelp is harvested for several reasons, including directly obtaining its by-products as well as indirectly for use as a food source in abalone culturing and as a substrate in the Pacific herring fishery. Harvesting can have a variety of possible impacts on the habitat functions provided by kelp canopies. For example, giant kelp provides refuge to prey resources utilized by some EFH species. The kelp canopy also serves as habitat for canopy-dwelling invertebrates and can have an enhancing effect on fish recruitment and abundance. Removal of the canopy may affect some species by potentially displacing species such as young-of-the-year or juvenile rockfishes (Miller and Geibel 1973).

Recommended Conservation Measures

1. Site mariculture operations away from subaquatic vegetation areas. Facilities should be close-circuited and located in upland areas as often as possible. Tidally influenced wetlands should not be enclosed or impounded for mariculture purposes, including hatchery and grow-out operations. Siting of facilities should also take into account the size of the facility, proximity of wild fish stocks, migratory patterns, competing uses, hydrographic conditions, and upstream uses.
2. Determine benthic productivity by sampling prior to any operations. Areas of high productivity should be avoided to the maximum extent possible. Sampling design should be developed with input from local, state, Tribal and federal resource agencies.

3. Investigate water depths and circulation patterns where cage mariculture operations are undertaken to insure conditions are adequate to preclude the buildup of waste products, excess feed, and chemical agents.
4. Undertake a thorough scientific review and risk assessment before any non-native species are allowed to be introduced. Any net pen structure should have small enough webbing to prevent entanglement by prey species. Mitigation should be provided for the areas impacted by the facility.
5. Encourage research into the timing of fish recruitment to kelp canopies and the response of canopy dwelling juvenile groundfish to kelp harvesting operations in order to minimize potential adverse impacts to canopy habitat function.
6. Encourage development of harvesting methods to minimize impacts on plant communities such as the destruction of canopy-dwelling invertebrates and the loss of food and/or habitat to fish populations during harvesting operations.
7. Mitigation for unavoidable, extensive, or permanent loss of plant communities should be provided.

5.0 COASTAL/MARINE ACTIVITIES

5.1 Point Source Discharge

Point-source discharges from municipal sewage treatment facilities or storm water discharges are controlled through the EPA's mandated regulations under the Clean Water Act and by state water regulations. The primary concerns associated with municipal point-source discharges involve treatment levels needed to attain acceptable nutrient inputs and overloading of treatment systems due to rapid development of the coastal zone. Storm drains are contaminated from communities with settling and storage ponds, street runoff, and harbor activities. Annually, wastewater facilities through sewage outfall lines introduce large volumes of untreated excrement and chlorine as well as treated freshwater into the nation's waters. This can significantly alter pH levels of marine waters (NPFMC 1999).

Potential Adverse Impacts

There are many potential impacts from point-source discharge, but it is important to note that point-source discharges and resulting altered water quality in aquatic environments does not necessarily result in adverse impacts to either marine resources or EFH. Because most point-source discharges are regulated by the state or EPA, effects to receiving waters are generally considered in those cases. Point-source discharges can adversely affect EFH by 1) reducing habitat functions necessary for growth to maturity, 2) modifying community structure, 3) bioaccumulation, and 4) modifying habitat.

At certain concentrations, point-source discharges can alter the following properties of ecosystems and associated communities: diversity, nutrient and energy transfer, productivity, biomass, density, stability, connectivity, and species richness and evenness. Pollution effects may be related to changes in water flow, pH, hardness, dissolved oxygen, and other parameters that affect individuals, populations, and communities. Sewage, fertilizers, and de-icing chemicals (e.g., glycols, urea) are examples of common urban pollutants that decompose with high biological or chemical oxygen demand (NPFMC 1999).

Point-source discharges, at certain concentrations, can modify by altering the following characteristics of finfish, shellfish, and related organisms: growth, visual acuity, swimming speed, equilibrium, feeding rate, response time to stimuli, predation rate, photosynthetic rate, spawning seasons, migration routes, and resistance to disease and parasites. Additionally, zones of low dissolved oxygen from their decomposition can retard growth of salmon eggs, larvae, and juveniles and may delay or block smolt and adult migration. Sewage and fertilizers also introduce nutrients into urban drainages that drive algal and bacterial blooms which may smother incubating salmon or produce toxins as they grow and die. Thermal effluents from industrial sites and removal of riparian vegetation from streambanks allowing solar warming of water can degrade salmon habitat. Heavy metals, petroleum hydrocarbons, chlorinated hydrocarbons, and other chemical wastes can be toxic to salmonids and their food, and they can inhibit salmon movement and habitat use in streams (NPFMC 1999).

Elevated salinity levels from desalination plants also need to be considered. While these studies have shown that they may not produce toxic effects (Bay and Greenstein 1994), peripheral effects of pollution may include forcing rearing fish into areas of high predation. Conversely, influx of treated freshwater from municipal wastewater plants may force rearing fish into habitat with less than optimal salinity for growth (NPFMC 1999).

Point-discharges may affect the growth, survival and condition of EFH-managed species and prey species if high levels of contaminants (e.g., chlorinated hydrocarbons; trace metals, PAHs, pesticides, and herbicides) are discharged. If contaminants are present, they may be absorbed across the gills or concentrated through bioaccumulation as contaminated prey is consumed (Raco-Rands 1996). Many heavy metals and persistent organic compounds such as pesticides and polychlorinated biphenyls tend to adhere to solid particles discharged from outfalls. As the particles are deposited, these compounds or their degradation products (which may be equally or more toxic than the parent compounds) can enter the

EFH foodchain by bioaccumulating in benthic organisms at much higher concentrations than in the surrounding waters (Stein et al. 1995). Due to burrowing, diffusion, and other upward transport mechanisms that move buried contaminants to the surface layers and eventually to the water column, pelagic and nektonic biota may also be exposed to contaminated sediments through mobilization into the water column.

Discharge sites may also modify habitat by creating adverse impacts to sensitive areas such as freshwater shorelines and wetlands, emergent marshes, sea grasses, and kelp beds if located improperly. Extreme discharge velocities of effluent may also cause scouring at the discharge point as well as entrain particulates and thereby create turbidity plumes. These turbidity plumes of suspended particulates can reduce light penetration and lower the rate of photosynthesis and the primary productivity of an aquatic area while elevated turbidity persists. The contents of the suspended material can react with the dissolved oxygen in the water and result in oxygen depletion, or smother submerged aquatic vegetation sites including eelgrass beds and kelp beds. Accumulation of outfall sediments may also alter the composition and abundance of infaunal or epibenthic invertebrate communities (Ferraro 1991). Pollutants, either suspended in the water column (e.g., nitrogen, contaminants, fine sediments) or settled on the bottom, can affect habitat. Many benthic organisms are quite sensitive to grain size, and accumulation of sediments can also submerge food organisms (see Section 4.2.2).

Recommended Conservation Measures

1. Locate discharge points in coastal waters well away from shellfish beds, sea grass beds, coral reefs, and other similar fragile and productive habitats.
2. Reduce potentially high velocities by diffusing effluent to acceptable velocities.
3. Determine benthic productivity by sampling prior to any construction activity related to installation of new or modified facilities. Outfall design (e.g., modeling concentrations within the predicted plume or likely extent of deposition along a productive nearshore), should be developed with input from appropriate resource and Tribal agencies.
4. Provide for mitigation when the degradation or loss of habitat from placement and operation of the outfall structure and pipeline.
5. Institute source-control programs that effectively reduce noxious materials to avoid introducing these materials into the waste stream.
6. Ensure compliance with pollutant discharges regulated through discharge permits which set effluent discharge limitations and/or specify operation procedures, performance standards, or best management practices. These efforts rely on the implementation of best management practices to control polluted runoff (EPA 1993).
8. Discharges should be treated to the maximum extent practicable, including implementation of up-to-date methodologies for reducing discharges of biocides (e.g., chlorine) and other toxic substances.
9. Use land-treatment and upland disposal/storage techniques where possible. Use of vegetated wetlands as natural filters and pollutant assimilators for large-scale discharges should be limited to those instances where other less damaging alternatives are not available and the overall environmental and ecological suitability of such an action has been demonstrated.
10. Avoid siting pipelines and treatment facilities in wetlands and streams. Since pipelines and treatment facilities are not water dependent with regard to positioning, it is not essential that they be placed in wetlands or other fragile coastal habitats. Avoiding placement of pipelines within streambeds and wetlands will also reduce inadvertent infiltration into conveyance systems and retain natural hydrology of local streams and wetlands.

5.2 Fish Processing Waste - Shoreside and Vessel Operation

Seafood processing facilities are either shore-based facilities discharging through stationary outfalls or mobile vessels engaged in the processing of fresh or frozen seafood (SAIC 2001). Discharge of fish waste from shoreside and vessel processing has occurred in marine waters since the 1800s (NPFMC 1999). With the exception of fresh market fish, some form of processing involving butchering, evisceration, pre-cooking or cooking is necessary to bring the catch to market. Precooking or blanching facilitates the removal of skin, bone, shell, gills, and other materials. Depending on the species, the cleaning operation may be manual, mechanical, or a combination of both (EPA 1974). Seafood processing facilities generally consist of mechanisms to offload the harvest from fishing boats; tanks to hold the seafood until the processing lines are ready to accept them; processing lines, process water and waste collection systems; treatment and discharge facilities; processed seafood storage areas; and necessary support facilities such as electrical generators, boilers, retorts, water desalinators, offices, and living quarters. In addition, marinas that cater to patrons who fish a large amount can produce a large amount of fish waste at the marina from fish cleaning.

Potential Adverse Impacts

Generally, seafood processing wastes consist of biodegradable materials that contain high concentrations of soluble organic material. Seafood processing operations have the potential for adversely affecting EFH through 1) direct and/or nonpoint source discharge, 2) particle suspension, and 3) increased turbidity and surface plumes.

Seafood processing operations have the potential for adversely affecting EFH through the direct and/or nonpoint source discharge of nutrients, chemicals, fish by-products, and "stickwater" (water and entrained organics originating from the draining or pressing of steam-cooked fish products). Investigations by the EPA show that impacts affecting water quality are a direct function of the receiving waters. In areas with strong currents and high tidal ranges, waste materials disperse rapidly. In areas of quieter waters, waste materials can accumulate and result in shell banks, sludge piles, dissolved oxygen depressions, and associated aesthetic problems (Stewart and Tangarone 1977). If adequate disposal facilities are not available at marinas that generate a large amount of fish waste, there is a potential for disposal of fish waste in areas without enough flushing to prevent decomposition and the resulting dissolved oxygen depression (EPA 1993).

Processors discharging fish waste are required to have NPDES permits from the EPA. Various water quality standards including those for BOD, total suspended solids (TSS), fecal coliform bacteria (FC), oil and grease, pH, and temperature are all considerations in the issuance of such permits. Although fish waste, including heads, viscera, and bones, is biodegradable, fish parts that are ground to fine particles may remain suspended for some time, thereby overburdening habitats from particle suspension (NPFMC 1999). Such pollutants have the potential to adversely impact EFH. The wide differences in habitats, types of processors, and seafood processing methods define those impacts and can also prevent the effective use of technology-based effluent limits.

In certain areas such as Alaska, seafood processors are allowed to deposit fish parts in a Zone of Deposit (ZOD) (EPA 2001). This can remove benthic habitat from the environment, reduce locally associated invertebrate populations, and lower dissolved oxygen levels in overlying waters. Impacts from accumulated processing wastes are not limited to the area covered by the ZOD. Severe anoxic and reducing conditions occur adjacent to effluent piles (EPA 1979). Examples of localized damage to benthic environment include several acres of bottom-driven anoxic by piles of decomposing waste up to 26 fee (7.9 m) deep. Juvenile and adult stages of flatfish are drawn to these areas for food sources. One effect of this attraction may lead to increased predation on juvenile fish species by other flatfishes, diving seabirds, and marine mammals drawn to the food source (NPFMC 1999). However, due to the difficulty in monitoring these areas, impacts to species can go undetected.

Scum and foam from seafood waste deposits can also occur on the water surface and/or increase turbidity. Increased turbidity decreases light penetration into the water column, reducing primary production. Reduced primary production decreases the amount of food available for consumption by higher trophic level organisms. In addition, stickwater takes the form of a fine gel or slime that can concentrate on surface waters and move onshore to cover intertidal areas.

Recommended Conservation Measures

1. Base effluent limitations on site-specific water quality EFH concerns to the maximum extent practicable.
2. Avoid the practice of discharging untreated solid and liquid waste directly into the environment. Use of secondary or wastewater treatment systems should be encouraged where possible.

3. Designation of new ZODs should not be allowed. Options to eliminate or reduce ZODs at existing facilities should be explored.
4. Control stickwater by physical or chemical methods.
5. Promote sound fish waste management through a combination of fish-cleaning restrictions, public education, and proper disposal of fish waste.
6. Encourage the alternative use of fish processing wastes (e.g., fertilizer for agriculture, and animal feed).
7. Options for additional research should be explored. There is not much current research on which to base management decisions about habitat. Some improvements in waste processing have occurred, but the technology-based effluent guidelines have not changed in 20 years.
8. Locate new plants outside rearing and nursery habitat. Monitor both biological and chemical changes to the site.

5.3 Water Intake Structures/Discharge Plumes

The withdrawal of riverine, estuarine and marine waters by water intake structures is a common aquatic activity. Water may be withdrawn to cool coastal power generating stations, used as a source of water for agricultural purposes, and more recently, as a source of potable water for desalinization plant operations. In the case of power plants and desalinization plants, the subsequent discharge of heated and/or chemically-treated discharge water can also occur.

Potential Adverse Impacts

Adverse impacts to EFH from water intake structures and effluent discharges can interfere or disrupt EFH functions in the source or receiving waters by 1) entrainment, 2) impingement, 3) discharge, 4) operation and maintenance, and 5) construction-related impacts.

Entrainment is the withdrawal of aquatic organisms along with the cooling water into the cooling system. These organisms are usually the egg and larval stages of managed species and their prey. Entrainment can subject these life stages to adverse conditions resulting from the effects of increased heat, antifouling chemicals, physical abrasion, rapid pressure changes, and other detrimental effects. Consequently, diverting water without adequate screening prevents that portion of the EFH from providing important habitat functions necessary for the early life stages of managed living marine resources and their prey. Long-term water withdrawal may adversely affect fish and shellfish populations by adding another source of mortality to the early life stage which often determines recruitment and year-class strength (Travnichek et al. 1993).

Impingement occurs to organisms that are too large to pass through in-plant screening devices and instead become stuck or impinged against the screening device or remain in the forebay sections of the system until they are removed by other means (Grimes 1975, Hanson et al. 1977, Helvey and Dorn 1987, Helvey 1985, Langford et al. 1978, Moazzam and Rizvi 1980). The organisms cannot escape due to the water flow that either pushes them against the screen or prevents them from exiting the intake tunnel. Similar to entrainment, the withdrawal of water can entrapped particular species especially when visual acuity is reduced (Helvey 1985). This condition reduces the suitability of the source waters to provide normal EFH functions necessary for subadult and adult life stages of managed living marine resources and their prey.

Thermal effluents in inshore habitat can cause severe problems by directly altering the benthic community or killing marine organisms, especially larval fish. Temperature influences biochemical processes of the environment and the behavior (e.g., migration) and physiology (e.g., metabolism) of marine organisms (Blaxter 1969). Further, the proper functioning of sensitive areas may be affected by the action of intakes as selective predators, resulting in cascading negative consequences as observed by the overexploitation of local fish populations in coral-reef fish communities (Carr et al. 2002).

Other impacts to aquatic habitats can result from construction related activities (e.g., dewatering, dredging, etc.) (see Section 4.1) as well as routine operation and maintenance activities. There is a broad range of impacts associated with these activities depending on the specific design and needs of the system. For example, dredging activities can cause turbidity, degraded water quality, noise, and substrate alterations. Many of these impacts can be reduced or eliminated through the use of various techniques, procedures, or technologies, but some may not be fully eliminated except by eliminating the activity itself.

In the case of power plants using once-through cooling, biocides such as sodium hypochlorite and sodium bisulfate may used periodically to clean the intake and discharge structures. Chlorine is extremely toxic to aquatic life.

Recommended Conservation Measures

1. Locate facilities that rely on surface waters for cooling in areas other than estuaries, inlets, heads of submarine canyons, rock reefs or small coastal embayments where EFH species or their prey concentrate. Discharge points should be located in areas that have low concentrations of living marine resources. They should incorporate cooling towers to control temperature and employ sufficient safeguards to ensure against release of blow-down pollutants into the aquatic environment in concentrations that reduce the quality of EFH.
2. Design intake structures to minimize entrainment or impingement. Velocity caps that produce horizontal intake/discharge currents should be employed and intake velocities across the intake screen should not exceed 0.5 foot per second.
3. Design power plant cooling structures to meet the "best technology available" requirements (BTAs) as developed pursuant to Section 316(b) of the Clean Water Act. Use of alternative cooling strategies, such as closed cooling systems (e.g., dry cooling) should be used to completely avoid entrainment/impingement impacts in all industries which require cooling water. When alternative cooling strategies prove infeasible, other BTAs may include but are not limited to fish diversion or avoidance systems, fish return systems that convey organisms away from the intake and mechanical screen systems that prevent organisms from entering the intake system, and habitat restoration measures.
4. Regulate discharge temperatures (both heated and cooled effluent) such that they do not appreciably alter the temperature that could cause a change in species assemblages and ecosystem function in the receiving waters. Strategies should be implemented to diffuse the heated effluent.
5. Avoid the use of biocides (e.g., chlorine) to prevent fouling where possible. The least damaging antifouling alternatives should be implemented.
6. Mitigate for impacts related to power plants and other industries requiring cooling water. Mitigation should compensate for the net loss of EFH habitat functions from placement and operation of the intake and discharge structures. Mitigation should be provided for the loss of habitat from placement of the intake structure and delivery pipeline, the loss of fish larvae and eggs that may be entrained by large intake systems, and the degradation or loss of habitat from placement of the outfall structure and pipeline as well as the treated water plume.
7. Treat all discharge water from outfall structures to meet state water quality water standards at the terminus of the pipe. Pipes should extend a substantial distance offshore and be buried deep enough to not affect shoreline processes. Buildings and associated structures should be set well back from the shoreline to preclude the need for bank armoring.

5.4 Oil/Gas Exploration/Development/Production

Offshore exploration, development, and production of natural gas and oil reserves have been, and continues to be, an important aspect of the U.S. economy. As demand for energy resources grows, the debate over trying to balance the development of oil and gas resources and the protection of the environment will also continue. Projections indicate that U.S. demand for oil will increase by 1.3 percent per year between 1995 and 2020. Gas consumption is projected to increase by an average of 1.6 percent during the same time frame (Waisley 1998). Much of the 1.9 billion acres within the offshore jurisdiction of the U.S. remain unexplored (OGTAD 1985). It is also expected that some of the older oil and gas platforms in operation will reach the end of their productive life in the near future. The question of decommissioning is also an issue.

Potential Adverse Impacts

Offshore oil and gas operations can be classified into exploration, development, and production activities. Petroleum exploration/development/production occurs in varying water depths and usually over soft-bottom substrates, although hard-bottom habitats may be present in the general vicinity. These areas are subject to an assortment of physical, chemical, and biological disturbances. These disturbances include 1) noise from seismic surveys, vessel traffic, and construction of drilling platforms or islands, traffic from vessels, 2) physical alterations to habitat from the construction, presence and eventual decommissioning and removal of facilities such as islands or platforms, storage and production facilities, and pipelines to onshore common carrier pipelines, storage facilities, or refineries, 3) waste discharges including well drilling fluids, produced waters, surface runoff and deck drainage, domestic waste waters generated from the offshore facility, solid-waste from wells (drilling muds and cuttings) and other trash and debris from human activities associated with the facility, 4) oil spills, and 5) platform storage, and pipeline decommissioning (NPFMC 1999, Helvey 2002).

Noise sources may generate sound pressure that can disrupt or damage marine life. Oil and gas activities may generate noise from drilling activities, construction, production facility operations, seismic exploration and supply vessel and barge movements (see Section 4.5). The impacts of oil exploration-related seismic energy releases may interrupt and cause fish to disperse from the acoustic pulse with possible disruption to their feeding patterns. It is known that noise in the marine environment may adversely affect marine mammals by causing them to change behavior (movement, feeding), interfere with echolocation and communication, or may result in injury to hearing organs (Richardson et al. 1995). Activities such as vessel anchoring, platform or artificial island construction, pipeline laying (see Section 4.10), dredging, and pipeline burial can alter bottom habitat by altering substrates used for feeding or shelter. Disturbances to the associated epifaunal communities, which may provide feeding or predator escape habitat, can also result. Benthic organisms, especially prey species, may recolonize disturbed areas, but this may not occur if the composition of the substrate is drastically changed or if facilities are left in place after production ends. Dredging, trenching and pipelaying generate spoils that may be disposed of on land or the marine environment where sedimentation may smother benthic habitat and organisms. Most of these activities associated with oil and gas operations, however, are conducted under permits and regulations that require companies to minimize impacts or to avoid construction or other disturbances in sensitive marine habitats (see Section 4.2.2).

The discharge of drilling muds and cuttings can result in varying degrees of change on the sea floor and affect feeding, nursery, and shelter habitat for various life stages of managed species. Drilling muds and cuttings may adversely affect bottom-dwelling organisms at the site by burial of immobile forms or forcing mobile forms to migrate. Exploratory and construction activities may also result in resuspension of fine-grained mineral particles, usually smaller than silt, in the water column. These suspended particulates can reduce light penetration and lower the rate of photosynthesis and the primary productivity of the aquatic area especially if suspended for lengthy intervals. Groundfish and other fish species can suffer reduced feeding ability leading to limited growth if high levels of suspended particulates persist. The contents of the suspended material can react with the dissolved oxygen in the water and result in oxygen depletion. In addition, the discharge of oil drilling muds can change the chemical and physical characteristics of benthic sediments at the disposal site by introducing toxic chemical constituents. Changes in the clarity and the addition of contaminants can reduce or eliminate the suitability of water bodies as habitat for fish species and their prey (NMFS 1998).

Oil spills are a serious potential source of contamination to the marine environment from oil and gas development. Offshore oil and gas development will inevitably result in some oil entering the environment. Most spills are expected to be of small size, although there is a potential for large spills to occur. Many factors determine the degree of damage from a spill, including the type of oil, size and duration of the spill, geographic location of the spill, and the season. Although oil is toxic to all marine organisms at high concentrations, certain species are more sensitive than others. In general, the early life stages (eggs and larvae) are most sensitive, juveniles are less sensitive, and adults least so (Rice et al. 2000).

In whatever quantities, lost oil can affect habitats and living marine resources. Accidental discharge of oil can occur during almost any stage of exploration, development, or production on the outer continental shelf (OCS) or in nearshore coastal areas. Oil spills can occur from many possible sources including equipment malfunction, ship collisions, pipeline breaks, other human error, or severe storms. Oil spills can also be attributed to support activities associated with product recovery and transportation. In addition to crude oil spills, chemical, diesel, and other contaminant spills can occur with OCS activities (NPFMC 1999).

Chronic small oil spills are a potential problem because residual oil can build up in sediments and affect living marine resources. Low levels of petroleum components (polycyclic aromatic hydrocarbons- PAH) from such chronic pollution can accumulate in salmon tissues and cause lethal and sublethal effects, particularly at the embryo stage. Effects on fish from low-level chronic exposure may increase embryo mortality, reduce marine growth (Heintz et al. 2000), or increase straying away from natal streams by returning adults (Wertheimer et al. 2000).

It is possible for a major oil spill (i.e., 50,000 barrels) to produce a surface slick covering up to several hundred square kilometers of surface area. If the oil spill moves toward land, habitats and species could be affected by the loading of oil into the near shore environment. In the initial hours after a large spill, aromatic hydrocarbons would generally be at toxic levels to some organisms. Beneath and surrounding the surface slick, there would be some oil-contaminated waters. Physical and biological forces act to reduce oil concentrations with depth and distance (NPFMC 1999); generally the lighter fraction aromatic hydrocarbons evaporate rapidly, particularly during periods of high wind and wave activity. Heavier oil fractions may settle through the water column. Suspended sediment can adsorb and carry oil to the seabed. Hydrocarbons may be solubilized by wave action which may enhance adsorption to sediments, which then sink to the seabed, contaminating benthic sediments. Carls et al. (2003) demonstrated that tides and the resultant hydraulic gradients provide a mechanism for groundwater transport of soluble and slightly soluble contaminants (such as oil) from beaches surrounding streams into the hyporheic zone where pink salmon eggs incubate. Oil may reach nearshore areas and affect productive nursery grounds or areas containing high densities of fish eggs and larvae. An oil spill near an especially important habitat (e.g., a gyre where fish or invertebrate larvae are concentrated) could also result in a disproportionately high loss of a population of marine organisms. Other aquatic biota at risk would be eggs, larvae and other planktonic organisms in the upper seawater column. Because they cannot actively avoid exposure, their small size means they absorb contaminants quickly, and their proximity to the seasurface means they may be vulnerable to photo-enhanced toxicity effects, which can increase the toxicity of hydrocarbons several fold (Barron et al. 2003). In addition, oil spills may interrupt commercial or subsistence fishing activities.

Habitats that are susceptible to damage from spill oil include not just the low energy coastal bays and estuaries where oil may accumulate but also high energy cobble environments where oil is driven into sediments through wave action. Many of the beaches in Prince William Sound with the highest persistence of oil following the *Exxon Valdez* oil spill were high-energy environments containing large cobbles overlain with boulders. These beaches were pounded by storm waves which drove the oil into and well below the surface (Michel and Hayes 1999). Oil that mixes into bottom sediments can persist for years. Subsurface oil was still detected in beach sediments of Prince William Sound 12 years after the *Exxon Valdez* oil spill, much of it unweathered and more prevalent in the lower intertidal biotic zone than at higher tidal elevations (Short et al. 2002). Additional concern is the unknown impact of an oil-related event near and/or within ice. The water column adjacent to the ice edge is stable. This stabilization (or stratification) would allow relatively quick transport of oil to the sea floor. Additionally, oil trapped in ice could impact habitat significantly after the initial event, months or years later, and even into a different region (NPFMC 1999).

Residual oil from a spill can remain toxic for long periods. Petroleum is a complex mixture of alkanes and aromatic hydrocarbons, of which the alkyl-substituted and multi-ring PAHs are the most toxic and persistent. Following weathering, the aromatic fraction of oil is dominated by PAHs as the lighter aromatic components evaporate or are degraded. Because of low solubility in water, the large PAH concentrations probably contribute little to acute toxicity of oil-water solutions. Lipophilic PAH, however, may cause physiological injury if it accumulates in tissues after exposure (Carls et al. 1999, Heintz et al. 2000). Also, even when concentrations of oil are sufficiently diluted not to be physically damaging to marine organisms, it still may be detected by them, and may alter certain behavior patterns.

Oil and gas platforms may be comprised of a lattice-work of pilings, beams and pipes that support diverse fish and invertebrate populations and are considered de facto artificial reefs (Love and Westphal 1990, Love et al. 1994, Love et al. 1999, Helvey 2002). Because decommissioning includes plugging and abandoning all wells and removing the platforms and associated structures from the ocean, impacts to EFH can result during removal. Impacts during the demolition phase may include underwater sound pressure waves (see Section 4.5.1) and impacts on marine organisms; removal of structures may remove habitat for invertebrates and fish that associate with midwater structures. In some areas of the U.S., offshore oil and gas platforms are allowed to remain after decommissioning, thereby providing permanent habitat for some organisms.

The potential disturbances and associated adverse impacts on the marine environment has been reduced through the operating procedures required by regulatory agencies and in many cases self imposed by facilities operators. Most of the activities associated with oil and gas operations are conducted under permits and regulations that require companies to minimize impacts or avoid construction in sensitive marine habitats. New technological advancements result in improved operating practices reducing the potential for impacts. For example the discharge of muds and cuttings is being phased out of modern oil and gas production programs; generally such byproducts of exploration or development are ground into finer materials and injected into wells that penetrate subsea reservoir strata and do not enter the marine environment.

Recommended Conservation Measures

Oil and gas exploration, development, and production can be conducted in a manner that minimizes adverse impacts on the marine environment. Over the past several decades, government agencies and petroleum production companies have developed operating procedures that reduce potential adverse effects; these procedures are generally required through permits. The following are recommended measures that should be considered in permitting future oil and gas operations.

1. Conduct pre-project biological surveys in consultation with NMFS to determine the extent and composition of biological populations or habitat in the proposed production area. On the basis of the site-specific surveys a determination will be made whether or not the operations are likely to have an adverse effect upon EFH, or that a special biological population/habitat does not exist. Based on the information in the surveys, the following may be recommended:
    a. Redesign facilities to accommodate habitat concerns.
    b. Operate during those periods of time, as established in consultation with NMFS, that do not adversely affect biological resources.
    c. Modify operations to ensure that significant biological populations or habitats deserving protection are not affected.
2. Limit the discharge of produced waters into marine and estuarine environments. Re-inject produced waters into the oil formation whenever possible.
3. Avoid discharge of muds and cuttings into the marine and estuarine environment. Use methods to grind and re-inject such wastes down an approved injection well or use onshore disposal wherever possible. When not possible, provide for a monitoring plan to quantitatively assess whether effluent discharges are meeting the needs of EFH.
4. Limit placement of causeways or structures in the nearshore marine environment.
5. Encourage the use of geographic response strategies that identify EFH and environmentally sensitive areas and identify appropriate cleanup methods to include the prestaging of response equipment.
6. Use methods to transport oil and gas that limit the need for handling in environmentally sensitive areas, including EFH.
7. Prohibit drilling of the first development well into the targeted hydrocarbon formations during hazardous or sensitive environmental conditions, such as broken ice.
8. Prohibit drilling of exploration wells into untested formations during hazardous or sensitive environmental conditions.
9. Provide for monitoring and leak detection systems that preclude oil and gas from entering the environment.
    a. Utilize systems that detect spills and leaks as rapidly as technologically possible so that action can

be taken to avoid or reduce the effect to EFH, and

   b. Utilize maximum precautions to eliminate pipeline failure caused by external forces.

10. Evaluate impacts to habitat during the decommissioning phase, including impacts during the demolition phase and impacts resulting from permanent habitat losses.

5.5 Habitat Restoration/Enhancement

Habitat loss and degradation are major, long-term threats to the sustainability of fishery resources (NOAA Fisheries 2002). Viable coastal and estuarine habitats are important to maintaining healthy fish stocks. Good water quality and quantity, appropriate substrate, ample food sources and substantial hiding places are needed to sustain fisheries. Restoration and/or enhancement of coastal and riverine habitat that supports managed fisheries and their prey will assist in sustaining and rebuilding fisheries stocks and recovering certain threatened or endangered species by increasing or improving ecological structure and functions. Habitat restoration/enhancement may include, but is not limited, to improvement of coastal wetland tidal exchange or reestablishment of historic hydrology; dam or berm removal; fish passage barrier removal/modification; road related sediment source reduction; natural or artificial reef/substrate/habitat creation; establishment or repair of riparian buffer zones and improvement of freshwater habitats that support anadromous fishes; planting of native coastal wetland and submerged aquatic vegetation; creation of oyster reefs; and improvements to feeding, shade or refuge, spawning and rearing areas that are essential to fisheries.

Potential Adverse Impacts

The implementation of restoration/enhancement activities may have localized and temporary adverse impacts on EFH. Possible impacts can include 1) localized nonpoint source pollution such as influx of sediment or nutrients, 2) interference with spawning and migration periods, 3) temporary or permanent removal feeding opportunities; and 4) indirect effects from actual construction portions of the activity.

Unless proper precautions are taken, upland related restoration projects can contribute to nonpoint source pollution. Such concerns should be addressed as part of the planning process (see Section 2.1). Particular in-water projects may interfere with spawning periods or impede migratory corridors and should be addressed accordingly. Projects may also have an effect on the feeding behavior of managed species. For instance, if dredging is involved, benthic food resources may be impacted. (See also Section 4.1). Impacts can occur from individuals conducting the restoration, especially at staging areas, as part of accessing the restoration site, or the actual restoration techniques employed. Particular impacts can result from water quality impacts from individuals conducting the restoration, excessive foot traffic, diving techniques, equipment handling, boat anchoring, and planting techniques.

The use of artificial reefs is a popular form of habitat enhancement, but it can also impact the aquatic environment through the loss of habitat upon which the reef material is placed or the use of inappropriate materials in construction. Usually, reef materials are set upon flat sand bottoms or “biological deserts” which end up burying or smothering bottom-dwelling organisms at the site or even preventing mobile forms (e.g., benthic-oriented fish species) from utilizing the area as habitat. Some materials may be inappropriate for the marine environment (e.g., automobile tires; compressed incinerator ash) and can serve as sources of toxic releases or physical damage to existing habitat when breaking free of their anchoring systems (Collins et al. 1994).

Recommended Conservation Measures

1. Use BMPs to minimize and avoid all potential impacts to EFH during restoration activities. This conservation measure requires the use of BMPs during restoration activities to reduce impacts from project implementation. BMPs should include, but are not limited to, the following:

   a. Measures to protect the water column—Turbidity curtains, haybales, and erosion mats should be used.

   b. Staging areas—Areas used for staging will be planned in advance and kept to a minimum size.

   c. Buffer areas around sensitive resources—Rare plants, archeological sites, etc., will be flagged and avoided.

d. Invasive species—Invasive plant and animal species should be removed from the proposed action area prior to commencement of work. Only native plant species should be planted. Measures to ensure native vegetation or revegetation success will be identified and implemented (see also Section 4.4).

e. Ingress/egress areas—Temporary access pathways will be established prior to restoration activities to minimize adverse impacts from project implementation.

2. Avoid restoration work during critical fish windows to reduce direct impacts to important ecological functions such as spawning, nursery, and migration. This conservation measure requires scheduling projects when managed species are not expected in the area. These periods should be determined prior to project implementation to reduce or avoid any potential impacts.
3. Provide adequate training and education to volunteers and project contractors to ensure minimal impact to the restoration site. Volunteers should be trained in the use of low-impact techniques for planting, equipment handling, and any other activities associated with the restoration. Proper diving techniques need to be used by volunteer divers.
4. Conduct monitoring before, during, and after project implementation to ensure compliance with project design and restoration criteria. If immediate post-construction monitoring reveals that unavoidable impacts to EFH have occurred, appropriate coordination with NOAA Fisheries should occur to determine appropriate response measures, possibly including mitigation.
5. Mitigate fully any unavoidable damage to EFH during project implementation and accomplish within reasonable period of time after the impacts occurred.
6. Remove and restore, if necessary, any temporary access pathways and staging areas used in the restoration effort.
7. Determine benthic productivity by sampling prior to any construction activity in the case of subtidal enhancement (e.g., artificial reefs). Areas of high productivity should be avoided to the maximum extent possible. Sampling design should be developed with input from state and federal resource agencies. Prior to construction, an evaluation of the impact resulting from the change in habitat (sand bottom to rocky reef, etc.) should be performed. Post-construction monitoring should examine the effectiveness of the structures for increasing habitat productivity.

5.6 Marine Mining

Mining activity, as also described in Section 3.1.1 and Section 3.1.2, can lead to the direct loss of EFH for certain species. Offshore mining as well the mining of gravel from beaches, can increase turbidity of water and, thus, the resuspension of organic materials could affect less motile organisms (i.e., eggs and recently hatched larvae) in the area. Benthic habitats could be damaged or destroyed by these actions. Mining of large quantities of beach gravel can significantly affect the removal, transport, and deposition of sand and gravel along the shore, both at the mining site and down current (NPFMC 1999). Neither the future extent of this activity nor the effects of such mortality on the abundance of marine species is known.

<u>Potential Adverse Impacts</u>

Mining practices that can impact EFH include physical impacts from intertidal dredging and chemical impacts from the use of additives such as flocculates (NPFMC 1999). Impacts include the removal of substrates that serve as habitat for fish and invertebrates; creation (or conversion) of areas to less productive or uninhabitable sites such as anoxic holes or silt bottom; burial of productive habitats, such as in near shore disposal sites (as in beach nourishment); release of harmful or toxic materials either in association with actual mining, or in connection with machinery and materials used for mining; creation of harmful turbidity levels; and adverse modification of hydrologic conditions so as to cause erosion of desirable habitats. Submarine disposal of mine tailings can also alter the behavior of marine organisms. Submarine mine tailings may not provide suitable habitat for some benthic organisms. In laboratory experiments, benthic dwelling flatfishes (Johnson et al. 1998b) and crabs (Johnson et al. 1998a) strongly avoided mine tailings.

During beach gravel mining, water turbidity increases and the resuspension of organic materials can affect less motile organisms (i.e., eggs and recently hatched larvae) in the area. Benthic habitats can be damaged or destroyed by these actions. Changes in bathymetry and bottom type may also cause alteration in population and migrations patterns (Hurme and Pullen 1988).

Recommended Conservation Measures

1. Avoid mining in waters containing EFH.
2. Minimize the areal extent and depth of extraction to minimize recolonization times.
3. Limit sand mining and beach nourishment in areas with EFH.
4. Monitor turbidity during operations and cease operations if turbidity exceeds predetermined threshold levels. Use sediment or turbidity curtains to limit the spread of suspended sediments and minimize the area affected.
5. Monitor the number of individual mining operations to avoid and minimize cumulative impacts. For instance, three mining operations in an intertidal area could impact EFH, whereas one may not. Also, disturbance of previously contaminated mining areas threaten an additional loss of EFH.

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8.0 INDEX

Appendix 7. Organizations contacted for information on non-fishing impacts to EFH

Contact	Organization	Comments	Contact Recommendations
NOAA/NMFS			
Russ Strach NMFS NW Region EFH Coordinator 503-231-6266	NMFS	*To his knowledge, there is no GIS data available *Recommends using data rich areas (I.e. Willapa) as example of possibilities *Especially important non-fishing impacts on west coast: dredging gravel mining sediment contamination shoreline development	Barb Seekins - EFH GIS Analyst 503-736-4739
Mark Helvey NMFS SW Region EFH Coordinator	NMFS		
Barb Seekins EFH GIS Analyst 503-736-4739 barbara.seekins@noaa.gov	NOAA	*To her knowledge, there is no readily available NFI data. She is researching a similar question next week and will let me know if she finds anything. I e-mailed a follow-up.	Dredging: Don Easedale ACE GIS Analyst Estuary HazMat: Jill Peterson 206-526-6944 Montery Bay Research Institute - no number
Jill Peterson Estuary HazMat 206-526-6944	NOAA	*Has Environmental Sensitivity Maps for California available digitally, nothing for Oregon. Washington State was done in the mid-eighties so it is available in hard copy. Currently doing the Columbia River.	George Graettinger - NMFS GIS Analyst 206-526-4660
George Graettinger 206-526-4660	NOAA	message 10-2	
Ken Buja 301-713-3028 National Status and Trends	NOAA	They do not have any human impact data, they focus on biological information	call Nancy Wright at CDF&G
EPA			
Bill Bogue 206-553-1676 bogue.william@epa.gov	EPA	*He is the GIS analyst in charge of Coastal issues, and to his knowledge they do not have any NFI information available. Because the State offices in Washington and Oregon are so strong, EPA takes a back seat.	Lorraine Edmond EPA Coastal EMAP - 206-553-7366 Wash & Oregon DOE and DEQ have facility information
Lorraine Edmond 206-553-7366 EPA Coastal EMAP	EPA	Began sampling small estuaries in 1999, large estauries in 2000. Looking at water quality, sediment and fish (by trawling). Recommended National Coastal Condition Health Report. www.epa.gov/owow/oceans/NCCR/index and www.epa.gov/r10earth/emap.htm	California

Contact	Organization	Comments	Contact Recommendations
ARMY CORPS OF ENGINEERS			
Dan Specht 415-977-8591	USACE Northern Califor	Has dredging information (see data sheet). He is new to the job so he is just beginning to pull together information. There is no coastwide dataset. Most data they have are at the single project level. Responsible for navigable waters only. Although they regulate some mining in navigable waters, no GIS coverage available. Database is available, but few permits are in it.	need to contact each regional ACE office for same information Puget Sound
Jim Francis 503-808-4856 GIS Analyst	USACE Portland District	Has dredge site surveys in microstation - he will look into if anything is in ArcView. He'll call back with what exactly they have.	Mark Siipola - he does sediment testing at disposal sites. 503-808-4885
Doug Swanson 503-808-4856 GIS Analyst	USACE Portland District	will look into dredge and fill data and get back to me	keep calling
Lauren Cole-Warner 206-764-6550	USACE Seattle District	Part of the Regional sediment evaluation team	David Kendall 206-764-3768
David Kendall 206-764-3768	USACE Seattle District	pointed me to the bi-annual report containing dredge and fill sites on their web page. www.usace.army.mil	maybe David Fox can help get digital data to us. 206-764-6083
David Fox 206-764-6083	USACE Seattle District GIS Analyst	e-mail request and he will see if he can help - extremely limited resources. E-mail sent 1-29-04	david.f.fox@usace.army.mil
Jeff Dorsey 503-808-4769	USACE Portland District	phone tag, last message left 1-30	
Miscellaneous			
Bob Euliss 360-902-3015	Office of the Interagency Committee for Outdoor Recreation (IAC)	Have marina and boat launch data available for public facilities only. There is no database containing private marinas.	
Liam Intellman 360-457-6622	Olympic Coast National Marine Sanctuary	primarily site specific information, but gave contact names	fiber optics: ACE regulates at state level OR Fisherman's Cable Committee - Scott McMullen 503-325-2285 CA Coastal Commission - Maria Kavanaugh 541-737-5359 Helen Berry - Shoreline hardening in shorezone database

Contact	Organization	Comments	Contact Recommendations
Scott McMullen 503-325-2285	OR Fisherman's Cable Committee	this group is the first stop for cable applicants in Oregon. 5 cables laid in OR, another this winter. CA has approx. 20 cables and WA has 3 (not including Navy). As far as he knows, there is no centralized government GIS database containing cable locations.	www.ofcc.com is his web page, www.iscpc.org should be reviewed for private companies that may have cable locations mapped and for sale. ***called again January 30 and Scott said he would send me lat/longs for the 6 cables off Oregon Coast (5 current and 1 proposed)
Maria Kavanaugh 541-737-5359	California Coastal Commission	message	
Debra Wolcott 805-389-7627	Minerals Management Service Information Technology		79 active leases (470 issued) in the pacific, call janice hall to get info 805-389-7621
Janice Hall 805-389-7621	Minerals Management Service Information Technology	message 1-16, 1-23	
Boyd Bosserman 303-275-7127	Minerals Management Service Mapping and Boundary Branch	Maps and GIS data of the MMS Offshore Leasing Program	
Dorcie Sarantos 401.243.8114	KMI Optical Networking Intelligence	inquired to see if they sell digital information on west coast cable location - information pending	
Henry Hale 1 877 579 0218 hhenry@primetrica.com	PriMetrica, Inc.	have hard copy cable information for purchase, he is looking into getting digital information for us. Sent e-mail to him with our requirements.	
Tanya Haddad 503.731.4065 ext. 30 tanya.haddad@state.or.us	Oregon Ocean-Coastal Management Program Oregon Department of Land Conservation & Development	message	
Bob Wargo (973) 326-3398 rwargo@att.com	AT&T	Scott McMullen suggested I contact Bob - he's the Chair of the North America Submarine Cable Association. Thought he could get me cable location for CA and WA	
Jody Gianini 805-771-9638	Central California Joint Cable/Fisheries Liason Committee		**www.fiberfish.org has 5 cable locations**

Contact	Organization	Comments	Contact Recommendations
Robin Downey (360) 754-2744	Pacific Shellfish Growers Association	Location data for aquaculture sites not available. Dept of Health has info available in huge blocks of available areas, but not what is actually being farmed (which is a small percentage of available area). There are 300 active farms in Washington State. WDFW does have an Aquatic Farm Registry but is extremely inaccurate.	Contacts: Bob Woolrich (DOH) 360-236-3329

Contact	Organization	Comments	Contact Recommendations
Washington State Agencies			
Michele Robinson 360-249-1211	WA DFW Marine Resources Division	they have no NFI type data, they do regulate shellfish beds, call for info	Olympic National Marine Sanctuary (Carol Burnthal)360-457-6622 Dan Ayers - WA DFW shellfish guy 360-249-1209 Rebecca Post WA DOE 360-407-7114 Roy Peterson - WA DOE 360-407-7202
Dan Ayers 360-249-1209	WA DFW Marine Resources Division (shellfish)	message	
Rebecca Post 360-407-7114	WA DOE	message 10-10	
Roy Peterson 360-407-7202	WA DOE	message 10-10	
Sharon O'Conner 360-407-6142	WA DOE	if anyone has water quality information (point source and non-point source) DOE is the agency. She will ask around and call me back.	
Stephen Burneth (360) 407-6459	WA DOE	not much on non-point source pollution. USGS LULC best available. They have facility information, but not outfall info. No-one's done anything on the coast - work has focused on Puget Sound.	
Andrea Copping 206-685-8209	Sea Grant	Invasive species: no comprehensive database available. Need tolook at species impacting areas, Spartina is the big invasive in the NW. In SF Bay, Benthic Organisms are the biggest problem. Aquaculture: commercial sites will have big effect on EFH, need to map culture locations Water Quality: 303(d) may be best legally defensible source, but big problems with data. Recommends combining ambient water quality data with sediment info.	Contacts: Invasive species - Scott Smith WDFW 360-902-2724 Aquaculture: Robin Downey, Pacific Coast Shellfish Growers Association Water Quality: Jan Newton (DOE) 360 407-6675
Scott Smith 360-902-2724	WA DFW Invasive Species Coordinator	message 1-30	
Helen Seyferlich 360-236-3323	WA Department of Health Shellfish Division	She is completing a GIS database of all active shellfish farms in Washington State. Will send it	**Call to follow up.**

Contact	Organization	Comments	Contact Recommendations
Bob Woolrich 360-236-3329	Washington State Department of Health	only have fecal coliform and temp data for Willapa and Grays Harbor. Nothing on the Coast.	
California/Oregon State			
"Mira" 831.649.2942	DFG CA GIS Lab - Marine Conservation		sending e-mail with link to web site with available data and other contact information (Oct 10)
Ivan Comacho 503-229-5088	OR DEQ GIS Lab	phone tag	
Mark Charles 503-229-5589	OR DEQ NPS Control Program	message october and january 16, mark returned call 1-22, I left message 1-23	
Jack Gregg 415-904-5246	California Coastal Commission NPS/Water Quality Program	Non-point source data is not readily available for the state, altho there is some localized data for areas such as the San Francisco Bay. There is a statewide water quality snapshot developed by the public for one day in 2003, but it is a volunteer-based effort with only one day's data. Even this agency is working at the small scale and does not have a statewide database.	point source data may be available for the state water board.
Frank Schnitzer 541-967-2039 x25	OR Dept of Geology	phone tag - last message 1-23, 1-30	
USGS			
Cynthia Barton 253-428-3600 ext: 2602	USGS - NW Contact	Efforts on west coast have focused on a handful of watersheds (Sacramento, Willamette, SF Bay, LA, Puget Sound). Need to call National office for coarser LULC data available coastwide.	Vicky Lucas (Washington contact) 206-220-4567 Rick Harris (California contact) 916-278-3021
Rick Hines 916-278-3021	USGS - California Water Resources Coordinator	They do have watershed LULC data available, speak with GIS folks	Donna Knifong 916-278-3081
Donna Knifong 916-278-3081	USGS - California GIS Analyst	have early 1990's satellite LULC data, basic classification (orchards, forested, urban, etc)	contact Naomi Nakagaki 916-278-3092
Naomi Nakagaki 916-278-3092	USGS -National GIS Analyst	have early 1990's satellite LULC data, 30m resolution, she will send	

Appendix 8. Evaluation of a US West Coast Groundfish Habitat Conservation Regulation via Analysis of Spatial and Temporal Patterns of Trawl Fishing Effort.

Evaluation of a US West Coast Groundfish Habitat Conservation Regulation via Analysis of Spatial and Temporal Patterns of Trawl Fishing Effort.

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ABSTRACT

Recent emphasis on linkages between essential fish habitat and fish stock productivity has raised concerns about the management of fishing activities such as trawling, which have the potential to impact fish habitat. Knowing specifically where and how intensively trawl effort has occurred over time provides ecologists with the necessary background for habitat impact and recovery studies, and provides fishery managers with an assessment of how habitat conservation objectives are being met. The objectives of this study were (1) to examine the extent to which the 2000 Pacific Fishery Management Council footrope restriction has shifted and reduced trawl fishing effort on Oregon fishing grounds, (2) to relate these changes in distribution to the benthic habitat type over which they occur, and (3) to develop methods for enhancing fine-scale spatial review of targeted fishing effort.

Density analysis of available trawl start locations provided a spatial and temporal understanding of how fishing efforts increased and decreased in relation to habitat distribution and fishery management actions between 1995 and 2002. Trawl effort patterns exhibit significant inter-annual variability and patchy distribution. Areas of increased fishing effort were still evident between years despite an overall decline in trawl tows across the time scale of this study. Tow end point locations for the years 1998-2001 were retrieved from manual logbooks for five reference sites located in the proximity of rock habitat features. Trawl towlines were mapped from start to end point and demonstrated a marked enhancement of fine-scale fishing effort resolution, with increased ability to identify effort shifts over benthic habitat. Distinct spatial shifts in fishing intensity (measured as km towed) away from rock habitat were evident at all reference sites, with an average reduction of 86%. Some slight shifts into surrounding unconsolidated sediments also occurred, indicating effort displacement as well as reduction. Fishing intensity was calculated from commercial trawl and research trawl survey towlines to achieve the most accurate assessment of fishing impacts and potential habitat recovery areas. Research trawling intensity was less than 1% of commercial trawl effort originating from the same sites. A brief comparison of Oregon

vessel towlines and California vessel towlines demonstrated similar targeted fishing patterns by both fleets, except at one site.

Results indicate that the footrope restriction, in conjunction with associated landing limits, was effective in protecting rocky habitats from trawl fishing impacts. Reference areas were identified where essential fish habitat (EFH) recovery is likely occurring off the coast of Oregon. Substantial regulatory changes continue in this fishery, with trip limits and gear restrictions continuously adjusted. Continued monitoring and review of spatial trawl data would assist in fishery management decision-making and assess conservation objectives for depleted groundfish and associated habitats. Future research should incorporate analysis of catch data and expand the review of trawl towlines for the entire US West coast groundfish fishery. The trawl towline spatial analysis developed in this work is a credible method for reviewing fishing effort at the scale of the fishery and in relation to detailed habitat data. The research presented here provides an example of how an interdisciplinary approach and critical assessment of data can work to resolve marine management challenges.

INTRODUCTION

There has been substantial concern over the effects of bottom-trawling and other fishing activities on benthic ecosystems and the sustainability of fish populations (Dieter et al. 2003, Johnson 2002, NRC 2002, Kaiser and de Groot 2000, Rester 2000, Thrush et al. 1998, Watling and Norse 1998, Jones 1992). Because bottom-trawling can alter essential fish habitat (EFH), it is important to understand fishing patterns both spatially and in the context of fishery management. It is imperative that fishery management measures implemented to protect depleted groundfish species and their associated habitat be critically evaluated as to their success. In the absence of such evaluation, there is no means to determine whether habitat conservation objectives are being met or what role regulatory actions play in recovering fish populations. Previous studies reviewing the effects of Pacific groundfish management have rarely assessed spatial or habitat specific implications (Babcock and Pikitch 2000, Gillis et al. 1995, Pikitch 1987, Pikitch and Melteff 1987).

Advances in the application of geographical information systems (GIS) now offer the capability to effectively analyze and evaluate spatially-related fishery management concerns (Valavanis 2002, Kruse et al. 2001, Meaden 2000, Isaak and Hubert 1997, Meaden 1996, Meaden and Chi 1996). The use of GIS improves our ability to form spatially appropriate biological and management related questions and to determine if present data sets can adequately address these questions. This tool allows for the synthesis of broad-scale spatial data sets from multiple disciplines. Spatial changes due to biological significance or regulatory decision-making can now be viewed simultaneously. As a spatial analysis tool, GIS is especially adapted to aid in management functions at various scales for monitoring of change, comparative studies (spatial and temporal), and modeling projection scenarios.

Primary management measures used to mitigate fishing impacts on habitat include regulating gear use, controlling landing limits for targeted fish (to reduce overall fishing effort and therefore frequency of disturbance), and by restricting or closing geographical areas to particular gear types. To date, the Pacific Fishery Management Council (PFMC) has implemented a combination of all three methods for the US West coast groundfish trawl fishery to protect and rebuild depleted rockfish (*Sebastes spp.*) populations (65 FR 221, 67 FR 57973). Many rockfish species are associated with hard-bottom, high-relief rocky areas (McCain 2003, Love et al. 2002). Habitat sensitivity to fishing impacts from mobile trawl gear is thought to be greatest in these stable areas of high habitat complexity (substrate surface topography) with a prominent degree of biogenic cover (Kaiser et al. 2003, Kaiser et al. 2002, Auster and Langton 1999, Auster 1998). Recovery appears to be most rapid in habitats which are less physically stable (i.e., sand), in contrast with rocky areas (Collie et al. 2000). Although these rocky areas are often the target of conservation concerns, very little attention has been given to the study of fishing impacts and recovery in these hard-bottom habitats in the Pacific Northwest.

The primary objective of this study was to examine trawl effort shifts over benthic habitats in response to regulatory changes in the US West coast groundfish fishery. In particular, this study focused on a PFMC-mandated restriction in trawl footrope size for landing nearshore and shelf rockfish species as well as most flatfish species. This regulation, enacted in 2000 to shift fishing incentives, linked various groundfish trip limits to large (> 8 inch (> 20.5 cm) diameter) and small (≤ 8 inch (≤ 20.5 cm) diameter) footrope configurations (65 FR 221 1/4/00, PFMC 2000, PFMC 1999). The composition of a small footrope could not exceed 8 inches along its entire length, which includes discs, attachments, or any other materials applied to the footrope cable and/or chain. Fishermen were also prohibited from attaching chafing gear to small footrope configurations. By inhibiting the large footrope gear necessary to pass over rough terrain and obstructions, this restriction was designed to redirect fishing effort off of high-relief rocky areas where depleted rockfish species are most abundant. Furthermore, the retention of most fish normally caught in these areas was prohibited if using large footrope gear to reduce the incentive to fish in these areas. The effort it would take to fish these areas and the large amounts of fish that would have to be discarded would make fishing economically unfeasible. Previous studies by Hannah (2003, 2000), based solely on catch information, indicated that a reduction in fishing effort had occurred after the trawl footrope restriction, but did not determine any relationship to benthic habitat. Hannah (2003) also recognized that the landing limits connected to footrope size may also play an important role in the reduction of trawling.

Comprehensive maps of seafloor lithology along the west coast of the United States have recently been compiled. Goldfinger et al. (2003) assembled and interpreted existing geological and geophysical data for the Oregon continental margin, which was made available for this study. The resolution and accuracy of the lithology data vary because of the non-uniform availability of data sources. An assessment was provided using ranked data distributions which allowed for the review of input data quality and suitability for habitat mapping (Romsos 2004). Oregon marine geomorphological features are identified in Figure 1 with an overlay of the seafloor lithology data. The width of the continental shelf is very narrow (~17 km) at Cape Blanco in southern Oregon and generally widens going north to Cape Falcon (~ 61 km). The boundaries of these Oregon lithology data extend from the Washington border at 46° 15’ 00” N latitude to the California border at 42° 00’ 00” N latitude. The eastern boundary is the intertidal zone and the western boundary is the edge of the continental slope (~ 3000 m depth). The system used to describe surficial geologic habitat types was a modification of the classification described by Greene et al. (1999). Benthic habitat, as defined for this study, refers to the surficial lithologic units dictating substrate type as described by Romsos (2004). While broader definitions of “habitat” may encompass many other ecological and abiotic factors, this study uses the structural substrate component as a proxy for associated benthic fish communities.

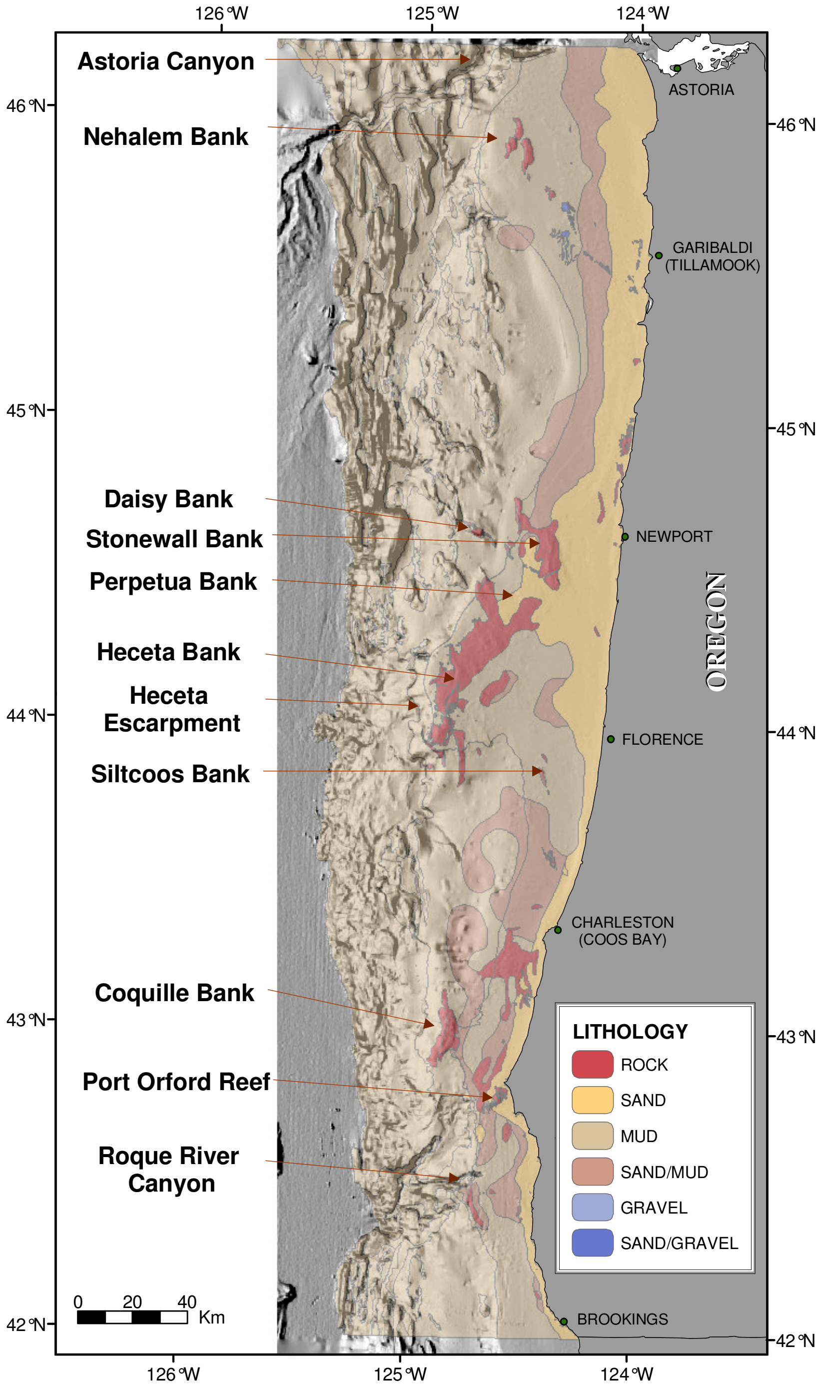


Figure 1. Oregon marine geomorphological features noted by shaded bathymetry and associated seafloor lithology. Seafloor lithology is shown with 50% transparency and units are further described by Romsos (2004) and Goldfinger et al. (2003).

The spatial resolution of fishing effort is determined by the reporting of information by the fishery. To appropriately address different management issues, the proper resolution is required. Data collection procedures for the US Pacific West coast groundfish fishery include a tri-state trawl logbook program (Sampson and Crone 1997). Trawl logbooks contain fishing location information, but prior to 1997 spatial resolution was poor because many locations were reported as the center point of large (10 x 10 nautical mile) geographical blocks. Reporting fishing effort as the number of tows per block ignores the possibility that tows are not homogeneously distributed throughout the block. Trawl fishing effort is known to be concentrated in particular areas with patchy distribution (Ragnarsson and Steingrimsson 2003, Marrs et al. 2002, Kulka and Pitcher 2001, Auster and Langton 1999, Rijnsdorp 1998), and benthic habitats occur on a finer, more detailed scale than that of traditional reporting blocks. This contributes to potential bias when applying data values over coarse scale blocks or grids (Rose 2002b unpublished manuscript, Larcombe et al. 2001, Piet et al. 2000, Pitcher et al. 2000, Rijnsdorp 1998). Spatial resolution of fishing effort has also been limited in Oregon and Washington because electronic conversion of paper logbooks results in only the trawl start location being entered into electronic databases. A single point can limit our ability to review spatial patterns at the scale of actual fishing practices (e.g., tows can cover large distances, overlap, and cross grid cells). This present research utilized methods for adequately reviewing spatial relationships between targeted, patchy fishing effort and benthic habitat features.

This study was focused exclusively in Oregon waters and consisted of several components. First, an analysis of spatial and temporal shifts in trawl fishing effort over benthic habitat was performed using available trawl start locations for the entire study period (1995-2002). This provided an initial spatial understanding of where increases and decreases in fishing effort occurred related to habitat distribution and fishery management measures. Second, precise tow end-point information was retrieved from manual logbooks for five reference sites located in the proximity of rock habitat features (1998-2001). Trawl towlines were then mapped from start point to end point for finer scale resolution of fishing locations to enhance the examination of fishing effort shifts over benthic habitat. Finally, fine scale spatial shifts in relation to the 2000 footrope restriction were then reviewed using complete trawl towlines. A brief comparison of Oregon vessel towlines and CA vessel towlines was also made to assess any spatial variations by fleet. Fishing intensity (measured as km towed) was calculated from commercial trawl and research trawl survey towlines to achieve the most accurate assessment of fishing impacts and potential habitat recovery areas. The outcomes of this study are expected to reveal how management measures might influence trawl fishing effort shifts to aid in habitat conservation, methodologies to effectively evaluate the extent of habitats affected by bottom-fishing disturbances, and to emphasize the benefits of increasing the spatial resolution of fishery data.

METHODS

Commercial trawl logbook data were obtained for the limited entry groundfish fishery from state databases maintained by the Oregon Department of Fish and Wildlife (1995-2002), the Washington Department of Fish and Wildlife (1995-2001), and the California Department of Fish and Game (1995-2001). Washington and California data were filtered so that only trawls which occurred off the coast of Oregon were represented. Oregon data were not requested with any geographical restriction and records extended into both Washington and California waters. These logbook records were removed from the analysis during the process of spatially joining annual effort layers with a benthic habitat layer that exclusively covered the Oregon coast, from approximately latitude 46°15’30” N to 42°1’0” N. A single logbook record consisted of the parameters for an individual trawl tow, including information pertaining to the vessel, date, time and location of tow, gear used, and catch. This study included only those trawl tows using gear which comes in contact with the seafloor. Unfortunately, it was impossible to review specific bottom trawl gear types used before and after the footrope restriction due to the inconsistency of gear codes recorded by different states and the confounding use of a non-specific groundfish trawl gear code before 2000. Logbook records were dropped from the analysis if they were recorded using a midwater gear configuration, were recorded as the central point of a 10 x 10 nautical mile statistical reporting block rather than an actual tow location, or if a starting location was reported over any landmass. The application of these filters removed approximately 15% of Oregon logbook records, 25% of California logbook records, and 69% of Washington logbook records (Table 1). Removals were attributed primarily to records reporting use of midwater gear. In the case of California, central reporting block locations resulted in the removal of all records from 1995-1996.

Spatial analysis and mapping were conducted with ArcGIS Desktop version 8.2 by Environmental Systems Research Institute (ESRI). The analyses included use of the ArcINFO workstation, various ESRI extensions, and additional software tools. Data layers created and used in this study were all standardized using the same projected coordinate system (UTM Zone 10N) and datum (WGS 1984) to minimize spatial error in the analysis. In this projection, the central meridian is placed within the center of interest to minimize distortion of spatial properties in that region. It is best suited for north-south areas, such as the U.S. Pacific west coast, which conveniently falls along the center of Zone 10N.

Locations where trawl fishing begins, referred to as the set of each tow, were mapped for each year and by state. Trawl set locations from all three states were then combined into annual point (vector) layers of fishing effort. Oregon habitat polygons (rock, gravel, gravel/sand, sand, sand/mud, mud) (Figure 1), as described by Romsos (2004) and Goldfinger et al. (2003), were spatially joined to annual point layers using an identity function to compute the geometric intersection between data layers. The number of tows per year per habitat type was then summarized.

Table 1. Records filtered from raw database records that were provided by each of the three states. Resulting annual record totals were then used for analysis. Records were removed if the trawler used midwater gear, the set location was recorded as the center of a statistical reporting block, or the set location was noted over a landmass. Note: California and Washington data were only requested for those logbook records which occurred in Oregon waters.

Filter Applied	**1995**	**1996**	**1997**	**1998**	**1999**	**2000**	**2001**	**2002**	**Total**	**% of Total**
Oregon	18459	18787	18129	15719	13557	11670	11579	8716	116616	
Midwater Gear	1885	1965	1907	1467	1700	2103	1417	679	13123	11.25%
Center of Block	1520	1678	665	27	19	0	0	0	3909	3.35%
Over Landmass	39	53	74	33	85	53	2	4	343	0.29%
Outside of OR Waters	5500	4939	4520	4694	4011	3215	3235	3096	33200	28.47%
Final Records for Analysis	9515	10152	10963	9498	7742	6299	6935	4941	32845	
Washington	52	46	56	17	25	103	60	N/A	359	
Midwater Gear	26	41	28	10	25	58	43	N/A	231	64.35%
Center of Block	16	7	0	0	0	0	0	N/A	23	6.41%
Over Landmass	0	0	0	0	0	0	0	N/A	0	0%
Final Records for Analysis	10	5	28	7	0	45	17	N/A	112	
California	428	445	511	833	627	474	340	N/A	3658	
Center of Block	428	445	13	2	1	1	0	N/A	890	24.33%
Over Landmass	0	0	3	1	1	0	3	N/A	8	0.22%
Final Records for Analysis	0	0	495	830	625	473	337	N/A	2760	

To observe the spatial shift in fishing effort between years, each annual trawl set point layer was converted to a continuous surface (raster) layer based on point density within the same geographic extent. A density calculation measures the number of trawl set points using a uniform areal unit (such as a square kilometer) to create a density value for each cell in the resulting layer to identify patterns where trawl set points are concentrated. Several parameters affect the resulting density surface and patterns, including the density unit, search radius, and cell size. A kernel density calculation per square kilometer was used with a 5,000 meter search radius and an output cell size of 100 m^2. Square kilometer density units adequately reflect fishery scale features (Kulka and Pitcher 2001). The search area dictates the distance within which points are found to calculate the density value assigned to each cell in the output raster layer. The search diameter used in this calculation was later verified to be within the average towline length of the fishery and thus matches the scale of fishing patterns. The output cell size determines how fine or coarse the pattern appears. Using a kernel density calculation, rather than a uniform “simple” calculation gives a smoother density surface with easily detected patterns. Density values were calculated to distribute trawl set points throughout a landscape for each year and then subtracted between years to observe areas of increased and decreased fishing effort.

Five case-study reference areas were selected by comparing spatial patterns of fishing effort with benthic habitat type (Figure 2). Four sites were selected which contained both rock habitat and significant fishing effort (Site 1-4). One additional site was selected based on a bathymetric structure, the Rogue River Canyon, with a greater proportion of soft sediment habitat and significant fishing effort (Site 5). Concentric buffers at specified distances from the same central point, with diameter size increasing by 1 km intervals, were reviewed to determine the most appropriate size for selecting trawl set points and habitat polygons at each site. The ideal size buffer for each site was then used to select the trawl set points within it for further data retrieval. Two adjoining buffers were used to select the southern-most site for optimal coverage of fishing effort patterns, which could not be adequately represented by a single symmetrical buffer. A subset of Oregon logbook records was created for each reference site (Table 2). Additionally, the quality of rock habitat data was assessed within each site buffer using ranked distributions of data density and quality developed by Romsos (2004). The order of rock habitat quality values ranked Site 1 as the highest, followed closely by Site 2 and Site 4 with equal values, Site 5 with a moderate value and Site 3 with the lowest value.

Tow end locations, referred to as haul points, for each site’s subset of records were manually retrieved from paper logbooks held by the Oregon Department of Fisheries and Wildlife office in Newport, Oregon. A protocol was developed to assure data confidentiality and quality control. Logbook records which did not contain haul location information (4% of all reference site records) were removed from the analysis.

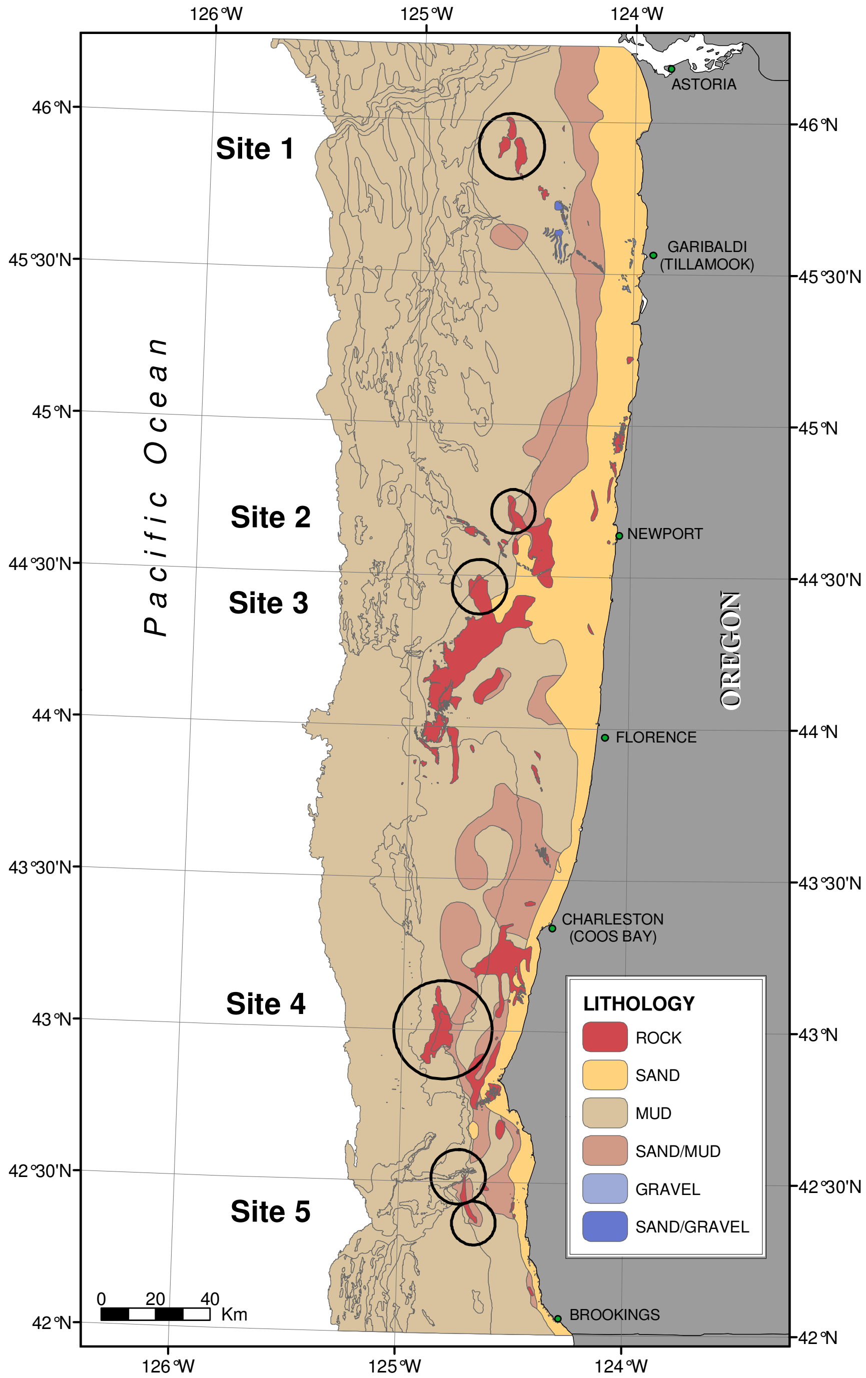


Figure 2. Location of reference sites (Site 1-5) in proximity to rock habitat features on the continental shelf off the west coast of Oregon, USA. Benthic habitat data are represented in the lithologic units described by Goldfinger et al. (2003). Reference site buffers (**O**) indicate the area within which trawl start (set) locations were selected for further retrieval of trawl end (haul) locations in manual logbooks.

Table 2. Description of five selected reference sites and logbook records from within these sites used to construct trawl towlines by retrieval of tow haul (end) locations. Filtering steps that were applied to identify and remove unsuitable records for this study are noted.

	Site 1	Site 2	Site 3	Site 4	Site 5
Site Selection Buffer Diameter (km)	24	16	20	36	20 & 16
Mean Reported Site Depth (fathom)	102	94	101	160	166
Minimum Reported Site Depth (fathom)	51	53	60	39	50
Maximum Reported Site Depth (fathom)	250	185	320	650	600
Selected OR Logbook Records	326	538	1442	1551	1350
Haul Location Missing	26	28	30	84	48
Haul Location Identical to Set Location	0	6	7	3	3
Haul Location Over Landmass	0	0	1	5	1
Selected CA Logbook Records	-	-	-	71	429

Records with haul locations identical to the tow set location or for which trawling occurred over a landmass were also dropped from the analysis (< 0.5 %).

Haul locations were mapped with the corresponding set location. Trawl towlines were created using a Visual Basic script which draws a straight line from each set location to each corresponding haul location. The azimuth of each towline from true North (0°) was calculated using an expression (polyline_Get_Azimuth.cal) in the ArcMap attribute table field calculator. The length of each towline was measured to estimate the distance traveled. Towline length was used to predict vessel speed based on the logbook-reported tow duration. This was done to determine if towline distances could have been traveled within a realistic range of towing speeds. An overlay of trawl towlines across benthic habitat type subsequently split each towline into multiple segments at each habitat boundary and joined the attributes of the underlying habitat type to each towline segment using an identity command. The length of each resulting towline/habitat type segment was measured by updating feature topology. Towline segment lengths were then summarized annually by habitat type and compared across years. Patterns of trawl towlines were reviewed in both a spatial and temporal context.

Swept area calculations, defined as the amount of ground potentially contacted by trawl gear, were not made for the purposes of this study in part due to the absence of detailed trawl gear notation in logbooks and the wide variety of gear used in the fishery. Often "average" gear parameters are used in calculations for the purposes of estimation. The detailed spatial distribution of trawl towlines and towline distance measurements can provide similarly acceptable information in regard to fishing intensity.

California state database logbook records from 1997 to the present contain the location for both tow set and tow haul. California records were used for a comparison with the spatial and temporal patterns observed in towlines originating from Oregon logbook data. Subsets of California logbook records were created for the two southern reference sites (where OR/CA fishing effort overlapped) using the same site buffer selection and clip method (Table 2). California subsets were then mapped and processed using the same methodology as the Oregon reference site records noted above.

Research trawling has occurred off the Pacific coast since 1977 in the form of NMFS groundfish surveys. Trawl towlines were mapped for groundfish research survey tows. Research trawling (conducted during both continental shelf and slope surveys) which originated within reference site areas accounted for only a small fraction of total fishing effort. Fishing intensity (measured as kilometers towed) by research vessels was less than 1% of that exhibited by commercial fishing vessels during the same time period (1998-2001). Therefore, research trawling information was not considered in subsequent analyses.

Groundfish management measures for the limited entry trawl fishery were tabulated from the Federal Register for the time period 1995-2002. Acceptable Biological Catch (ABC), Optimal Yield (OY), and annual allocation to the commercial trawl fishery were recorded by year for each managed species or fish assemblage. Cumulative trip limits were organized and recorded by month. In-season changes to trip limits were added to these tables for each management change during the course of a year. This compilation of temporal management measures provided the basis by which corresponding fishing effort distributions were reviewed.

RESULTS

A decreasing trend in annual trawl fishing effort off the Oregon coast was observed across all years from 1997-2002 (Table 1). Directed fishing effort in Oregon waters by Washington vessels was concentrated along the Oregon-Washington border and diffused in a southerly direction. There was a greater amount of effort in Oregon waters by California trawlers than from Washington trawlers. California trawl effort demonstrated a similar trend as the Washington vessels, with effort concentrated at the Oregon-California border and diffusing gradually in a northerly direction.

Trawl fishing effort differed by location and intensity in proximity to the major rocky bank features on the Oregon continental shelf (Figure 1). Trawl set points for the entire study period fell within mapped seafloor lithology, which extended to approximately the 3000 m depth contour. Trawl set points over Nehalem Bank occurred predominantly over portions of the bank located farthest offshore. On Stonewall bank, there was a concentration of set points along the north to northwest slope-edge of the bank, but very few over the main bank. Cape Perpetua bank had a similar concentration of set points around the northwest slope-edge portion of the bank, but again very few points over the main bank. Trawl set points are found throughout the Heceta Escarpment, the slope-edge feature just offshore of Heceta Bank, with only a few points appearing over the southern tip of the actual bank itself. Siltcoos Bank did not have any associated trawling activity. Coquille Bank displayed set point patterns northwest of the main bank, to the north, south and west of the bank, with a lesser density of set points over this bank as well. Orford reef is a nearshore feature which did not experience any documented trawling activity.

In addition to an overall decline in effort, there were shifts in the number of trawl sets between years and between habitat types. The number of trawl sets per habitat type was consistent with the total area of habitat type available, i.e. the majority of trawl sets took place in the largest geographically mapped habitat type - mud (Table 3). The smallest extent of mapped habitat, gravel habitat, did not contain any trawl set locations, though it is still possible that trawl tows may be crossing into this habitat designation. A reduction in tows within all habitat types took place from 1997-2000. In 2001 and 2002, there was a distinct increase in both the number of tows and proportion of tows in sand habitat relative to 1998-2000. The proportion of tows in sand/mud habitat remained steady from 1997 to 2001, then increased in 2002. Tows in mud habitat were steady in 2000 and 2001 but significantly decreased in both number and proportion in 2002. Tow sets in rock habitat decreased in both 1999 and 2000, with the proportion of tows in rock habitat decreasing significantly during 2000. Tow sets in rock habitat increased in 2001 and slightly decreased again in 2002, but still remained at much lower levels than before 2000.

Broad scale spatial shifts in trawl fishing effort were apparent across years, as visualized by density maps (Figure 3). The spatial distribution of areas experiencing increases and decreases in fishing effort between years are summarized in Table 4. Areas of increased fishing effort were still evident in each between-year calculation, despite the overall decline in trawl tows each year. This provided clear evidence that trends or shifts in effort are occurring which were not attributed solely to the decrease in annual tow numbers. Shifts in fishing effort were at times extremely patchy and at other times somewhat continuous in distribution. One such continuous distribution is a decrease in fishing effort along the outer continental shelf in 2002 from fishing effort which occurred in 2001. This is in part attributed to the first full depth-related spatial closure of the fishery from approximately 100 to 250 fathoms in September of 2002 (67 FR 57973).

Table 3. Results of the geographic overlay of tow set point locations and corresponding habitat type. Results are noted as both the number and proportion of tow set locations over each habitat type. The total mapped area of each habitat type (km^2) is also included.

Lithologic Unit Habitat Type	Total Area of Habitat (km^2)	Tow set locations								
		1995	**1996**	**1997**	**1998**	**1999**	**2000**	**2001**	**2002**	**Total**
Sand/Mud	4,236,923	1170	1398	1493	1520	1240	986	990	949	7178
Sand	5,922,956	610	664	912	653	582	350	625	968	4090
Mud	32,555,575	7081	7217	8343	7423	6219	5428	5560	2927	35900
Rock	1,756,087	599	849	725	733	313	52	105	93	2021
Gravel	7,489	0	0	0	0	0	0	0	0	0
Gravel/Sand	37,606	65	24	13	6	13	2	0	0	34
		Porportion of tow set locations								
		1995	**1996**	**1997**	**1998**	**1999**	**2000**	**2001**	**2002**	**Total**
Sand/Mud		0.123	0.138	0.130	0.147	0.148	0.145	0.136	0.192	0.146
Sand		0.064	0.065	0.079	0.063	0.070	0.051	0.086	0.196	0.083
Mud		0.743	0.711	0.726	0.718	0.743	0.796	0.764	0.593	0.729
Rock		0.063	0.084	0.063	0.071	0.037	0.008	0.014	0.019	0.041
Gravel		0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000
Gravel/Sand		0.007	0.002	0.001	0.001	0.002	0.000	0.000	0.000	0.001

Table 4. Summary of increasing and decreasing trawl fishing effort calculated by subtracting an annual set location density layer from the density layer of the previous year, calculated for each year pair between 1997 and 2002.

Annual Difference	Increased Effort	Decreased Effort
1998-1997	Largely located from central to southern OR on the continental margin between 100-200 m contours, with patchy distribution along the entire margin.	Patchy decreases observed from nearshore to deep offshore regions, but concentrated mostly along the northern border west of Astoria and extending into central OR along the 200 m contour.
1999-1998	Concentrated along the northern border west of Astoria with additional light increases in deeper water offshore along the entire margin.	Concentrated in a semi-solid band from Depoe Bay to the southern Oregon border along and just inshore of the 200 m contour.
2000-1999	Primarily located in the northern region both along the 100 m contour and in deeper offshore waters past 300 m.	Several concentrated areas are west of Astoria and Newport and also in the southern region from Bandon to Brookings between the 100-300 m contours.
2001-2000	From the northern border to central OR between the 200-300 m contours with several patches centrally located along the 100 m contour. Additional patches are located between Bandon and Port Orford.	Noted in the northern region along the 100 m contour and also offshore in deeper waters both north and south of Heceta Bank.
2002-2001	Only several small patches are noted in the northern region, two west of Astoria (<50 m and at 100 m) and one between Netarts and Pacific City from the 50-100 m contours.	Observed in a large band along the entire continental margin focused at the 200-300 m contours.

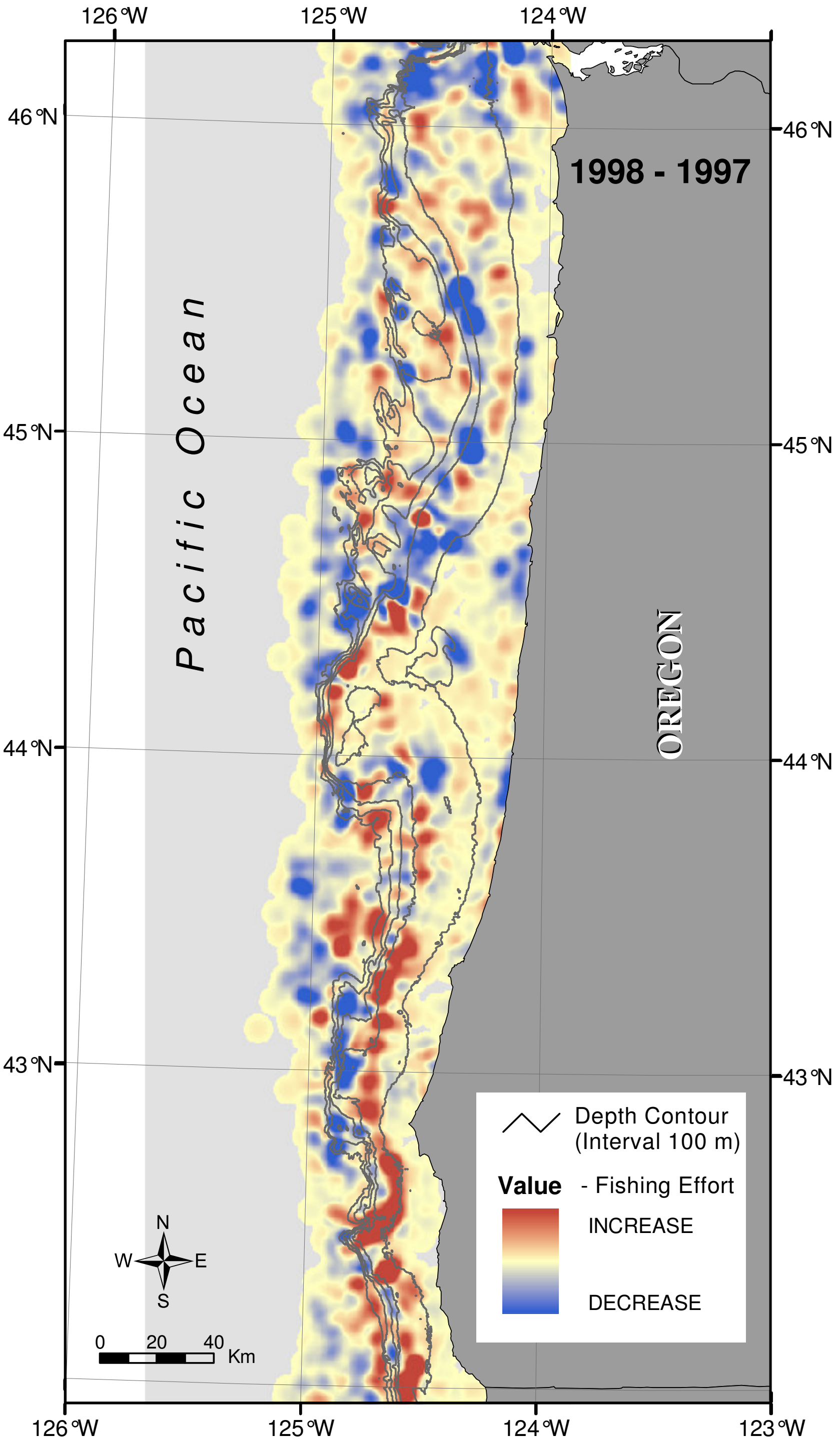
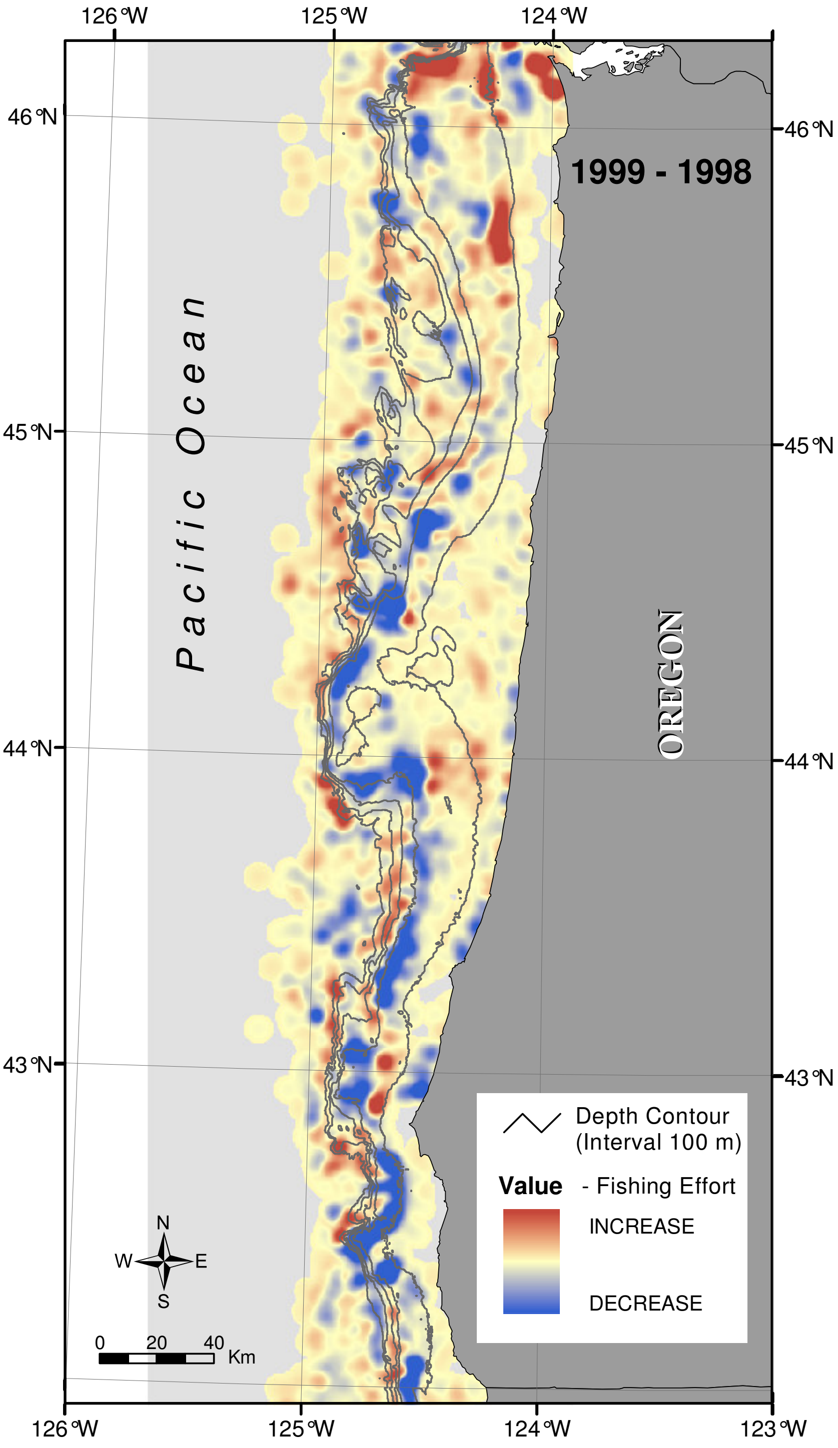


Figure 3. Density maps of the extent and degree of increase or decrease in trawl fishing efforts represented from the difference between annual trawl set point densities. Density values are calculated in the same geographic extent for each individual year and then subtracted between two consecutive years to observe areas of increase (red), no change (yellow), or decrease (blue). Depth contours (100-500 m) are noted to delineate the continental shelf and slope and areas with no data value are represented in grey.



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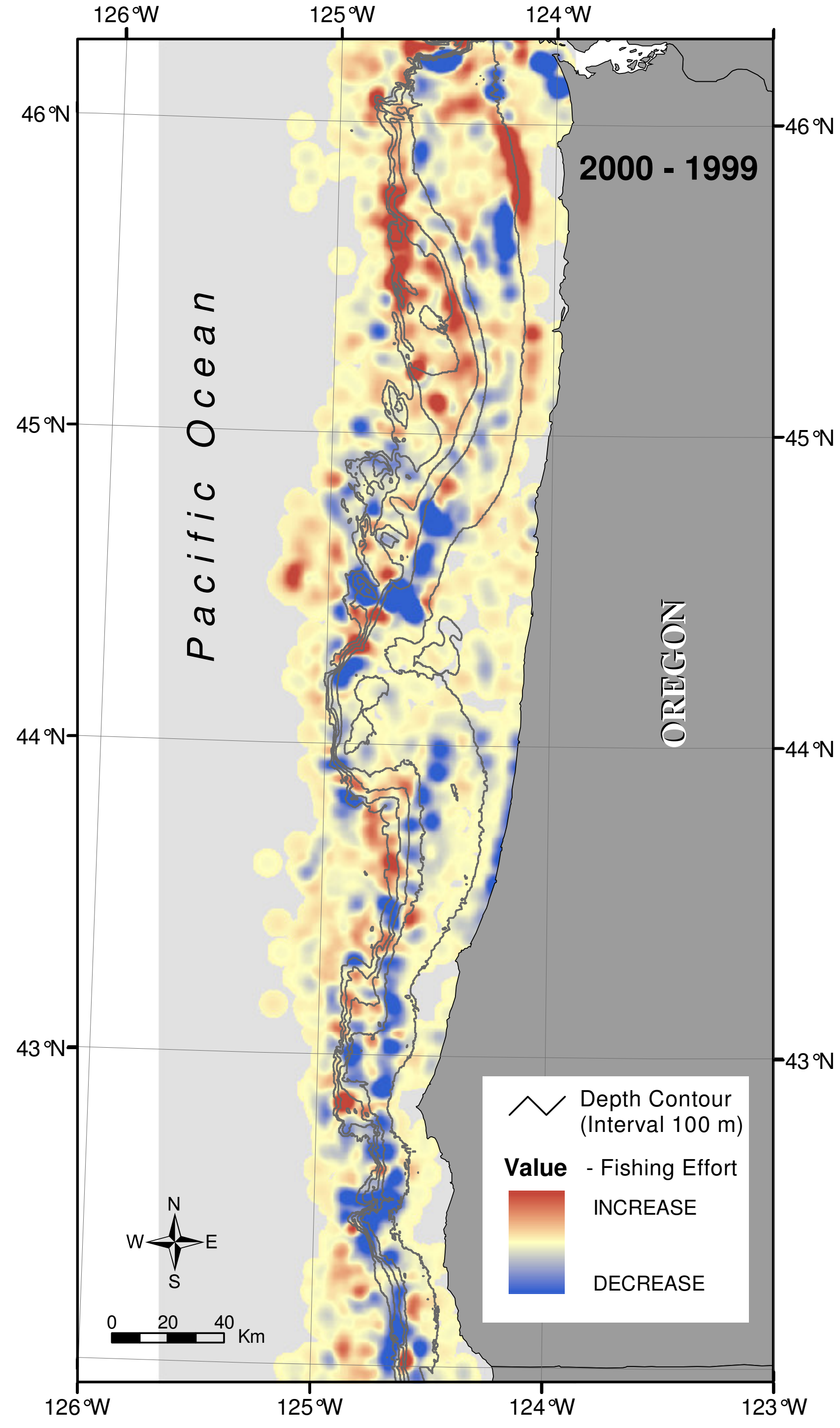

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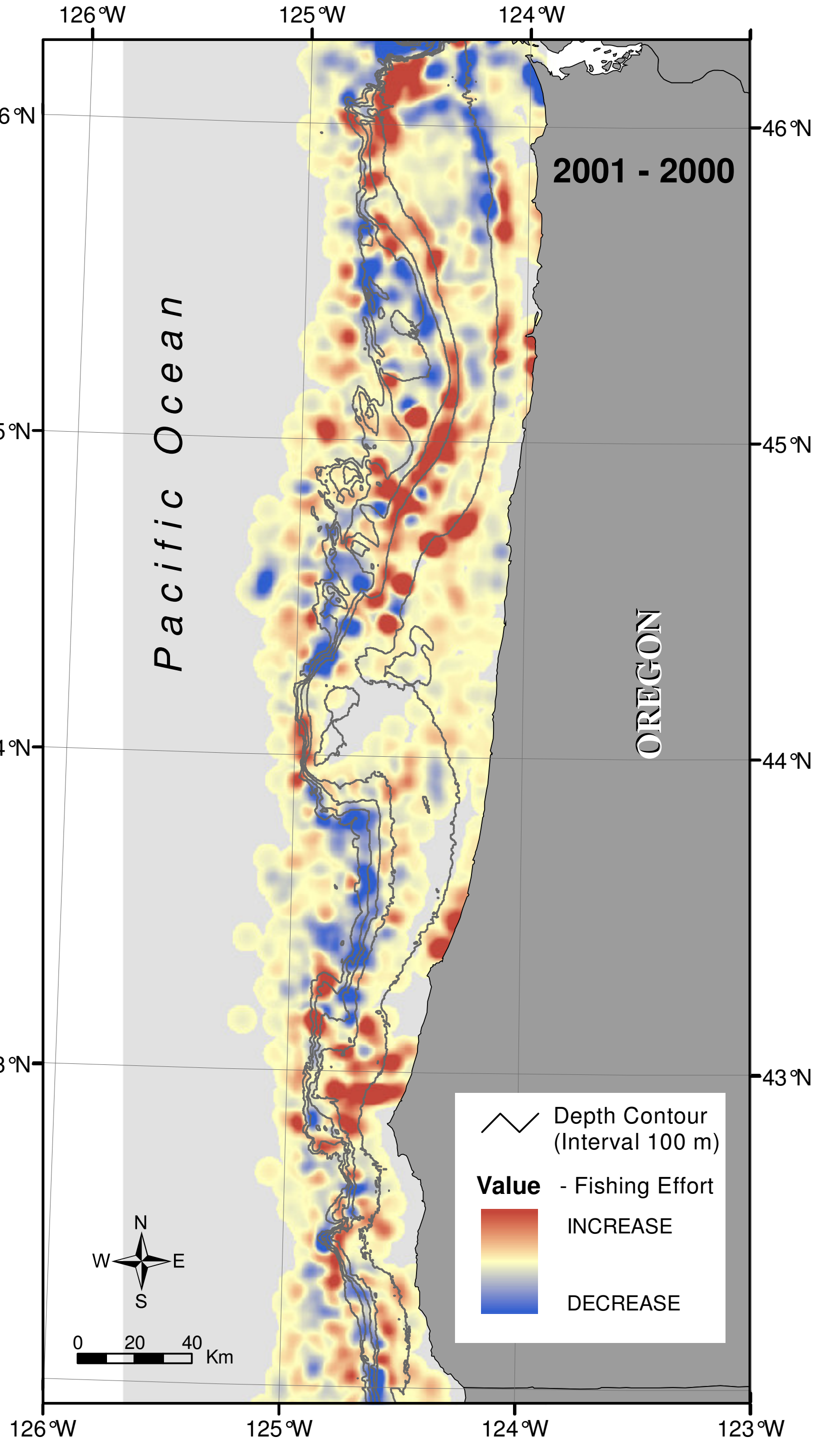

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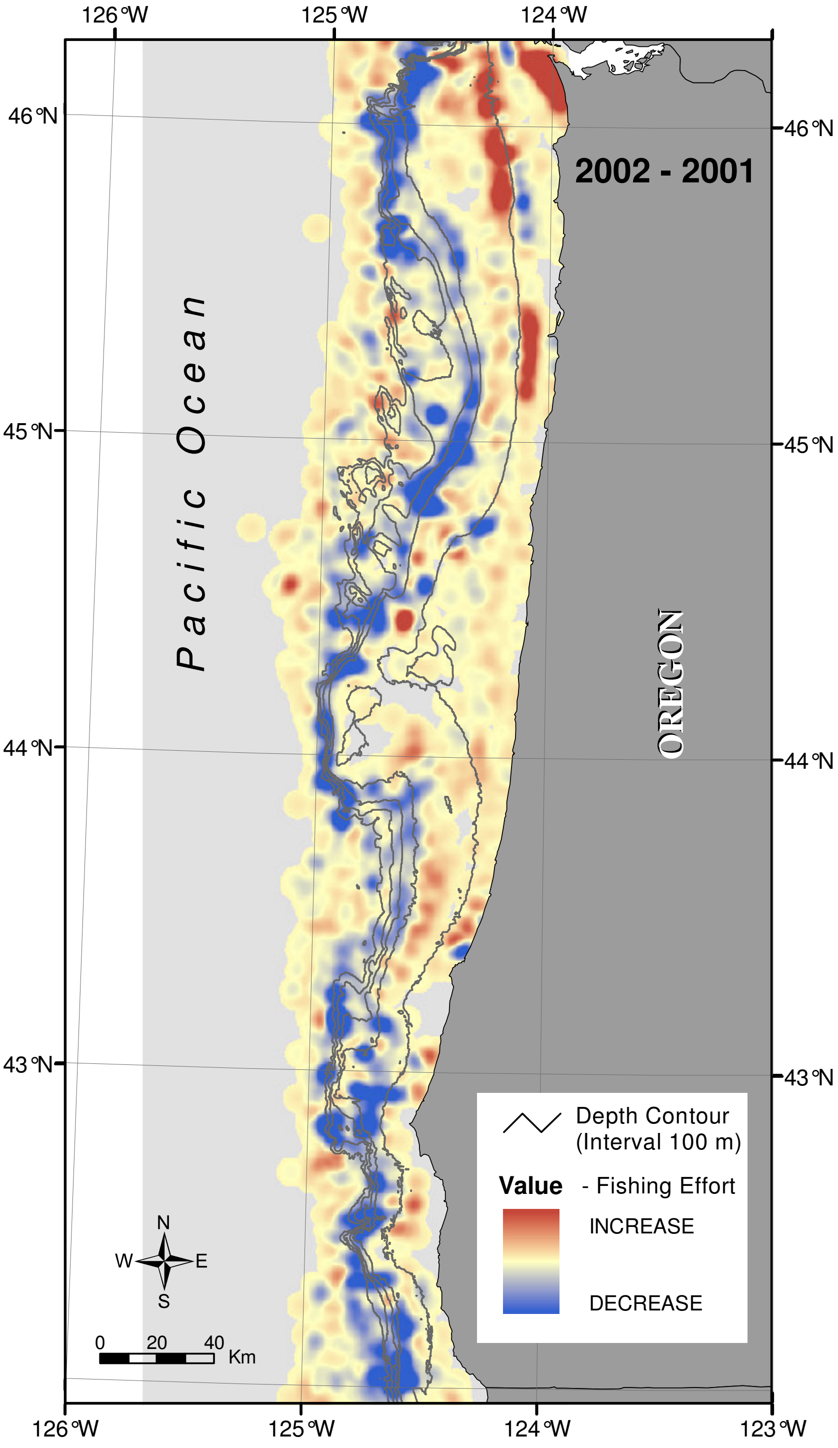

Figure 3. *Continued.*

The use of trawl towlines created for each reference site demonstrates a substantial improvement in the resolution of fishing effort data relative to the use of start point locations alone (Figure 4). Towlines also depict the direction of towing and the distance towed. Towlines provide an enhanced visual representation of spatial patterns in the variability of trawl towing behavior relative to habitat, bathymetry, and direction. Based on an azimuth calculation from true North (0°) for each towline, the majority of towlines are positioned within northern (315° to 45°) or southern (135° to 225°) directional quadrants (Table 5). Predicted vessel speeds derived from towline length and logbook duration fell within a realistic range of tow speeds established from interviews conducted with fishermen. This evidence supports the assertion that the trawl towline model is a close proximity to reality. This model cannot determine the exact path trawled but does appear to be a rather close proxy. The straight-line towline model is a conservative estimate of actual distances trawled due to the many factors which prevent towing in exactly straight lines.

Table 5. The percentage of reference site trawl towlines that lie within directional quadrants based on their azimuth (calculated from true North (0°)).

	Site 1	Site 2	Site 3	Site 4	Site 5
North-South Quadrant (315° to 45° and 135° to 225°)	90%	77%	84%	89%	65%
East-West Quadrant (45° to 135° and 225° to 315°)	10%	23%	16%	11%	35%

The ability to detect changes or shifts in spatial fishing patterns over habitat was greatly enhanced by the towline model. Spatial shifts in fishing effort away from rock habitat were strikingly evident for all reference sites after the 2000 footrope restriction (Figure 4). Fishing intensity was summarized as the kilometers towed per year for a given habitat type. Total distance trawled over each habitat type was pooled for the two years prior to the footrope restriction (1998-1999) and the two years after its implementation (2000-2001) (Table 6). The number of split towline segments that occurred over each habitat type exemplifies the difference between just counting the number of total trawl tows in an area and getting an estimate of actual fishing distances covered over each habitat. Decreasing fishing intensity and a decreasing number of towlines segments over rock habitat is demonstrated for all five reference sites after the footrope restriction. Fishing intensity decreases were greatest after the footrope restriction at Site 2 (93.7% reduction) and Site 1 (93.6% reduction). Site 5 demonstrated a 90% reduction followed by reductions of 84.8% at Site 3 and 69% at Site 4. Increasing fishing intensity is shown over mud habitat at reference sites 1 and 4 although the number of towline segments decreases slightly. Smaller increases occur over sand habitat at reference site 1, 3 and 4. Reference site 3 demonstrates a small increase in towing distance over sand habitat, despite a decrease in the number of towline segments represented.

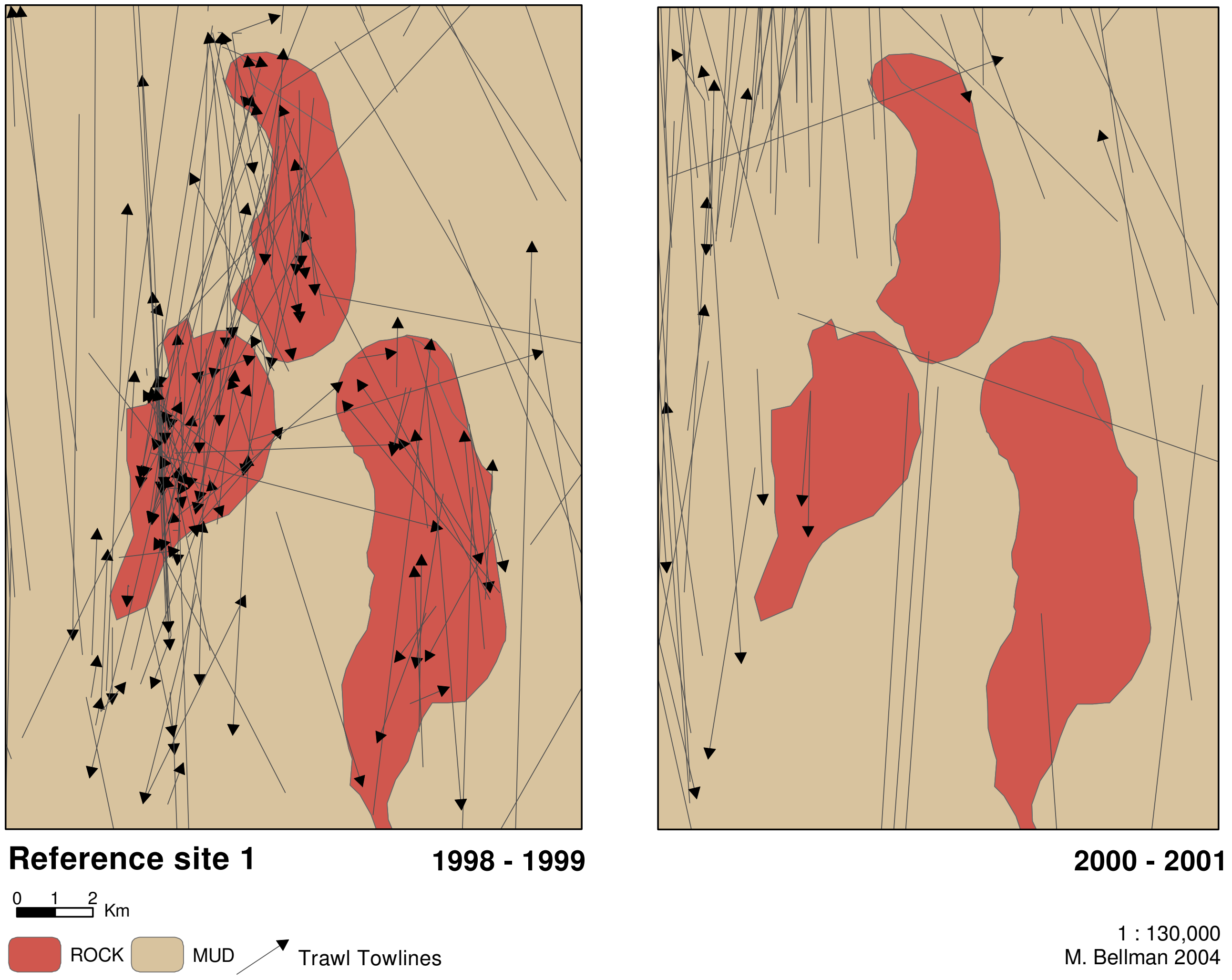

Figure 4. Spatial shifts in trawl effort away from rock habitat at five selected reference sites before (1998-1999) and after (2000-2001) the footrope restriction. See Figure 2 for reference site locations. Note scale changes between sites.

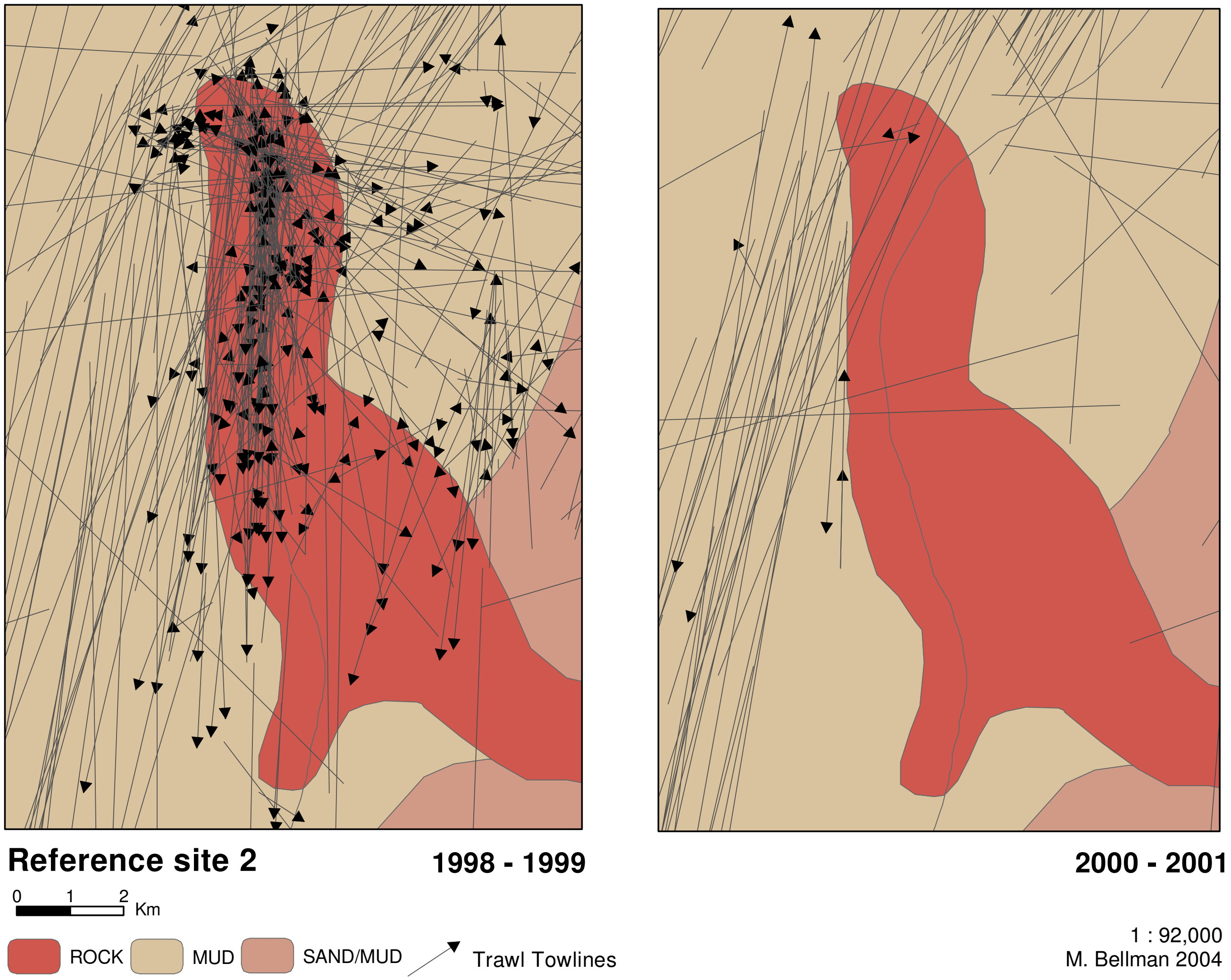

Figure 4. *Continued.*

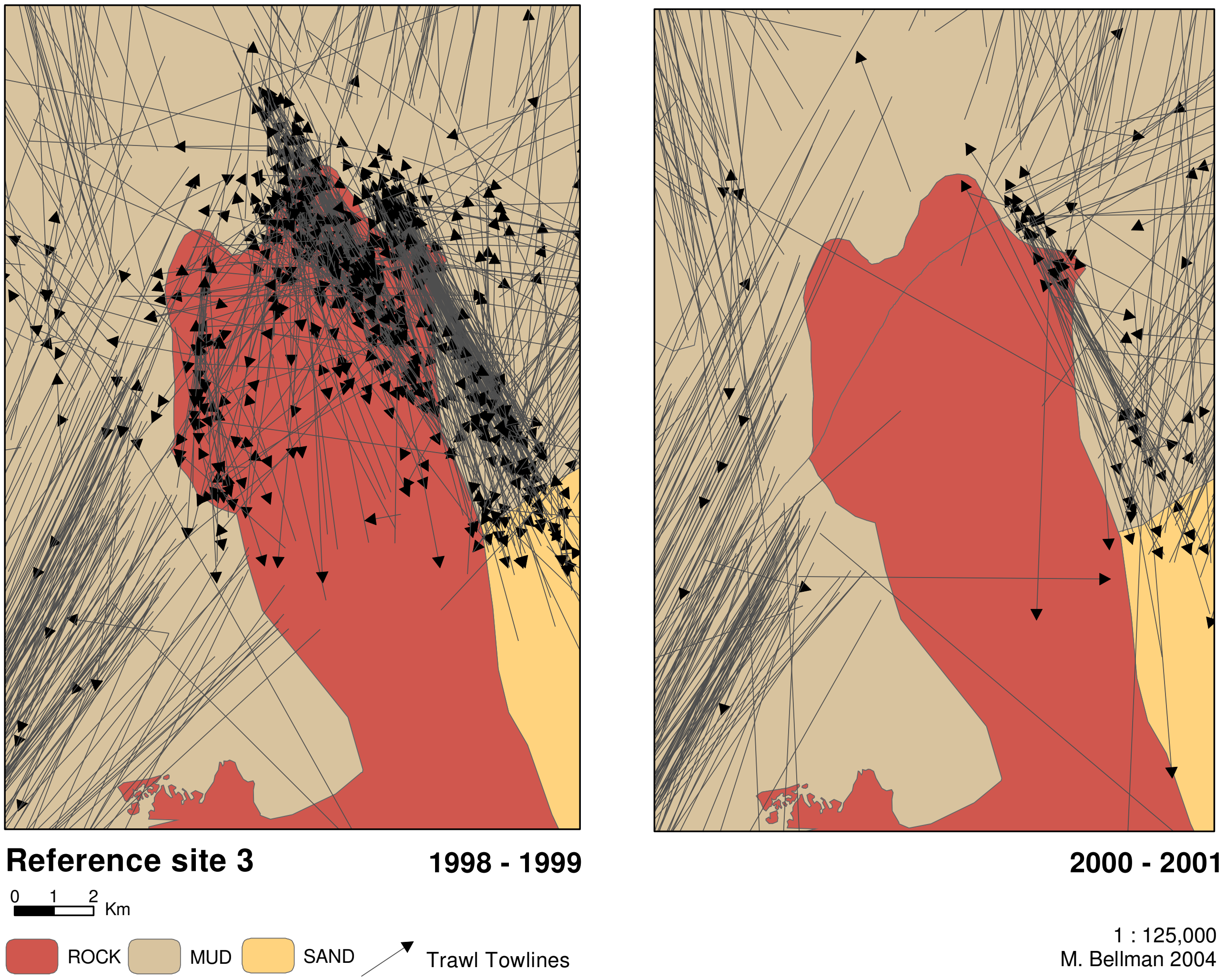

Figure 4. *Continued.*

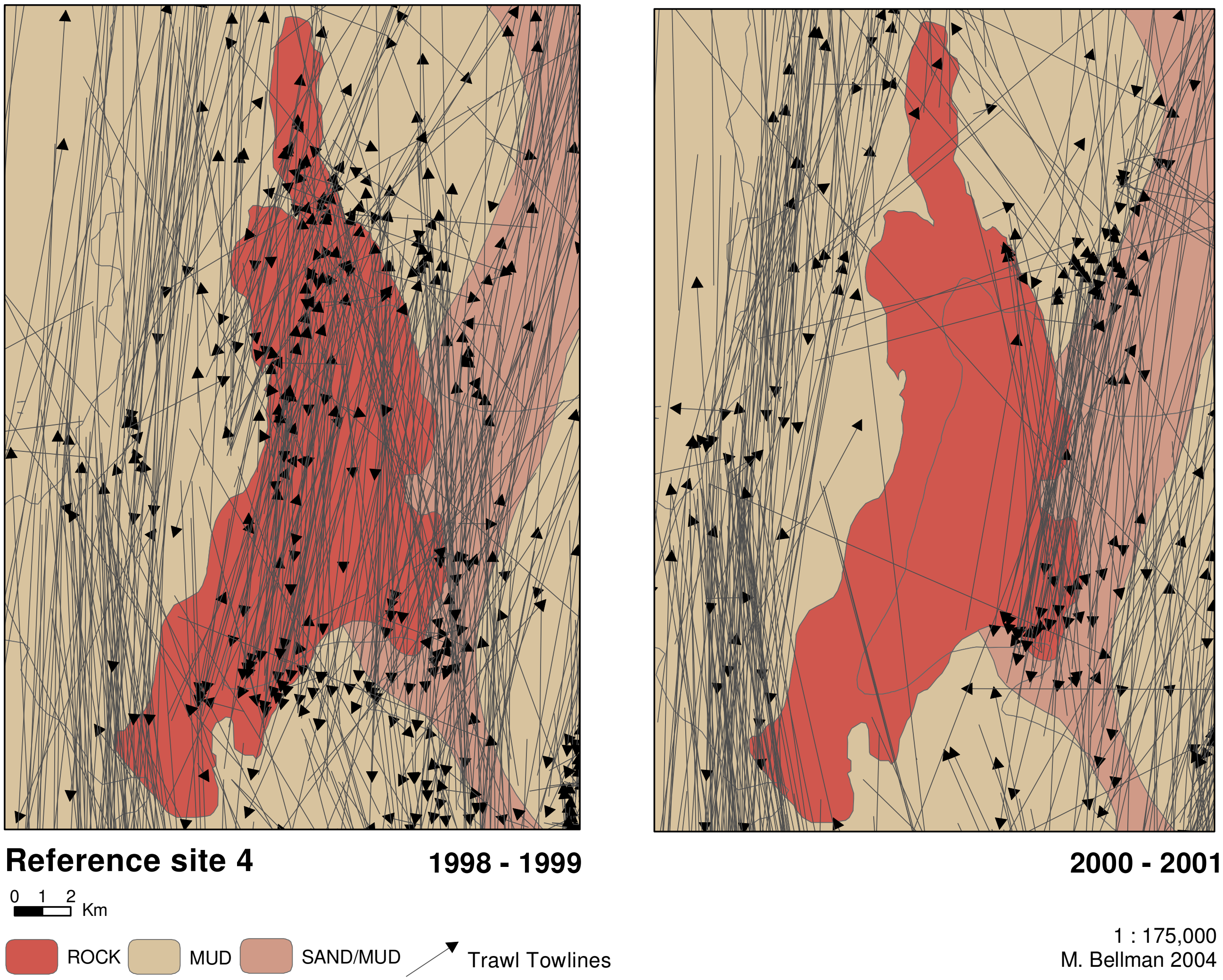

Figure 4. *Continued.*

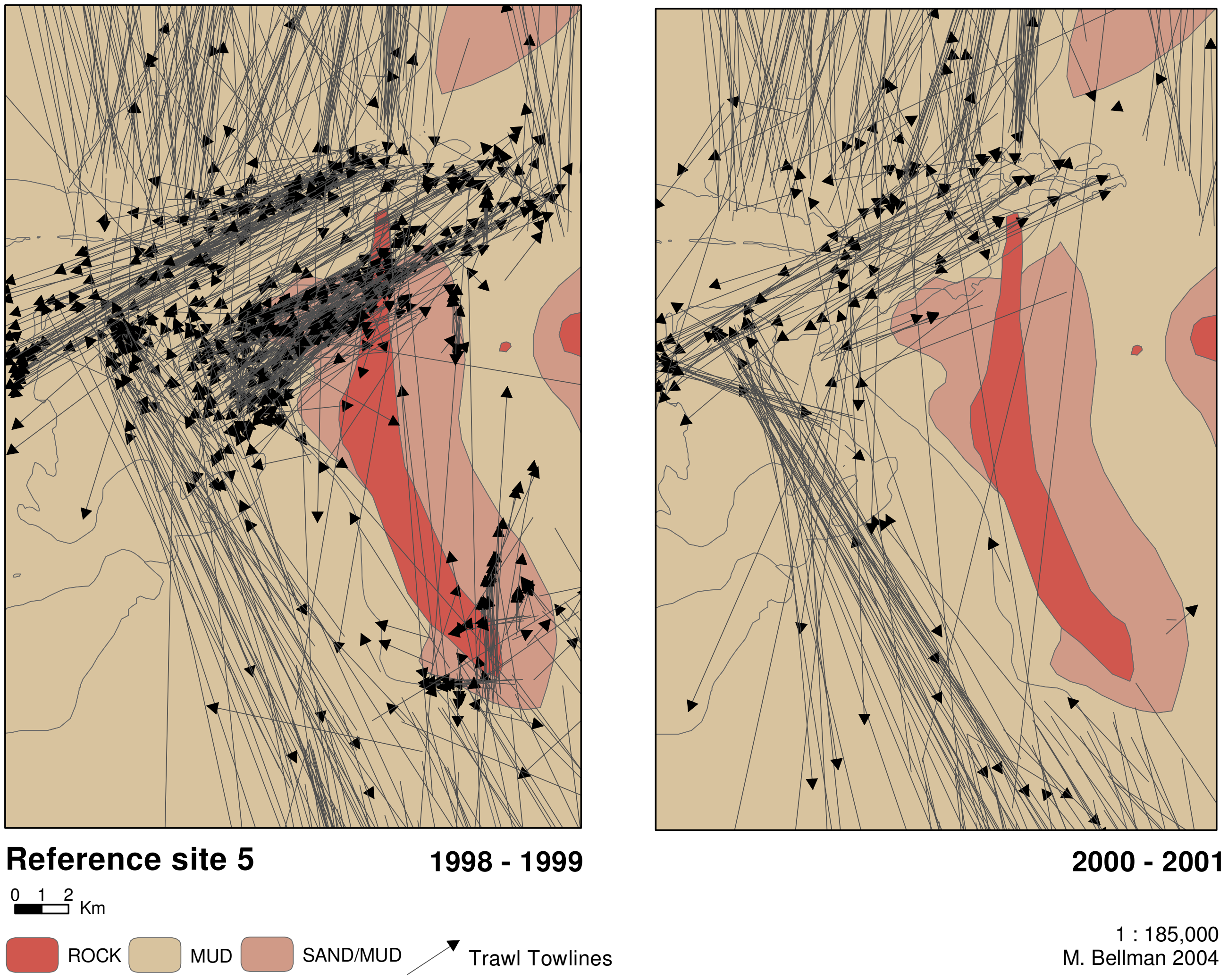

Figure 4. *Continued.*

Table 6. Total trawl towline distances (km) and the number of towline segments over benthic habitat type before (1998-1999) and after (2000-2001) the footrope restriction. A towline segment represents one section of a towline. Each towline was split at each habitat polygon boundary (i.e. multiple towline segments can be created by splitting a single individual towline).

	Towline Distances (km)											
	Rock			Mud			Sand			Sand/Mud		
Reference Site	1998-1999	2000-2001	% Change	1998-1999	2000-2001	% Change	1998-1999	2000-2001	% Change	1998-1999	2000-2001	% Change
Site 1	403	25	-93.6	1340	2071	54.6	0	10	> 100.0	39	51	29.7
Site 2	764	49	-93.7	1977	1402	-29.1	70	7	-89.4	518	300	-42.0
Site 3	1670	253	-84.8	6487	5731	-11.6	116	124	6.9	17	2	-88.4
Site 4	2049	636	-69.0	6924	7243	4.6	7	15	94.3	1929	1807	-6.3
Site 5	232	22	-90.4	7763	4913	-36.7	40	18	-54.5	1057	150	-85.8
	Towline Segments											
	Rock			Mud			Sand			Sand/Mud		
	1998-1999	2000-2001	% Change	1998-1999	2000-2001	% Change	1998-1999	2000-2001	% Change	1998-1999	2000-2001	% Change
Site 1	450	37	-91.8	224	205	-8.5	0	1	100.0	8	9	12.5
Site 2	166	16	-90.4	402	133	-66.9	12	3	-75.0	90	54	-40.0
Site 3	906	135	-85.1	1329	760	-42.8	102	62	-39.2	2	1	-50.0
Site 4	579	257	-55.6	1436	1340	-6.7	2	5	150.0	469	483	3.0
Site 5	203	12	-94.1	2638	1163	-55.9	18	6	-66.7	553	41	-92.6

In general, Oregon and California towline patterns for reference site 5 are consistent but Oregon vessel towlines demonstrate two additional spatial patterns. Oregon vessels also trawl within and along the length of the canyon and over an area just south of the canyon at depths of approximately 150-200 m. These trawl patterns are closely associated with the bathymetric features of the Rogue River canyon. The canyon's east-west orientation reflects the higher percentage of towlines in reference site 5 positioned within east and west directional quadrants (Table 5). The majority of California tows began north of the canyon and trawling occurred in a northerly direction. A second group of tows by California vessels began in the southwestern section of the upper site 5 selection buffer and towed south along the 400 m contour. The third group of tows by California vessels began in the southwestern section of the lower site 5 selection buffer at depths greater than 150 m and trawled in a southeasterly direction. California towlines in reference site 4 were consistent with Oregon towline patterns. Most of the California set points were located in the southern half of the site 4 selection buffer and trawling occurred in a southerly direction.

DISCUSSION

There is significant inter-annual variability in trawl fishing effort. These inter-annual shifts are affected by factors such as changes in target species, management trip limits, and fishing strategies (Sampson 2001, Babcock and Pikitch 2000). Overall, fishing effort exhibited patchy distribution and maintained similar statewide patterns over the entire study period. This consistency is common when fishermen return to areas previously known to harbor high abundances of target species and suitable seafloor for trawling.

From a conservation standpoint, this patchiness may be desired if fishing efforts do not also expand into the unaffected areas. Patchy distribution of trawl effort disturbs the same areas of seabed frequently, but in turn leaves large areas unaffected by the impacts of fishing gear. Spatial management measures, such as closed areas, can have the effect of shifting fishing activity to areas that were previously lightly fished or very rarely fished (Holland 2003, Rijnsdorp et al. 2001). The mitigation of a closed area should be carefully weighed against resulting redistributions of fishing effort. Larcombe et al. (2001) demonstrated that a general increase or redistribution in trawl fishing effort unrelated to closed areas tended to concentrate in those relatively small, high-effort areas rather than expanding into new fishing grounds. From fine-scale spatial analysis it is possible to identify if fishing effort is localized to a small area versus the same amount of fishing effort that is spread out over a larger area. Fishing impact and recovery studies have not clearly addressed how the dynamics of these two different spatial patterns of fishing effort might relate to various habitats. In the context of conservation, these dynamics may depend upon which habitats or non-target species are located within already targeted fishing grounds. Conservation objectives tend to target habitat types or species particularly sensitive to fishing pressure. The evaluation of spatial effort distributions within various habitats will be a critical component in executing management decisions for conservation objectives.

Density mapping created views of aggregated fishing effort which closely reflected habitat-related patterns. These are usually undetected by grid methods, unless the grids are perhaps set at very fine scales (i.e. 1 x 1 km cells). A grid method basically splits geographical space into a pattern of arbitrarily sized cells and assigns fishing effort homogeneously within each cell. Cell size has a large influence on the results of such work. Cell size can either be too small and fishing practices overlap into multiple cells, or too large and assigned fishing effort is too broadly distributed. Another main concern is that grid cells are often unable to reflect the spatial complexity of geographic features, such as habitat boundaries, an issue addressed by this work. To avoid extrapolation, a density calculation requires the use of parameters that are within the scale of the fishery. The search diameter used in this study (radius = 5 km) was within the average distance of trawl towline lengths (average = 11.86 km). Density mapping greatly facilitated the identification and extent of particular habitat areas that were experiencing changes in fishing pressure, which aided in the selection of study sites.

Another brief consideration is that density mapping provides an easily aggregated view of trawl start locations, which is often necessary when working with any confidential fishery-dependent data. Confidentiality concerns can still be addressed by this method and yet the spatial resolution of fishing effort patterns is improved.

This density mapping technique was validated in a non-experimental manner when it was discovered that decreasing fishing effort density directly overlaid a continuous depth range along the entire length of the Oregon coast between 2002 and 2001, a result of a spatial closure in the fishery. In September of 2002, a large portion of the continental shelf off Oregon, from approximately 100 to 250 fathoms, was closed to trawling to protect overfished darkblotched rockfish (*Sebastes crameri).* Even though this closure was only reflected in the study data for four months at the end of the fishing year, it nevertheless was revealed as a marked decrease in fishing effort in relation to that which occurred in 2001 throughout the closure boundaries.

The use of trawl towlines rather than set point locations resulted in the analysis of fleet responses to management measures at an appropriate spatial scale. Towlines provide a basis by which to observe patterns of fine scale yet realistic fishing effort. Based on this analysis, it is crucial that in the future all haul location data be entered into electronic databases from fishery-dependent collection programs. Because haul locations have been and are currently provided by fishermen in paper logbooks, it would require only a minimal cost to include this field in data entry. The effort to review and process spatial data on an annual basis would provide not only an additional quality control step by verifying realistic reporting of fishing location, but would also allow evaluation of current spatial management measures. Although this study focused on five reference sites off the Oregon coast, this work could easily be expanded to examine all trawl logbook data for the US West coast.

The spatial shift of tow patterns away from rock habitat was distinctly evident from visualization of trawl towlines after the 2000 PFMC footrope restriction (Figure 4). Towline analysis also provided a measurement of trawling intensity by habitat type. The reduction in reference site towing over rocky habitat was both visibly evident and clearly measured by intensity with an average – 86 % change (Table 6). The reduction in effort over rocky habitat did not simply result in an overall reduction in fishing effort. Some fishing effort also slightly shifted from rock habitat to surrounding areas of unconsolidated sediments. Impacts in areas where *increased* fishing effort is occurring should be studied to assess the accompanying unintended consequences of this management action.

Several models of fishing activity have attempted to evaluate connections to the economics of fleet reduction, the study of marine protected areas, resource depletion, and the prediction of long-term responses to regulatory strategies (Scholz et al. 2003, Caddy and Carocci 1999, Maury and Gascuel 1999, Walters and Bonfil 1999). Such models would benefit from the fine tuning that trawl towline analysis can provide by accurately representing the distribution of fishing effort in geographic space.

We observed a majority of north-south tow directions, with the exception of east-west towing related to the Rogue River Canyon bathymetry in southern Oregon. This supports previous observations by Friedlander et al (1999) of trawl marks on the seafloor commonly orienting parallel to bathymetric contours. Spatially stratified exploration should therefore be conducted to locate bathymetric contours which may affect tow patterns prior to assuming a north-south tow direction in models of fishing effort.

Trawl gear disturbance on the seafloor can be examined through the use of high-resolution side-scan sonar (Friedlander et al. 1999, Krost et al. 1990), but the towline model can better quantify fishing effort over the use of trawl tracks seen with side-scan sonar. The path covered by a trawl, or trawl track, is often visible as a long, narrow, linear depression. Side-scan sonar is costly and the detectability of trawl tracks is heavily dependent on timing of the side-scan survey and the time at which fishing occurred, while trawl towlines display fishing activity at the scale of the fishery and provide an enduring (if indirect) record of potential trawl tracks. However, these two methods may prove complementary. Reviewing trawl towlines may provide the first step for identifying areas where high fishing impact disturbance occurs and trawl marks could then be examined closely with the use of side-scan sonar to verify fishing impacts and logbook positional accuracy to some degree.

The results indicate that the footrope restriction, in conjunction with associated landing limits, was effective in protecting rocky habitats from trawl fishing impacts. This supports previous demonstrations that gear changes or modifications can achieve some purposeful level of conservation (Valdemarsen and Suuronen 2003, Rose et al. 2002a unpublished manuscript, Van Marlen 2000). Fishery managers often only manage for direct habitat conservation by the force of conservation legislation or if it was demonstrated that a loss of habitat would directly lead to a loss of yield in the fishery. Similarly in this case, although the footrope regulation was only indirectly aimed at habitat conservation, it ultimately served this purpose.

Future extensions of this research will need to incorporate analysis of catch data to clarify the effects of gear restriction versus trip limits. One possible method described by Larcombe et al. (2001) apportions catch equally along the length of a towline and then summarizes catch within a fine-scale grid of 1 km^2 cells. Branch et al. (2004, unpublished manuscript) utilizes a clustering method related to trawl towline locations and associated catch data, which could then be used to delineate groups of tows in specific areas and their associated target species. This would be particularly useful information for various patterns of towlines identified at or near the rocky banks examined in this study.

This study directly assessed the effects of a previous management action, which is not often done in the context of fishery management today. Substantial regulatory changes have occurred in the last decade which have ultimately resulted in a reduction in trawl fishing effort off the Oregon coast. Effort shifts can be studied on any time step, from arbitrary (i.e. 1 year) to more natural steps, like regulatory regime shifts. Tracking of regulatory change by species provides the foundation to spatially examine individual management measures in a multi-species groundfish fishery. Fishery management compilation tables created for this study have been valuable tools in both research and outreach. It is recommended that this type of systematic tracking be instituted formally as a required exercise for management purposes and that these materials should be made readily available to all stakeholders. The tracking of fishery management change should be accompanied by a follow-up evaluation of the outcomes of fishery management actions.

Trip limits and gear restrictions associated with the original 2000 footrope regulation have since been adjusted. It will be necessary to continue monitoring responses in fishing effort to evaluate sustained habitat protection. Depth-based spatial management closures were implemented in September 2002 and related closures continued into 2003. Rock habitats within reference sites were not protected by these depth-based closures until May 2003. Therefore, the observed patterns in fishing effort reviewed here were solely based on previous management strategies. Potential habitat recovery from trawl impacts on rocky habitats in the studied reference areas began prior to the full spatial closure. It is very likely that in the near future these depth-based restrictions will be lifted in some areas or to some fishing gears and habitat protection will continue to vary as closure boundaries shift.

Reference site areas have been identified where EFH recovery is likely occurring off the coast of Oregon. These reference sites should be studied *in situ* as soon as possible to begin answering fundamental questions regarding recovery rates of habitat in the absence of trawling. There is a lack of published literature regarding both trawl impacts on rocky habitat and its recovery upon removal of these impacts (Kaiser et al. 2002, Collie et al. 2000). The largest research gaps are in determining event-response relationships as a function of gear, recovery time, and habitat type – especially in naturally stable, structurally complex habitats such as rocky reef habitat. For benthic communities that have experienced chronic fishing disturbance, it is not known whether eventual recovery to a "former" (often unknown) state will occur if fishing is halted, or if the system might have reached an alternative stable state from which it cannot simply return following removal of fishing disturbances (Holling et al. 1995, Holling 1973). It is generally thought that at high fishing effort levels, initial reductions would decrease impacts marginally but that benefits would be more apparent as effort declined even further (NRC 2002). The reference sites identified in this study can be used in further studies to provide additional insight in understanding such concepts.

Identifying both the distribution of benthic habitat types and the spatial extent and intensity of fishing effort is critical for evaluating where fishing gear impacts take place and how this in turn affects associated fish populations and their habitats (Johnson 2002, Meaden 2000). "Habitat" as defined in this study is fairly limited in the framework of groundfish EFH. Numerous studies have shown correlations between demersal fish and various classifications of seafloor substrate (Nasby-Lucas et al. 2002, Yoklavich et al. 2000, McRea et al. 1999, Stein et al. 1992, Hixon et al. 1991, Matthews 1989). New information on other aspects of fish-habitat associations could be incorporated, such as depth, temperature, salinity, biogenic structure, and nutrient or prey availability. By integrating new information on seafloor substrate at finer scales or by including ecological habitat factors, examining the effects of fishing effort distribution and intensity in the context of EFH would be enhanced.

Results also demonstrate the necessity of improving the spatial resolution of fishery data to address current fishery management concerns. Limitations on spatial precision are ultimately tied to the accuracy of the original positions recorded in logbooks. The precision of location using GPS is an improvement over Loran A and C, which were the shore-based navigation systems used prior to the implementation of GPS. Spatial precision works to the fisherman's advantage because they can place their gear more accurately with the aid of GPS chart-plotters and supplementary acoustic equipment (Molyneaux 2002). Since the mid-1990's, the spatial precision of logbook data has benefited from the use of GPS, requiring records of actual tow location in trawl logbooks, and from observer's independent monitoring of fishing activities. Implementation of electronic vessel logbook systems to monitor fisheries would be effective in providing accurate and timely spatial data to improve fisheries management (Meaden 2000, NRC 2000). These systems would also shorten the lag time that currently occurs in the availability of data for management purposes. An electronic logbook system would facilitate utilization of spatial data on fishing catch and effort as a means to directly evaluate management of the fishery. Vessel monitoring systems may assist in verifying spatial location and patterns of fishing from individual tows, but this would require linkage to detailed fishing logbooks that host all of the other fields of data associated with a fishing tow and particular fishing trip (Kemp and Meaden 2002, Marrs et al. 2002, Rijnsdorp 1998). At this point in time, VMS systems in the U.S. West coast groundfish fishery may not be useful for management purposes other than basic enforcement of spatial area violations. Other fishing patterns, such as lifting trawl doors and resetting the same tow in a different direction, circular tows, etc, can be better addressed from detailed trawl track data from position loggers or frequent transmission of VMS vessel location data. Until then, trawl towlines are one method by which we can improve fishing effort resolution.

The issue of logbook and fishing effort confidentiality may need to be addressed in light of recent spatial management measures and enforcement, as well as the idea that fisheries are intended to be managed as a public-trust resource. Potential bias generated from any changes in confidentiality (i.e. misreporting) would need to be addressed.

Certainly, care should be taken in selecting the use of GIS methods for analyzing confidential data which is intended for aiding in the decision-making process to avoid any public presentation of sensitive data in the resulting maps. The overhaul of data-gathering and regulatory policies should include considerations for performing spatial analysis of fleet distributions and fishing effort to better assist in sustainable long-term fisheries management (Walters and Martell 2002, Pitcher 2001, NRC 2000).

Though extensive information is contained in logbooks, these data have been underutilized in fisheries management (NRC 2000, Starr and Fox 1996). This study's use of fishery-dependent logbook data demonstrates the extensive geographic and temporal coverage that these data contain relative to fishery-independent data sources. Research survey tows originating from reference sites were less than 1% of the fishing intensity by commercial tows selected from the same sites. Observer coverage and increases in collaborative research are incorporating more fishery-dependent data sources into the management arena (NRC 2004). Examining the previous year's fishing data before considering changes to regulations may work to alleviate concerns by fishermen that fishery managers do not value the information they provide (Gilden and Conway 2002, Kaplan 1998). With the recent shift to a two-year groundfish management cycle through Amendment 17 to the groundfish FMP, this can now be a realistic expectation when setting future policies and regulations.

The degree of interchange and support between associated marine disciplines such as fisheries oceanography, benthic habitat mapping, stock assessment, fishery database development, and spatial analysis is of critical importance for facilitating the evaluation of fishery management. With increasing environmental awareness, spatial relationships in marine fisheries management are developed by reaching agreements between often conflicting demands. Various stakeholder interests must be clearly represented to achieve optimal spatial balances in marine fishery-related issues. This study emphasizes the types of analysis and data needed to better inform the decision-making process for finding an optimal spatial balance between habitat conservation and fishing effort.

CONCLUSION

The increasing incorporation of ecosystem perspectives into fishery management will require understanding the spatial dynamics of both fish populations and fishery exploitation. Recent concerns regarding essential fish habitat and the possible adverse effects of bottom-fishing practices on such habitat highlight the need for and integrated understanding of ecosystem dynamics and fishery activities. Careful review and monitoring of spatial data from the US West Coast groundfish trawl fishery can assist in evaluating the extent of habitat affected by fishing disturbances and which management measures influence habitat conservation. This study demonstrated that the 2000 PFMC footrope restriction and associated landing limits influenced the shifting of trawl fishing effort away from rocky habitat off the Oregon coast. These rocky banks, which serve as habitat for depleted rockfish (*Sebastes spp.*) stocks, are now protected from the impacts of trawling. Methodologies developed in this study highlight the benefits of increasing the spatial resolution of fishery data collection. The collection of fishery data should strive for fine-scale resolution to make use of new spatial analyses to better evaluate concerns of the diverse stakeholders in the marine environment. The evaluation of complex fishery management measures can utilize the spatial linkages of information on fish distribution, habitat, environmental parameters, and fishery exploitation. New information on relationships between fish and habitat type, advances in seafloor mapping and habitat classification, and ongoing changes in fishery management will each contribute valuable information to future analyses of this type. The research presented here demonstrates how interdisciplinary research and analysis can resolve marine management challenges today and provide insight regarding the spatial aspects of this challenge.

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Appendix 9. Marine Protected Areas and Fishing Activities on the U.S. West Coast

Draft Document, May 2004
Fran Recht, Pacific States Marine Fisheries Commission

This document provides an inventory of specially designated areas on the west coast and any fishing restrictions that may be associated with them. Any fishing restrictions noted in this table are those that are specifically related to the special area designation and not to any rules that may more generally apply in the surrounding areas. Restrictions noted include areas where there may be full protection from fishing (marine reserves where no fish or other marine life may be taken) or be designed to protect certain species (e.g. clams) or certain species for certain times of years (e.g. salmon). These restrictions include those put in place by the Pacific Fishery Management Council (PFMC), by other federal agencies, or by state and local agencies. It also provides information on sites that do not regulate fishing activities as well as sites that have access restrictions or voluntary fishing access or use restrictions. Depending on the specific restrictions, some areas may provide some habitat protection benefits.

Information in this document was gathered from reviewing publications, federal register notices and state fishing rules. It updates and expands on information contained in PFMC's December 1998 document entitled Marine Protected Areas of Washington, Oregon, and California prepared by Al Didier, Jr. of Pacific States Marine Fisheries Commission: http://www.psmfc.org/publications/marine_prot_areas.pdf . That document was an extensive compilation of all federal, state, and local areas that had been designated for special reasons, including those unrelated to fishing activities (e.g. National Wildlife Refuges and National Parks). A portion of Table 3 (state and locally regulated areas in Washington state) and Tables 4 through 8 are included within this document, without update from that report. The website provides access to maps on-line that show the location of most of these features.

This document is focused on those areas where fishing activity is regulated (including areas of new fishing restrictions (e.g. the cowcod, yelloweye, and rockfish closure areas) or controlled by restricting access (e.g. areas closed to vessels). It reflects marine protected areas (MPAs) that have been designated since 1998 as well as any new or modified rules that apply to each area. This table is designed to correspond (by site id number) to a GIS layer that is still under development (see Section 5.2 of the May 2004, Impacts Model Description) by TerraLogic GIS, which is developing shape files from coordinates found in regulation as well as utilizing information obtained from the NOAA Marine Protected Area Center, California Department of Fish and Game and Washington Department of Fish and Game and other sources.

Information regarding kelp restrictions is incomplete. Additionally, this table does not include information on regulations affecting ***non-fishing activites*** in these sites. This information is being gathered by NOAA's Marine Protected Area Center (in progress) and may help understand where non-fishing impacts to habitat may be regulated. http://www.mpa.gov/inventory/atlas/pac/pacific.html

The information is presented in table format. The table provides a site id number, the site name, state, the designating agency, year of designation, whether it is a marine reserve (a fully protected area), the fishing regulations that apply, and other notes. Table 1 is information on federally designated marine protected areas; Table 2 contains information on fishing regulations designated by the Pacific Fishery Management Council; and Table 3 contains information on state and locally designated areas. Information on submarine cable areas (Table 4), offshore drilling platforms (Table 5), weather and scientific buoys (Table 6), restricted navigation areas (Table 7), danger zones and restricted areas (Table 8) is also presented.

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Table 1. Federally Designated Marine Protected Areas

SITE_ID	FULLNAME	AGENCY	YEAR ESTAB-LISHED	STATE	GIS layer updated?	Marine Reserve?[1]	FISHING REGULATIONS [3]	OTHER FISHING RELATED NOTES [2]	KELP HARVEST RESTRICTED? [3]	OTHER INFORMATION
NWR99	San Diego National Wildlife Refuge	DOI - NWR	1996	CA	yes		fishing not allowed on refuge			S.San Diego Bay NWR contains mudflat and subtidal habitat 10-12 feet averge depth
NWR37	Don Edwards San Francisco Bay National Wildlife Refuge	DOI - NWR	1972	CA	yes	No	sportfishing allowed, no commercial fishing			
NWR101	San Pablo Bay National Wildlife Refuge	DOI - NWR	1974	CA	yes	No	sportfishing allowed, no commercial fishing			
NWR54	Humboldt Bay National Wildlife Refuge	DOI - NWR	1973	CA	yes	No	sportfishing allowed, no commercial fishing			
NWR141	Guadalupe-Nipomo Dunes National Wildlife Refuge	DOI - NWR	2000	CA	yes		fishing not allowed on refuge	refuge is mean high tide and above		refuge is beach and dune area; no estuary. Approximately 3000 acres in size
NWR147	Lewis and Clark National Wildlife Refuge	DOI - NWR	1972	OR/WA	yes	No	sportfishing allowed, no commercial fishing			
NWR76	Nestucca Bay National Wildlife Refuge	DOI - NWR	1991	OR	yes		fishing not allowed on refuge			
NWR107	Siletz Bay National Wildlife Refuge	DOI - NWR	1991	OR	yes		fishing not allowed on refuge			

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[1] Is this area fully protected no-take area for living organisms?

[2] R = recreational fishing, C = commercial fishing

[3] refers only to special restrictions due to protected area status; not to other regulations that may apply

SITE_ID	FULLNAME	AGENCY	YEAR ESTAB-LISHED	STATE	GIS layer updated?	Marine Reserve?[1]	FISHING REGULATIONS [3]	OTHER FISHING RELATED NOTES [2]	KELP HARVEST RESTRICTED? [3]	OTHER INFORMATION
NWR11	Bandon Marsh National Wildlife Refuge	DOI - NWR	1983	OR	yes	No	sportfishing allowed, no commercial fishing	intertidal		
NWR155	Nisqually National Wildlife Refuge	DOI - NWR	1974	WA	yes	No	sportfishing allowed, no commercial fishing			
NWR124	Willapa National Wildlife Refuge	DOI - NWR	1936	WA	yes	No	sportfishing allowed, no commercial fishing			
NWR46	Grays Harbor National Wildlife Refuge	DOI - NWR	1990	WA	yes		fishing not allowed on refuge			
NWR38	Dungeness National Wildlife Refuge	DOI - NWR	1915	WA	yes	No	recreational fishing only; restricted in four marine zones by zone and time of year. Treaty rights fisheries also occur.	fishing prohibited in winter to protect nesting birds		
NWR100	San Juan Islands National Wildlife Refuge	DOI - NWR	1960	WA	yes	No	No public access on rocks	refuge is mean high tide and above on 83 rocks, reefs, and islands. No public access except Tern Island and Matia Island open to public. Have worked with San Juan Marine Resources Committee to establish voluntary fishing closure areas around some islands in subtidal zone		

SITE_ID	FULLNAME	AGENCY	YEAR ESTAB-LISHED	STATE	GIS layer updated?	Marine Reserve?[1]	FISHING REGULATIONS [3]	OTHER FISHING RELATED NOTES [2]	KELP HARVEST RESTRICTED? [3]	OTHER INFORMATION
NWR115	Tijuana Slough National Wildlife Refuge	DOI - NWR	1980	CA	yes	No	fishing not allowed on refuge			site is a coastal salt marsh.Ntl Estuarine Research Reserve overlay; also state park overlay
NWR103	Seal Beach National Wildlife Refuge	DOI - NWR	1974	CA	yes		fishing not allowed on refuge	public use severely restricted. This 1000 acre coastal salt marsh site is owned by the Navy; this area is what is left of Annaheim Bay.		
NWR156	Oregon Islands National Wildlife Refuge	DOI - NWR	1935	OR	yes		No public access on rocks	refuge is mean high tide and above		1853 rocks and islands
NWR160	Salinas River National Wildlife Refuge	DOI - NWR	1973	CA	yes	No	sportfishing allowed, no commercial fishing	mostly upland, S managed by State Lands Commission manages to mean high tide		
NWR149	Marin Islands National Wildlife Refuge	DOI - NWR	1992	CA	yes		No public access on rocks	refuge is mean high tide and above		
NWR93	Protection Island National Wildlife Refuge	DOI - NWR	1982	WA	yes		fishing is restricted 200 yards from shore (NWR leases land from WA DNR) except that some treaty rights fisheries occur. No public access on rocks	refuge is mean high tide and above	vessels must stay 200 yards from island shore	
NWR164	Sweetwater Marsh National Wildlife Refuge	DOI - NWR	1988	CA	yes		fishing not allowed on refuge			

SITE_ID	FULLNAME	AGENCY	YEAR ESTAB-LISHED	STATE	GIS layer updated?	Marine Reserve?[1]	FISHING REGULATIONS [3]	OTHER FISHING RELATED NOTES [2]	KELP HARVEST RESTRICTED? [3]	OTHER INFORMATION
NWR159	Quillayute Needles National Wildlife Refuge	DOI - NWR	1907	WA	yes		No public access on rocks	refuge is mean high tide and above		outer coast refuge. In total, the Quillayute Needles, Copalis and Flattery NWR consists of 600-800 rocks, reefs and islands.
NWR167	Three Arch Rocks National Wildlife Refuge	DOI - NWR	1907	OR	yes	No	No public access on rocks, Oregon State Marine Board closes area to boats 500 feet around the main rocks May 1-Sept 15th	refuge is mean high tide and above		9 rock islands, 15 acres total
NWR131	Cape Meares National Wildlife Refuge	DOI - NWR	1938	OR	yes	No	rocky headland	refuge is mean high tide and above		headland, old growth
NWR138	Flattery Rocks National Wildlife Refuge	DOI - NWR	1907	WA	yes		No public access on rocks	refuge is mean high tide and above.		outer coast refuge. In total, the Quillayute Needles, Copalis and Flattery NWR consists of 600-800 rocks, reefs and islands.
NWR31	Copalis National Wildlife Refuge	DOI - NWR	1907	WA	yes		No public access on rocks	refuge is mean high tide and above		outer coast refuge. In total, the Quillayute Needles, Copalis and Flattery NWR consists of 600-800 rocks, reefs and islands.
NPS27	Olympic National Park	DOI - NPS	1909	WA	yes	No	open to recreational fishing, some gear regulations (e.g. number of hooks, spinners etc.)	Park boundary is at lower low water		

SITE_ID	FULLNAME	AGENCY	YEAR ESTAB-LISHED	STATE	GIS layer updated?	Marine Reserve?[1]	FISHING REGULATIONS [3]	OTHER FISHING RELATED NOTES [2]	KELP HARVEST RESTRICTED? [3]	OTHER INFORMATION
NPS33	San Juan Island National Historical Park	DOI - NPS	1966	WA	yes			no subtidal area		
NWR132	Castle Rock National Wildlife Refuge	DOI - NWR	1980	CA	yes		No public access on rocks	refuge is mean high tide and above		
	Antioch Dune National Wildlife Refuge	DOI-NWR		CA			fishing not allowed on refuge	tidal area in Delta		
NWR137	Farallon National Wildlife Refuge	DOI - NWR	1909	CA	yes		No public access on rocks	refuge is mean high tide and above		
NPS12	Channel Islands National Park	DOI - NPS, CDFG	1980	CA	yes	No	To 1000 feet offshore, finfish and certain invertebrates may be taken	abalone (R,C); crabs (R,C); lobster (R,C); ghost shrimp (R,C); seaurchins (R,C); worms (R, C); chiones (R); clams (R); cockles (R);rock scallops (R); native oysters (R); jackknife clams (C); squid (C);	Yes. Marine aquatic plants may not be cut or harvested	
NPS31	Redwood National Park	DOI - NPS, CDFG	1968	CA	yes	No	To 1000 feet offshore, finfish and certain invertebrates may be taken	abalone (R,C); crabs (R,C); lobster (R,C); ghost shrimp (R,C); seaurchins (R,C); worms (R, C); chiones (R); clams (R); cockles (R);rock scallops (R); native oysters (R); jackknife clams (C); squid (C);	Yes. Marine aquatic plants may not be cut or harvested	

SITE_ID	FULLNAME	AGENCY	YEAR ESTAB-LISHED	STATE	GIS layer updated?	Marine Reserve?[1]	FISHING REGULATIONS [3]	OTHER FISHING RELATED NOTES [2]	KELP HARVEST RESTRICTED? [3]	OTHER INFORMATION
NPS19	Golden Gate National Recreation Area	DOI - NPS, CDFG	1972	CA	yes	No	To 1000 feet offshore, finfish and certain invertebrates may be taken	abalone (R,C); crabs (R,C); lobster (R,C); ghost shrimp (R,C); seaurchins (R,C); worms (R, C); chiones (R); clams (R); cockles (R);rock scallops (R); native oysters (R); jackknife clams (C); squid (C);	Yes. Marine aquatic plants may not be cut or harvested	
NPS30	Point Reyes National Seashore	DOI - NPS, CDFG	1972	CA	yes	No	To 1000 feet offshore, finfish and certain invertebrates may be taken	abalone (R,C); crabs (R,C); lobster (R,C); ghost shrimp (R,C); seaurchins (R,C); worms (R, C); chiones (R); clams (R); cockles (R);rock scallops (R); native oysters (R); jackknife clams (C); squid (C);		
NPS7	Cabrillo National Monument	DOI - NPS, CDFG		CA	yes	No	Recreational and commercial fishing are allowed; but no invertebrates may be taken and finfish may only be taken by hook and line			

SITE_ID	FULLNAME	AGENCY	YEAR ESTAB-LISHED	STATE	GIS layer updated?	Marine Reserve?[1]	FISHING REGULATIONS [3]	OTHER FISHING RELATED NOTES [2]	KELP HARVEST RESTRICTED? [3]	OTHER INFORMATION
NMS1	Channel Islands National Marine Sanctuary (CINMS)	NOAA - NMS	1980	CA	yes	10 areas totaling 132 square nm in state waters are marine reserves	some areas in state waters are marine reserves (10 areas) or have restrictions by fishery or sector (2 areas totaling 10 square nm in state waters regulate some fishing activities). Recreational and commercial fishing allowed in federal waters	Offshore boundary 6 nm distance; coastline length approx 150 mi.	no kelp harvest restrictions	2 areas totaling 10 square nm in state waters regulate some fishing activities
NMS11	Monterey Bay National Marine Sanctuary	NOAA - NMS	1992	CA		No	no restrictions on recreational and commercial fishing			5300 square mile marine protected area
NMS13	Olympic Coast National Marine Sanctuary	NOAA - NMS	1994	WA		No	no restrictions on recreational and commercial fishing			
NMS8	Gulf of the Farallones National Marine Sanctuary	NOAA - NMS	1981	CA	yes	No	recreational and commercial fishing are allowed except that commercial fishing for all groundfish is prohibited between the shoreline and the 10 fathom (18 m) depth contour around the Farralon islands and in this same area recreational fishing for certain species is prohibited (rockfish, lingcod, cabezon, greenlings of genus Hexacrammos, CA scorpionfish, CA sheephead and ocean whitefish)	Area 32.2 square nm, Depth range 0-360 feet (0-60 fathoms)		

SITE_ID	FULLNAME	AGENCY	YEAR ESTAB-LISHED	STATE	GIS layer updated?	Marine Reserve?[1]	FISHING REGULATIONS [3]	OTHER FISHING RELATED NOTES [2]	KELP HARVEST RESTRICTED? [3]	OTHER INFORMATION
NMS2	Cordell Bank National Marine Sanctuary	NOAA - NMS	1989	CA	yes	No	recreational and commercial fishing are allowed except that recreational fishing for rockfish, lingcod, cabezon, CA scorpionfish, kelp greenlings,greenlings of the genus Hexagrammos, CA sheephead and ocean whitefish are prohibited within a 5 nm radius around a point located at 38 degrees 02 ' N lat and 123 degrees 25'W. long	Benthic invertebrates located on Cordell bank or within 50 fathom line may not be taken	Benthic algae located on Cordell bank or within 50 fathom line may not be taken	
NMF36	Pacific Whiting Klamath River Salmon Conservation Zone	NOAA - NMFS		OR/CA	yes	No	Pacific whiting may not be taken or retained			area stretches approximately 6 nm north and south of Klamath River mouth and extends about 12 nm from the shore.
NMF35	Pacific Whiting Columbia River Salmon Conservation Zone	NOAA - NMFS		WA/OR	yes	No	Pacific whiting may not be taken or retained			area stretches approximately 6 nm due west from N. Head, runs south along the Columbia River Buoy and then east along the Red Buoy line to tip of the South Jetty.

SITE_ID	FULLNAME	AGENCY	YEAR ESTAB-LISHED	STATE	GIS layer updated?	Marine Reserve?[1]	FISHING REGULATIONS [3]	OTHER FISHING RELATED NOTES [2]	KELP HARVEST RESTRICTED? [3]	OTHER INFORMATION
NER18	Padilla Bay National Estuarine Research Reserve	NOAA/STATE - NERR	1980	WA	yes	No				11,000 acres. Contains seagrass meadows, tidal flats and sloughs, salt marshes, upland forests and meadows. Public access restricted and discouraged in sensitive marsh areas.
NER21	South Slough National Estuarine Research Reserve	NOAA/STATE - NERR	1974	OR	yes	No	No fishing restrictions, except that commercial oyster culture limited to 100 acres.	Recreational clamming and bait gathering allowed.		
NER22	Tijuana River National Estuarine Research Reserve	NOAA/STATE - NERR	1982	CA	yes	Yes	recreational and commercial fishing prohibited			
NER6	Elkhorn Slough National Estuarine Research Reserve	NOAA/STATE - NERR	1979	CA	yes					
	Pt. Reyes Headlands National Research Natural Area	DOI-NPS, CDFG	1972	CA						
	San Francisco Maritime National Historical Park	DOI-NPS	1988	CA						
	Santa Monica Mountains National Recreational Area	DOI-NPS, CDPR	1978	CA						

SITE_ID	FULLNAME	AGENCY	YEAR ESTAB-LISHED	STATE	GIS layer updated?	Marine Reserve?[1]	FISHING REGULATIONS[3]	OTHER FISHING RELATED NOTES[2]	KELP HARVEST RESTRICTED?[3]	OTHER INFORMATION
	Ebey's Landing National Historical Reserve	DOI-NPS, WPRC	1978	WA						
	Channel Islands Man and the Biosphere (MAB) Reserve	NOAA, NPS	1976	CA		no	recreational and commercial fishing are allowed			
	Central California Coast MAB Reserve	NOAA, NPS	1988	CA		no	recreational and commercial fishing are allowed			
	Cascade Head MAB Reserve	USFS	1976	OR		no	no fisheries-specific regulations			
	Olympic MAB Reserve	NPS	1976	WA		no	Recreational fishing is allowed; national park boundary is at lower low water.			

Table 2. Fishing Regulated Areas Established by the Pacific Fishery Management Council[4]

FULLNAME	AGENCY	YEAR ESTAB-LISHED	STATE	GIS layer updated?	Marine Reserve?[5]	FISHING REGULATIONS	OTHER FISHING RELATED NOTES[6]	OTHER INFORMATION
Cowcod Closure Area-RECREATIONAL FISHING	PFMC	January 2001 to present	CA		No	recreational fishing for all groundfish is prohibited in federal waters except that fishing for sanddabs is allowed with some gear and other location based restrictions and fishing is allowed March 1-December 31 shoreward of the 20 fathom (37m) contour for rockfish (except for cowcod, canary, and yelloweye), cabezon, lingcod, CA scorpionfish, sanddabs, kelp greenling, and greenlings of the Genus Hexogrammas. In state waters, shoreward of 20 fathoms fishing is allowed for the RCG complex (rockfish, cabezon, and greenlings), shallow nearshore rockfish (including black and yellow, china, grass, gopher and kelp rockfishes), cabezon, kelp and rock greenlings, bocaccio, lingcod, CA scorpionfish, ocean whitefish, and CA sheephead).	Changes in boundaries over time. Recreational fishing for sanddabs allowed with gear restrictions within CCA except between the shoreline and 10 fathom countour around the Farralon Islands. In April 2004, the rules will only allow fishing for minor nearshore rockfish species in federal waters.	
Cowcod Closure Area-COMMERCIAL FISHING	PFMC	January 2001 to present	CA		No	commercial fishing for groundfish prohibited year round except that rockfish and lingcod fishing is permitted shoreward of 20 fathoms (37 m) depth contour.	changes in boundaries over time.	

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[4] The columns GIS layer status (updated?) and Kelp harvest restricted? were deleted from this table because they contained no data

[5] Is this area fully protected no-take area for living organisms?

[6] R = recreational fishing, C = commercial fishing

FULLNAME	AGENCY	YEAR ESTAB-LISHED	STATE	GIS layer updated?	Marine Reserve?[5]	FISHING REGULATIONS	OTHER FISHING RELATED NOTES [6]	OTHER INFORMATION
Groundfish Area Closure	PFMC	July 2002 to Sept. 2002			No	Bottom trawl groundfish fishing closed on Sept 1 north of 40°10′ N. latitude. S. of 40°10′ N. latitude, as of July 1, limited entry trawl gear and exempted trawl gear prohibited, recreational fishing for rockfish and lingcod prohibited outside of 20 fathoms, limited entry fixed gear groundfish fishing prohibited outside of 20 fathoms (except for sablefish and slope rockfish)and inside 20 fathoms limited entry groundfish fishing is prohibited for minor shelf rockfish, bocaccio, and chilipepper rockfish.		
Dark Blotched Rockfish Closure Area (DBCA)	PFMC	Sept 2002 to March 2003			No	Limited entry groundfish trawl fishing prohibited, except that fishing for Pacific whiting is allowed with mid-water trawl gear. In Sept 2002, all limited entry groundfish trawl fishing also prohibited shoreward of DBCA.		
Yelloweye Conservation Area	PFMC	March 2003 to present	WA		No	Recreational groundfish and halibut fishing prohibited. Voluntary closure for the limited entry fixed gear sablefish fleet and salmon trollers	No commercial trawling in state waters in effect in area through other fishing rules not related to designation of rockfish conservation zone.	
Rockfish Conservation Area-RECREATIONAL groundfish fishery	PFMC, WDFW	March 2003 to present	WA		No	Recreational fishing for all groundfish in WA may be prohibited within the RCA on a seasonal basis.		RCA is generally defined by depth countours, but specifically defined by lat/long coordinates that is gear/and or sector specific. Boundaries may vary seasonally

FULLNAME	AGENCY	YEAR ESTAB-LISHED	STATE	GIS layer updated?	Marine Reserve?[5]	FISHING REGULATIONS	OTHER FISHING RELATED NOTES [6]	OTHER INFORMATION
Rockfish Conservation Area-RECREATIONAL groundfish fishery	PFMC, ODFW	March 2003 to present	OR		No	In Oregon recreational fishing for groundfish prohibited in RCA from June 1-September 30 and may be prohibited seasonally within an area shoreward of a boundary approximating the 30 fathom contour.		RCA is generally defined by depth countours, but specifically defined by lat/long coordinates that is gear/and or sector specific. Boundaries may vary seasonally
Rockfish Conservation Area-RECREATIONAL groundfish fishery	PFMC, CDFG		CA, from 40°10′ N. latitude and 34°27′ N.		No	Recreational fishing for all groundfish, except sanddabs is prohibited seaward of a boundary approximating the 30 fathom (55 m) depth contour along the mainland coast and along islands and offshore seamounts during Jan 1 through February 29 and Sept. 30 through Dec 31 and is prohibited seaward of the 20 fathom (37 m) depth contour during May 1 through August 31 and no recreational groundfish fishery is allowed seaward of the shoreline March 1 through April 30.		
Rockfish Conservation Area-RECREATIONAL groundfish fishery	PFMC, CDFG		CA, south of 34°27′ N		No	Recreational fishing for all groundfish, except sanddabs is prohibited seaward of a boundary approximating the 60 fathom (110 m) depth contour along the mainland coast and along islands and offshore seamounts during March 1 through December 31, and no recreational fishing for groundfish is allowed seaward of the shoreline Jan 1 through Feb 29, except in the Cowcod Conservation Area where groundfish fishing is prohibited seaward of the 20 fathom (37 m) contour.		
Rockfish Conservation Area-TRAWL Groundfish Fishery (limited entry and open access exempted trawl gear)	PFMC	March 2003 to present	WA,OR,CA		No	all trawling prohibited except that trawling for whiting (or widow or yellowtail rockfish, if allowed) using midwater gear and for pink shrimp trawling is allowed.	small footrope or midwater gear is required shoreward of the RCA.	RCA is generally defined by depth countours, but specifically defined by lat/long coordinates that is gear/and or sector specific. Boundaries may vary seasonally

FULLNAME	AGENCY	YEAR ESTAB-LISHED	STATE	GIS layer updated?	Marine Reserve?[5]	FISHING REGULATIONS	OTHER FISHING RELATED NOTES[6]	OTHER INFORMATION
Rockfish Conservation Area-NON-TRAWL Groundfish Fishery (limited entry fixed gear, open access non-trawl gears including longline and pots, gillnets)	PFMC	March 2003 to present	WA,OR,CA		No	fishing for groundfish with these gears prohibited; fishing for other species with this gear, e.g. salmon, ok		RCA is generally defined by depth countours, but specifically defined by lat/long coordinates that is gear/and or sector specific. Boundaries may vary seasonally

Table 3. State and Local Areas with Fishing Restrictions

FULLNAME	AGENCY	YEAR ESTAB-LISHED	STATE	GIS layer updated?	Marine Reserve?[7]	FISHING REGULATIONS	OTHER FISHING RELATED NOTES [8]	KELP HARVEST RESTRICTED? [9]	OTHER INFORMATION
Haystack Rock Marine Garden	ODFW	1960	OR			closed to take of shellfish and marine invertebrates except single mussels may be taken for bait	intertidal		
Cape Kiwanda Marine Garden	ODFW	1997	OR			closed to take of shellfish and marine invertebrates except single mussels may be taken for bait	intertidal		
Otter Rock Marine Garden	ODFW	1960	OR			closed to take of shellfish and marine invertebrates except single mussels may be taken for bait	intertidal		
Yaquina Head Marine Garden	ODFW	1960s	OR			closed to take of shellfish and marine invertebrates except single mussels may be taken for bait	intertidal		
Yachats Marine Garden	ODFW	1977	OR			closed to take of shellfish and marine invertebrates except single mussels may be taken for bait	intertidal		
Cape Perpetua Marine Garden	ODFW	1960s	OR			closed to take of shellfish and marine invertebrates except razor clams may be taken and single mussels may be taken for bait	intertidal		
Harris Beach Marine Garden	ODFW	1960s	OR			closed to take of shellfish and marine invertebrates except single mussels may be taken for bait	intertidal		

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[7] Is this area fully protected no-take area for living organisms?

[8] R = recreational fishing, C = commercial fishing

[9] refers only to special restrictions due to protected area status; not to other regulations that may apply

FULLNAME	AGENCY	YEAR ESTAB-LISHED	STATE	GIS layer updated?	Marine Reserve?[7]	FISHING REGULATIONS	OTHER FISHING RELATED NOTES [8]	KELP HARVEST RESTRICTED? [9]	OTHER INFORMATION
Netarts Bay Shellfish Preserve	ODFW	late 1960s or early 1970s	OR		No	closed to the taking of clams	subtidal and intertidal area		incidentally protects high and low salt marsh, sand and mixed sand/mud, and seagrass beds
Yaquina Bay Shellfish Preserve	ODFW	late 1960s or early 1970s	OR		No	closed to the taking of clams	subtidal and intertidal area		incidentally protects high and low salt marsh, sand and mixed sand/mud, and seagrass beds
Pyramid Rock (Rogue Reef)	ODFW		OR			closed to take of marine fish, shellfish, and marine invertebrates from 1000 feet around and including Pyramid rock from May 1 to Aug 31	subtidal		
Pirates Cove Subtidal Research Reserve	ODFW	1960	OR			Closed to the taking of shellfish and marine invertebrates except scientific permits may be issued for scientific and educational purposes.	subtidal	No	
Gregory Point Subtidal Research Reserve	ODFW	1960s	OR			Closed to the taking of shellfish and marine invertebrates except scientific permits may be issued for scientific and educational purposes.	subtidal		
Boiler Bay Intertidal Research Reserve	ODFW	1960s	OR		No	Closed to the taking of shellfish and marine invertebrates except abalone, clams, Dungeness crab, red rock crab, mussels, piddocks, scallops and shrimp (edible and bait) may be taken. Scientific permits may be issued for scientific and educational purposes.	intertidal		

FULLNAME	AGENCY	YEAR ESTAB-LISHED	STATE	GIS layer updated?	Marine Reserve?[7]	FISHING REGULATIONS	OTHER FISHING RELATED NOTES [8]	KELP HARVEST RESTRICTED? [9]	OTHER INFORMATION
Neptune State Park Intertidal Research Reserve	ODFW	1960s	OR		No	Closed to the taking of shellfish and marine invertebrates except abalone, clams, Dungeness crab, red rock crab, mussels, piddocks, scallops and shrimp (edible and bait) may be taken. Scientific permits may be issued for scientific and educational purposes.	intertidal		
Cape Arago Intertidal Research Reserve (Area B)	ODFW	1960s	OR		No	Closed to the taking of shellfish and marine invertebrates except abalone, clams, Dungeness crab, red rock crab, mussels, piddocks, scallops and shrimp (edible and bait) may be taken. Scientific permits may be issued for scientific and educational purposes.	intertidal		
Cape Arago Intertidal Research Reserve (Areas A,C)	ODFW		OR			Closed to the take of all shellfish and marine invertebrates. Scientific permits may be issued for scientific and education al purposes.	intertidal		
Brookings Intertidal Research Reserve	ODFW	1960s	OR		No	Closed to the taking of shellfish and marine invertebrates except abalone, clams, Dungeness crab, red rock crab, mussels, piddocks, scallops and shrimp (edible and bait) may be taken. Scientific permits may be issued for scientific and educational purposes.	intertidal		
Whale Cove Interdial Research Reserve	ODFW	1960s	OR		No	Closed to the take of marine fish, shellfish and invertebrates	subtidal and intertidal area	No	

FULLNAME	AGENCY	YEAR ESTAB-LISHED	STATE	GIS layer updated?	Marine Reserve?[7]	FISHING REGULATIONS	OTHER FISHING RELATED NOTES [8]	KELP HARVEST RESTRICTED? [9]	OTHER INFORMATION
CINMS Anacapa Island State Marine Reserve	CDFG	####	CA		Yes	no commercial or recreational fishing allowed	Shoreline length 3.3 nm, Area 1.7 square nm, Depth Range 0-600 feet (0-100 fathoms)	marine aquatic plants may not be cut or harvested	In 1978 Anacapa Island designated as Ecological Reserve; Fishing regs under that designation: recreational and commercial fishing allowed, but nothing allowed to be taken in Natural Area on north side of East Anacapa Island (extending out to 60 feet (10 fathoms) ; no invertebrates taken in closures on S. side of West Anacapa Island (extending out to 20 feet depth), on north side of Middle Anacapa Island (extending out to 20 feet depth). No net or trap used in waters less than 20 feet depth. No entry to closed area on N. side of West Anacapa Island Jan1-October 31

FULLNAME	AGENCY	YEAR ESTAB-LISHED	STATE	GIS layer updated?	Marine Reserve?[7]	FISHING REGULATIONS	OTHER FISHING RELATED NOTES [8]	KELP HARVEST RESTRICTED? [9]	OTHER INFORMATION
CINMS Santa Barbara Island State Marine Reserve	CDFG	####	CA		Yes	no commercial or recreational fishing allowed	Shoreline length 1 nm, Area 13.2 square nm, Depth Range 0-1,800 feet (O-300 fathoms)	Recreational harvest of kelp prohibited; commercial harvest in kelp lease sites permitted.	In 1978 Santa Barbara Island designated as Ecological Reserve; Fishing regs under that designation: recreational and commercial fishing allowed, but no invertebrates taken in special closure area on eastern side of island (to 20 feet depth) and no net or traps allowed to be used in this area.
CINMS Carrington Point (Santa Rosa Island) State Marine Reserve	CDFG	####	CA		Yes	no commercial or recreational fishing allowed	Shoreline length 5.3 nm, Area 13.3 square nm, Depth range 0-180 feet (0-30 fathoms)	marine aquatic plants may not be cut or harvested	
CINMS South Point (Santa Rosa Island) State Marine Reserve	CDFG	####	CA		Yes	no commercial or recreational fishing allowed	Shoreline length 3.8 nm, Area 10.8 square nm, Depth Range 0-1200 feet (0-200 fathoms)	marine aquatic plants may not be cut or harvested	
CINMS Gull Island (Santa Cruz Island) State Marine Reserve	CDFG	####	CA		Yes	no commercial or recreational fishing allowed	Shoreline length 2.9 nm, Area 16.1 square nm, Depth Range 0-1800 feet (0-300 fathoms)	marine aquatic plants may not be cut or harvested	
CINMS Scorpion (Santa Cruz Island) State Marine Reserve	CDFG	####	CA		Yes	no commercial or recreational fishing allowed	Shoreline length 3.3 nm, Area 10.3 square nm, Depth Range 0-750 feet (0-125 fathoms)	marine aquatic plants may not be cut or harvested	

FULLNAME	AGENCY	YEAR ESTAB-LISHED	STATE	GIS layer updated?	Marine Reserve?[7]	FISHING REGULATIONS	OTHER FISHING RELATED NOTES [8]	KELP HARVEST RESTRICTED? [9]	OTHER INFORMATION
CINMS Richardson Rock (San Miguel Island) State Marine Reserve	CDFG	####	CA		Yes	no commercial or recreational fishing allowed	Area 32.2 square nm, Depth range 0-360 feet (0-60 fathoms)	marine aquatic plants may not be cut or harvested	
CINMS Judith Rock (San Miguel Island) State Marine Reserve	CDFG	####	CA		Yes	no commercial or recreational fishing allowed	Shoreline length 1.4 nm, Area 5.1 square nm, Depth range 0-420 feet (0-70 fathoms)	marine aquatic plants may not be cut or harvested	In 1977 San Miguel Island designated as Ecological Reserve; Fishing regs under that designation: no fishing from shore or areas closed to boating; Where open to boating: commercial fishing allowed under permit for abalone, lobster, or sea urchin, or using hook and line or traps for rock crab; recreational fishing with hook and line, spear gun or hand held implements permitted
CINMS Harris Point (San Miguel Island) State Marine Reserve	CDFG		CA		Yes	no commercial or recreational fishing allowed (except within Cuyler harbor)	Shoreline length 6.3 nm, Area 18.2 square nm, Depth Range 0-300 feet (0-50 fathoms)	marine aquatic plants may not be cut or harvested	
CINMS Skunk Point (Santa Rosa Island) State Marine Reserve	CDFG		CA		Yes	no commercial or recreational fishing allowed	Shoreline length 2.7 nm, Area 1.4 square nm, Depth range 0-60 feet (0-10 fathoms)	marine aquatic plants may not be cut or harvested	

FULLNAME	AGENCY	YEAR ESTAB-LISHED	STATE	GIS layer updated?	Marine Reserve?[7]	FISHING REGULATIONS	OTHER FISHING RELATED NOTES [8]	KELP HARVEST RESTRICTED? [9]	OTHER INFORMATION
CINMS Anacapa Island State Marine Conservation Area	CDFG		CA		No	No take of living or non-living marine resources allowed except recreational fishing for spiny lobster and pelagic finfish allowed; commercial fishing for spiny lobster allowed	Shoreline length 2.2 nm, Area 8.1 square nm, Depth range 0-600 feet (0-100 fathoms)	marine aquatic plants may not be cut or harvested	Pelagic finfish are defined as northern anchovy, barraacudas, billfishes, dolphinfish, Pacific herring, jack mackerel, Pacific mackerel, salmon, Pacific sardine, blue shark, salmon shark, shortfin mako shark, thresher sharks, swordfish, tunas, and yellowtail.
CINMS Painted Cave (Santa Cruz Island) State Marine Conservation Area	CDFG		CA		No	No take of living or non-living marine resources allowed except recreational fishing for spiny lobster and pelagic finfish is allowed	Shoreline length 2 nm, Area 2.1 square nm, Depth range 0-300 feet	marine aquatic plants may not be cut or harvested	Pelagic finfish are defined as northern anchovy, barraacudas, billfishes, dolphinfish, Pacific herring, jack mackerel, Pacific mackerel, salmon, Pacific sardine, blue shark, salmon shark, shortfin mako shark, thresher sharks, swordfish, tunas, and yellowtail.
California Kelp Beds closed areas	CDFG			yes	No	kelp beds may not be harvested at any time		Yes	

FULLNAME	AGENCY	YEAR ESTAB-LISHED	STATE	GIS layer updated?	Marine Reserve?[7]	FISHING REGULATIONS	OTHER FISHING RELATED NOTES [8]	KELP HARVEST RESTRICTED? [9]	OTHER INFORMATION
MacKerricher State Park	CDPR, CDFG, SLC	1970	CA		No	To 1000 feet offshore, finfish and these invertebrates may be taken: abalone, (RC), chiones (R), clams (R), cockles (R), rock scallops (R), native oysters (R), crabs (R,C), lobsters (R,C), ghost shrimp (R,C), sea urchins (R,C), jacknife clams (C), squid (C), worms (R,C).			
Pt. Cabrillo Reserve	CDFG	1975	CA		No	Recreational fishing prohibited; Commercial fishing allowed for finfish and for the following invertebrates: lobster, abalone, and crab			
Russian Gulch State Park	CDPR, CDFG, SLC	1970	CA		No	To 1000 feet offshore, finfish and these invertebrates may be taken: abalone, (RC), chiones (R), clams (R), cockles (R), rock scallops (R), native oysters (R), crabs (R,C), lobsters (R,C), ghost shrimp (R,C), sea urchins (R,C), jacknife clams (C), squid			
Van Damme State Park	CDPR, CDFG, SLC	1970	CA		No	To 1000 feet offshore, finfish and these invertebrates may be taken: abalone, (RC), chiones (R), clams (R), cockles (R), rock scallops (R), native oysters (R), crabs (R,C), lobsters (R,C), ghost shrimp (R,C), sea urchins (R,C), jacknife clams (C), squid			
Manchester State Park	CDPR, CDFG, SLC	1970	CA		No	To 1000 feet offshore, finfish and these invertebrates may be taken: abalone, (RC), chiones (R), clams (R), cockles (R), rock scallops (R), native oysters (R), crabs (R,C), lobsters (R,C), ghost shrimp (R,C), sea urchins (R,C), jacknife clams (C), squid			

FULLNAME	AGENCY	YEAR ESTAB-LISHED	STATE	GIS layer updated?	Marine Reserve?[7]	FISHING REGULATIONS	OTHER FISHING RELATED NOTES [8]	KELP HARVEST RESTRICTED? [9]	OTHER INFORMATION
Arena Rock National Preserve	CDPR, CDFG, SLC	1987	CA		No	Access restrictions: No person shall drive, operate, place, land, taxi, takeoff, or stop a motor vehicle, motorboat or aircraft within the boundaries.			
Del Mar Landing Ecological Reserve	CDFG	1972	CA		No	Recreational fishing allowed for finfish only; commercial fishing prohibited.			
Salt Point State Park	CDPR, CDFG, SLC	1970	CA		No	To 1000 feet offshore, finfish and these invertebrates may be taken: abalone, (RC), chiones (R), clams (R), cockles (R), rock scallops (R), native oysters (R), crabs (R,C), lobsters (R,C), ghost shrimp (R,C), sea urchins (R,C), jacknife clams (C), squid			
Gerstle Cove Reserve	CWRCB, RWQCB, CDFG	1971	CA		No	Recreational fishing prohibited; Commercial fishing allowed for finfish and for the following invertebrates: lobster, abalone, and crab			
Fort Ross State Historic Park	CDPR, CDFG, SLC	1970	CA		No	Commercial fishing allowed; To 1000 fish offshore, recreational fishing for finfish and the following invertebrates: abalone, chiones, clams, cockles, rock scallops, native oysters, crabs, lobsters, ghost shrimp, sea urchins			
Sonoma Coast State Beach	CDPR, CDFG, SLC	1970	CA		No	Commercial fishing allowed; To 1000 fish offshore, recreational fishing for finfish and the following invertebrates: abalone, chiones, clams, cockles, rock scallops, native oysters, crabs, lobsters, ghost shrimp, sea urchins			

FULLNAME	AGENCY	YEAR ESTAB-LISHED	STATE	GIS layer updated?	Marine Reserve?[7]	FISHING REGULATIONS	OTHER FISHING RELATED NOTES [8]	KELP HARVEST RESTRICTED? [9]	OTHER INFORMATION
Bodega Marine Life Refuge	CWRCB, RWQCB, CDFG	2002	CA		Yes	No-take marine reserve			Established 1965 and allowed recreational and commercial fishing only for finfish, until no-take reserve established
Pt. Reyes Headlands Reserve	CDFG	1972	CA		No	Recreational fishing prohibited; Commercial fishing allowed for finfish and for the following invertebrates: lobster, abalone, and crab			
Duxbury Reef Reserve	CDFG	1971	CA		No	Commercial fishing allowed; Recreational fishing only for: abalone, Dungeness crab, rock crab, rickfish, lingcod, cabezon, surfperch, haliput, flounder, sole, turbot, salmon, kelp greenling, striped bass, steelhead, monkey faced eel, wolf-eel, smelt, silversides.			
James V. Fitzgerald Marine Reserve	CDFG		CA		No	Recreational fishing only for abalone, rockfish, lingcod, surfpearch, monkey-faced eel, rock eel, white croaker, halibut, cabezon, kelp greening, and smelt. Finfish taken only by hook and line or spearfishing. Commercial fishing only by holders of species--specific CDFG permits; To 1000 feet offshore, only the following invertebrates may be taken: lobster, abalone, crab. Abalone may be taken in waters 20 feet or more in depth.			
Hopkins Marine Life Reserve	CDFG	1984	CA		Yes	Recreational and commercial fishing prohibited			

FULLNAME	AGENCY	YEAR ESTAB-LISHED	STATE	GIS layer updated?	Marine Reserve?[7]	FISHING REGULATIONS	OTHER FISHING RELATED NOTES [8]	KELP HARVEST RESTRICTED? [9]	OTHER INFORMATION
Pacific Grove Marine Gardens Fish Refuge	CDFG	1984	CA		No	Recreational fishing allowed, but mollusks and crustaceans may not be taken; Commercial fishing allowed, but only sardines, mackerel, anchovies, squid and herring may be taken by ring net, lampara net, or bait net.			
Carmel Bay Ecological Reserve	CDFG	1976	CA		No	Recreational fishing allowed for finfish only; commercial fishing prohibited.			
Point Lobos Ecological Reserve	CDFG		CA		Yes	Recreational and commercial fishing prohibited			
Point Lobos Reserve	CDFG, CDPR	1973	CA		Yes	no take reserve			Regulations in place before the area received additional protection in XXXX were: 1000 feet offshore, finfish and these invertebrates may be taken: abalone, (RC), chiones (R), clams (R), cockles (R), rock scallops (R), native oysters (R), crabs (R,C), lobsters (R,C), ghost shrimp (R,C), sea urchins (R,C), jacknife clams (C), squid (C), worms (R,C)

FULLNAME	AGENCY	YEAR ESTAB-LISHED	STATE	GIS layer updated?	Marine Reserve?[7]	FISHING REGULATIONS	OTHER FISHING RELATED NOTES [8]	KELP HARVEST RESTRICTED? [9]	OTHER INFORMATION
Julia Pfeiffer Burns State Park	CDPR, CDFG, SLC		CA		No	To 1000 feet offshore, finfish and these invertebrates may be taken: abalone, (RC), chiones (R), clams (R), cockles (R), rock scallops (R), native oysters (R), crabs (R,C), lobsters (R,C), ghost shrimp (R,C), sea urchins (R,C), jacknife clams (C), squid (C), worms (R,C).			
Big Creek MRPA Ecological Reserve	CDFG	1994	CA		Yes	Recreational and commercial fishing prohibited			
Atascadero Beach Pismo Clam Preserve (Clam Refuge)	CDFG	1985	CA		No	No clams may be taken			
Morro Beach Pismo Preserve (Clam Refuge)	CDFG	1985	CA		No	No clams may be taken			
Pismo Invertebrate Reserve	CDFG	1977	CA		No	Recreational fishing allowed only for finfish; Commercial fishing is allowed for finfish and the following shellfish: lobster, abalone, crab			
Pismo-Oceano Beach Pismo Clam Preserve (Clam Refuge)	CDFG	1985	CA		No	No clams may be taken			
Vandenberg MRPA Ecological Reserve	CDFG, Vandenberg AFB	1994	CA		Yes	Recreational and commercial fishing prohibited			

FULLNAME	AGENCY	YEAR ESTAB-LISHED	STATE	GIS layer updated?	Marine Reserve?[7]	FISHING REGULATIONS	OTHER FISHING RELATED NOTES [8]	KELP HARVEST RESTRICTED? [9]	OTHER INFORMATION
San Miguel Island Ecological Reserve	CDFG	1977	CA		No	Recreational fishing by hook-and-line, spear gun, or hand-held implements in areas open to boating; Commercial fishing under permit for abalone, lobster, or sea urchin, or using hook-and-line or traps for rock crab, only in areas open to boating. Other gear/species fishermen must apply for and obtain permit			
Anacapa Island Ecological Reserve Natural Area	CDFG	1978	CA		Yes	No-take reserve			
Santa Barbara Island Ecological Reserve	CDFG	1978	CA		No	No invertebrates taken in special closure on eastern side of island, and no net or trap used in that area.			
Sycamore Canyon MRPA Ecological Reserve	CDFG	1994	CA		Yes	No-take reserve			
Abalone Cove Ecological Reserve	CDFG	1977	CA		No	Recreational fishing for finfish only; commercial fishing prohibited			

FULLNAME	AGENCY	YEAR ESTAB-LISHED	STATE	GIS layer updated?	Marine Reserve?[7]	FISHING REGULATIONS	OTHER FISHING RELATED NOTES [8]	KELP HARVEST RESTRICTED? [9]	OTHER INFORMATION
Point Fermin Marine Life Refuge	CDFG	1969	CA		No	Recreational fishing only for abalone, lobster, rockfish, greenling, lingcod, cabezon, yellowtail, mackerel, bluefin tuna, kelp bass, spotted sand bass, barred sand bass, sargo, croaker, queenfish, corbina, white seabass, opaleye, halfmoon, surfperch, blacksmith, barracuda, sheephead, bonito, CA halibut, sole, turbot, and sanddab. Finfish taken only by hook-and-line or spearfishing. Commercial fishing only by holders of species-specific CDFG permits; To 1000 feet offshore, only the following invertebrates may be taken: lobster, abalone, crab.			
Santa Catalina Island Marine Life Refuge	CDFG	1988	CA		Yes	No-take reserve			
Farnsworth Bank Ecological Reserve	CDFG	1972	CA		No	No purple coral or geological specimens may be taken			
Lovers Cover Reserve	CDFG	1974	CA		No	Recreational fishing prohibited; Commercial fishing allowed for finfish and for the following invertebrates: lobster, abalone, and crab			

FULLNAME	AGENCY	YEAR ESTAB-LISHED	STATE	GIS layer updated?	Marine Reserve?[7]	FISHING REGULATIONS	OTHER FISHING RELATED NOTES [8]	KELP HARVEST RESTRICTED? [9]	OTHER INFORMATION
Newport Beach Marine Life Refuge	CDFG	1981	CA		No	Recreational fishing only for abalone, lobster, rockfish, greenling, lingcod, cabezon, yellowtail, mackerel, bluefin tuna, kelp bass, spotted sand bass, barred sand bass, sargo, croaker, queenfish, corbina, white seabass, opaleye, halfmoon, surfperch, blacksmith, barracuda, sheephead, bonito, CA halibut, sole, utrbot, and sanddab. Fishfish taken only by hook-and-line or spearfishing. Commercial fishing only by holders of species-specific CDFG permits: To 1000 feet offshore, only the following invertebrates may be taken: lobster, abalone, crab.			
Crystal Cove State Park	CDPR, CDFG, SLC	1982	CA		No	To 1000 feet offshore, finfish and these invertebrates may be taken: abalone, (RC), chiones (R), clams (R), cockles (R), rock scallops (R), native oysters (R), crabs (R,C), lobsters (R,C), ghost shrimp (R,C), sea urchins (R,C), jacknife clams (C), squid			

FULLNAME	AGENCY	YEAR ESTAB-LISHED	STATE	GIS layer updated?	Marine Reserve?[7]	FISHING REGULATIONS	OTHER FISHING RELATED NOTES [8]	KELP HARVEST RESTRICTED? [9]	OTHER INFORMATION
Irvine Coast Marine Life Refuge	CDFG	1971	CA		No	Recreational fishing only for abalone, lobster, rockfish, greenling, lingcod, cabezon, yellowtail, mackerel, bluefin tuna, kelp bass, spotted sand bass, barred sand bass, sargo, croaker, queenfish, corbina, white seabass, opaleye, halfmoon, surfperch, blacksmith, barracuda, sheephead, bonito, Ca halibut, sole, turbot, and sanddab. Finfish taken ony by hook-and-line or spearfishing. Commercial fishing only by holders of species-specific CDFG permits; To 1000 feet offshore only the following invertebrates may be taken: lobster, abalone, crab.			
Laguna Beach Marine Life Refuge	CDFG	1968	CA		No	Recreational fishing only for abalone, lobster, rockfish, greenling, lingcod, cabezon, yellowtail, mackerel, bluefin tuna, kelp bass, spotted sand bass, barred sand bass, sargo, croaker, queenfish, corbina, white seabass, opaleye, halfmoon, surfperch, blacksmith, barracuda, sheephead, bonito, Ca halibut, sole, turbot, and sanddab. Finfish taken ony by hook-and-line or spearfishing. Commercial fishing only by holders of species-specific CDFG permits; To 1000 feet offshore only the following invertebrates may be taken: lobster, abalone, crab.			
Heisler Park Ecological Reserve	CDFG	1973	CA		Yes	No-take reserve			

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South Laguna Beach Marine Life Refuge	CDFG	1968	CA		No	Recreational fishing only for abalone, lobster, rockfish, greenling, lingcod, cabezon, yellowtail, mackerel, bluefin tuna, kelp bass, spotted sand bass, barred sand bass, sargo, croaker, queenfish, corbina, white seabass, opaleye, halfmoon, surfperch, blacksmith, barracuda, sheephead, bonito, Ca halibut, sole, turbot, and sanddab. Finfish taken ony by hook-and-line or spearfishing. Commercial fishing only by holders of species-specific CDFG permits; To 1000 feet offshore only the following invertebrates may be taken: lobster, abalone, crab.			
Niguel Marine Life Refuge	CDFG	1971	CA		No	Recreational fishing only for abalone, lobster, rockfish, greenling, lingcod, cabezon, yellowtail, mackerel, bluefin tuna, kelp bass, spotted sand bass, barred sand bass, sargo, croaker, queenfish, corbina, white seabass, opaleye, halfmoon, surfperch, blacksmith, barracuda, sheephead, bonito, Ca halibut, sole, turbot, and sanddab. Finfish taken ony by hook-and-line or spearfishing. Commercial fishing only by holders of species-specific CDFG permits; To 1000 feet offshore only the following invertebrates may be taken: lobster, abalone, crab.			

FULLNAME	AGENCY	YEAR ESTAB-LISHED	STATE	GIS layer updated?	Marine Reserve?[7]	FISHING REGULATIONS	OTHER FISHING RELATED NOTES [8]	KELP HARVEST RESTRICTED? [9]	OTHER INFORMATION
Dana Point Marine Life Refuge	CDFG	1969	CA		No	Recreational fishing only for abalone, lobster, rockfish, greenling, lingcod, cabezon, yellowtail, mackerel, bluefin tuna, kelp bass, spotted sand bass, barred sand bass, sargo, croaker, queenfish, corbina, white seabass, opaleye, halfmoon, surfperch, blacksmith, barracuda, sheephead, bonito, Ca halibut, sole, turbot, and sanddab. Finfish taken ony by hook-and-line or spearfishing. Commercial fishing only by holders of species-specific CDFG permits; To 1000 feet offshore only the following invertebrates may be taken: lobster, abalone, crab. No species may be taken in the intertidal zone.			
Doheny State Beach	CDFG	1969	CA		No	Recreational fishing only for abalone, lobster, rockfish, greenling, lingcod, cabezon, yellowtail, mackerel, bluefin tuna, kelp bass, spotted sand bass, barred sand bass, sargo, croaker, queenfish, corbina, white seabass, opaleye, halfmoon, surfperch, blacksmith, barracuda, sheephead, bonito, Ca halibut, sole, turbot, and sanddab. Finfish taken ony by hook-and-line or spearfishing. Commercial fishing only by holders of species-specific CDFG permits; To 1000 feet offshore only the following invertebrates may be taken: lobster, abalone, crab.			

FULLNAME	AGENCY	YEAR ESTAB-LISHED	STATE	GIS layer updated?	Marine Reserve?[7]	FISHING REGULATIONS	OTHER FISHING RELATED NOTES [8]	KELP HARVEST RESTRICTED? [9]	OTHER INFORMATION
City of Encinitas Marine Life Refuge	CDFG	1989	CA		No	Recreational fishing only for abalone, lobster, rockfish, greenling, lingcod, cabezon, yellowtail, mackerel, bluefin tuna, kelp bass, spotted sand bass, barred sand bass, sargo, croaker, queenfish, corbina, white seabass, opaleye, halfmoon, surfperch, blacksmith, barracuda, sheephead, bonito, Ca halibut, sole, turbot, and sanddab. Finfish taken ony by hook-and-line or spearfishing. Commercial fishing only by holders of species-specific CDFG permits; To 1000 feet offshore only the following invertebrates may be taken: lobster, abalone, crab.			
Cardiff and Elijo State Beaches	CDPR, CDFG, SLC	1989	CA		No	Commercial fishing allowed; To 1000 feet offshore, recreational fishing for finfish and the following invertebrates allowed: abalone, chiones, clams, cockles, rock scallops, native oysters, crabs, lobsters, ghost shrimp, sea urchins			
San Diego Marine Life Refuge	CDFG		CA		No	Recreational and commercial fishing allowed only for finfish			
U.C. Scripps Natural Reserve	UC;CDFG	1965	CA		Yes	Recreational and commercial fishing prohibited			
San Diego-La Jolla Ecological Reserve	CDFG	1971	CA		No	Recreational fishing prohibited; Commercial fishing allowed only for bait squid using a hand-held scoop net.			

FULLNAME	AGENCY	YEAR ESTAB-LISHED	STATE	GIS layer updated?	Marine Reserve?[7]	FISHING REGULATIONS	OTHER FISHING RELATED NOTES [8]	KELP HARVEST RESTRICTED? [9]	OTHER INFORMATION
Point Loma Reserve	CDFG, NPS	1978	CA		No	Recreational fishing for finfish only; commercial fishing for finfish, with restrictions on invertebrates. To 1000 feet offshore, only the following invertebrates may be taken commercially: lobster, abalone, crab.			
Kings Range MRPA Ecological Reserve	CDFG	1994	CA		Yes	No-take reserve			
Halibut and Bottomfish Closure Area, Marine Area 3-La Push	WDFW		WA		No	fishing for halibut and bottomfish is closed and anglers may not fish for salmon with bottomfish aboard			
Halibut and Bottomfish Closure Area, Marine Area 4-Neah Bay	WDFW		WA		No	fishing for halibut and bottomfish is closed and anglers may not fish for salmon with bottomfish aboard			
Dungeness Bay Closure- Marine Area 6	WDFW		WA		No	closed to fishing for salmon July 1-Sept 30.			
Kydaka Point Closure, Marine Area 5- Sekiu and Pillar Point	WDFW		WA		No	closed to fishing for salmon July 1-Sept 30.			
Dungeness Bay Closure- Marine Area 6	WDFW		WA		No	closed to fishing for salmon Nov 1-Sept 30.			
Sequim Bay Shrimp District-Marine Area 6	WDFW		WA		No	closed to fishing for shrimp			
Freshwater Bay Closure-Marine Area 6	WDFW		WA		No	closed to all fishing July 1- Aug 31			
Port Angeles Harbor Closure-Marine Area 6	WDFW		WA		No	closed to fishing for salmon July1-August 31			

FULLNAME	AGENCY	YEAR ESTAB-LISHED	STATE	GIS layer updated?	Marine Reserve?[7]	FISHING REGULATIONS	OTHER FISHING RELATED NOTES [8]	KELP HARVEST RESTRICTED? [9]	OTHER INFORMATION
Bellingham Bay Closure- Marine Area 7	WDFW		WA		No	closed to fishing for salmon July 1-August 15.			
Samish Bay Closure- Marine Area 7	WDFW		WA		No	closed to fishing for salmon July 1-October 15.			
July Rosario Strait/Eastern Strait of Juan de Fuca Closure- Marine Area 7	WDFW		WA		No	closed to fishing for salmon July 1- July 31			
Aug-Sept. Rosario Strait/Eastern Strait of Juan de Fuca Closure- Marine Area 7	WDFW		WA		No	closed to fishing of salmon August 1- September 30.			
Tualip Bay Closure- Marine Area 8-2 Port Susan and Port Gardner	WDFW		WA		No	closed to fishing for salmon			
Edmonds Public Fishing Pier- Marine Area 9	WDFW		WA		No	closed to fishing for foodfish and to the harvest of shellfish except when fishing from pier.			
Brackett's Landing Shoreline Sanctuary (formerly Edmonds Underwater Park)- Marine Area 9	WDFW		WA		Yes	closed to all harvest	bedlands and tidelands owned by the City of Edmonds and the water column above them		Edmonds Underwater Park established in 1970. A tribal no-fishing area
Keystone Conservation Area- Marine Area 9			WA		Yes	closed to all harvest	all waters, bedlands and tidelands from extreme high water (EHW) out to 600' offshore of EHW		

FULLNAME	AGENCY	YEAR ESTAB-LISHED	STATE	GIS layer updated?	Marine Reserve?[7]	FISHING REGULATIONS	OTHER FISHING RELATED NOTES [8]	KELP HARVEST RESTRICTED? [9]	OTHER INFORMATION
Admiralty Head Marine Preserve-Marine Area 9			WA		No	closed to all harvest except sea urchins and sea cucumbers	all waters, bedlands and tidelands from extreme low water out to 400 yards offshore		
Puget Sound Naval Shipyard at Bremerton-Marine Area 10			WA		No	closed to fishing for food fish at all times			
Chittenden Locks Closure-Marine Area 10			WA		No	closed to fishing			
Elliott Bay Public Fish Pier-Marine Area 10			WA		No	waters within 100 yards of the Elliott Bay Public Fishing Pier closed to fishing for food fish and the harvest of shellfish except when fishing from the pier.			
Duwamish Waterways Special Rules - area a-Marine Area 10			WA		No	July 1- Oct 31, Unlawful to use forage fish jig gear, night closure, non-buoyant lure restriction.			
Duwamish Waterways Special Rules - area b-Marine Area 10			WA		No	July 1- Oct 31, Terminal gear restricted to bait suspended above the bottom from a float.			
Orchard Rocks Conservation Area- Marine Area 10	WSP		WA		No	closed to all harvest except closure does not affect privately owned fish in net pens and the harvest of clams, oysters and mussels by tideland owners and their families.	waters and bedlands of Rich Passage within a 400 yard radius of Orchard Rocks		
Agate Pass Closure- Marine Area 10			WA		No	closed to all fishing Jan 1- March 31			
Shilshole Bay Closure- Marine Area 10			WA		No	closed to fishing for salmon July 1- Aug 31			

FULLNAME	AGENCY	YEAR ESTAB-LISHED	STATE	GIS layer updated?	Marine Reserve?[7]	FISHING REGULATIONS	OTHER FISHING RELATED NOTES [8]	KELP HARVEST RESTRICTED? [9]	OTHER INFORMATION
Elliott Bay closure			WA		No	closed to fishing for salmon July 1- Aug 31	does not include inner Elliott Bay Fishery		
Les Davis Fishing Pier- Marine Area 11			WA		No	waters within 100 yards of the Les Davis Fishing Pier closed to fishing for food fish and the harvest of shellfish except when fishing from the pier.			
Des Moines Fishing Pier- Marine Area 11			WA		No	waters within 100 yards of the Des Moines Public Fishing Pier closed to fishing for food fish and to the harvest of shellfish except when fishing from the pier			
City of Des Moines Park Conservation Area- Marine Area 11	WDFW, City of Des Moines		WA		Yes	closed to all harvest			also a suspected tribal no-fishing area
South 239th St. Park Conservation Area- Marine Area 11	WDFW, City of Des Moines		WA		Yes	closed to all harvest			also a suspected tribal no-fishing area
Colvos Passage Marine Preserve- Marine Area 11			WA		No	closed to all harvest except salmon trolling allowed			
Commencement Bay Closure			WA		No	closed to fishing for salmon June 1- July 31.			
Sund Rock Conservation Area- Marine Area 12			WA		No	closed to all harvest except tideland owners and their families may still harvest clams, oysters and mussels from their property	waters and bedlands of Rich Passage within a 400 yard radius of Orchard Rocks		
Enetai Hatchery Outfall Closure- Marine Area 12			WA		No	closed year round to fishing for food fish	waters within 100 yards of the Enetai Hatchery outfall		
Big Beef Closure- Marine Area 12			WA		No	closed to fishing for food fish Aug 1 to Nov 30.	waters within 100 feet of the Sea Hwy NW Big Beed Creek Bridge		

FULLNAME	AGENCY	YEAR ESTAB-LISHED	STATE	GIS layer updated?	Marine Reserve?[7]	FISHING REGULATIONS	OTHER FISHING RELATED NOTES [8]	KELP HARVEST RESTRICTED? [9]	OTHER INFORMATION
Octopus Hole Conservation Area- Marine Area 12			WA		No	closed to harvest year-round, except wihtin 100 feet of the high water mark	waters and bedlands of Hood Canal from shore to 200 yards due east		
Waketickeh Creek Conservation Area- Marine Area 12	WDFW		WA		No	closed to all harvest except that tideland owners and their familes may still harvest clams, oysters, and mussels from their property	waters and bedlands out perpendicular to shore 500 yards		tribal fishing not regulated
Carr Inlet Shrimp District- Marine Area 13			WA		No	closed to fishing for shrimp year-round			
Titlow Beach Marine Preserve- Marine Area 13			WA		No	closed to the harvesting of fish, shellfish, and wildlife, except salmon fishing using lures only is permitted from shore or non-motorized craft.			
Saltar's Point Conservation Area- Marine Area 13	WDFW		WA		No	city owned tidelands and water column above tidelands closed to all harvest			tribal fishing not regulated
Zee's Reef Marine Preserve- Area 13			WA		No	closed to all harvest except for fly fishing for salmon allowed			
Carr Inlet Closurees - Marine Area 13			WA		No	closed to fishing for salmon April 16- July 31 except open only to fly fishing for hatchery coho July 1-July 31. Waters at Minter Creek mouth wihtin 1000' of outer oyster stakes closed to fishing for salmon July 1- Sept 30.			

FULLNAME	AGENCY	YEAR ESTAB-LISHED	STATE	GIS layer updated?	Marine Reserve?[7]	FISHING REGULATIONS	OTHER FISHING RELATED NOTES [8]	KELP HARVEST RESTRICTED? [9]	OTHER INFORMATION
Budd Inlet Closure			WA		No	waters of Budd inlet south of the Fourth Ave Bridge closed year round. All continguous waters between the Fourth Ave Bridge and a line drawn between the NW corner of the Thriftway Market to a point 100 yards north of the railraod bridge located on the western side of the inlet closed to fishing for salmon and bottomfish July 16-Oct. 31. North of this line to the area south of a line project true west from the KGY Radio Station Tower to the western shore of the Budd inlet has night closure and non-buoyant lure restrcitions in effect July 16-Oct 31.			

Please note that Table 3. continues on the following pages, with information from Didier, 1998. Where areas overlap with the above information, the above information is more current).

Site Name	Eatablished	State	Managing Agency	Zone	Regulations
Friday Harbor to Point Caution	1990	WA	WDFW; FHL	S, I	No take of shellfish, bottomfish or food fish, except herring, and except salmon for commercial purposes
Yellow and Low Islands	1990	WA	WDFW; FHL	S, I	No take of shellfish, bottomfish or food fish, except herring, and except salmon for commercial purposes
False Bay	1990	WA	WDFW; FHL	S, I	No take of shellfish, bottomfish or food fish, except herring, and except salmon for commercial purposes
Argyle Lagoon	1990	WA	WDFW; FHL	S, I	No take of shellfish, bottomfish or food fish, except herring, and except salmon for commercial purposes
SW Shaw Island	1990	WA	WDFW; FHL	S, I	No take of shellfish except crab in Parks Bay. No take of bottomfish or food fish, except herring, and except salmon for commercial purposes
San Juan County/ Cypress I.	1923	WA	FHL	S, I	No take of marine biological materials, except for food, kelp, or with permission of the Director, Friday Harbor Marine Laboratories
Edmonds Underwater Park	1970	WA	City of Edmonds	S, I	No take of foodfish or shellfish
Sund Rock	1994	WA	WDFW	S, I	No take of shellfish, except shrimp; no take of food fish, except salmon and trout
Haro Strait	1979-1987	WA	WDFW	S, I	Closed to commercial harvest of sea urchins and sea cucumbers
San Juan & Upright Channel	1972	WA	WDFW	S, I	Closed to commercial harvest of sea urchins and sea cucumbers
Point Lawrence	1997	WA	San Juan County	S, I	Voluntary no-take of bottomfish
Bell Island	1997	WA	San Juan County	S, I	Voluntary no-take of bottomfish
Charles Island	1997	WA	San Juan County	S, I	Voluntary no-take of bottomfish
Pile Point	1997	WA	San Juan County	S, I	Voluntary no-take of bottomfish
Lime Kiln Lighthouse	1997	WA	San Juan County	S, I	Voluntary no-take of bottomfish
Kellett Bluff	1997	WA	San Juan County	S, I	Voluntary no-take of bottomfish
Gull Rock	1997	WA	San Juan County	S, I	Voluntary no-take of bottomfish
Bare Island	1997	WA	San Juan County	S, I	Voluntary no-take of bottomfish

Dabob Bay	1987	WA	DNR	I	Open to approved scientific research projects and educational functions, but closed to all other public activities
Kennedy Creek	1990	WA	DNR	I	Open to approved scientific research projects and educational functions, but closed to all other public activities
Skookum Inlet	1986	WA	DNR	I	Open to approved scientific research projects and educational functions, but closed to all other public activities
Zella M. Schultz / Protection Island	1975	WA	WDFW; USFWS	S, I	Closed to public access
Tongue Point	1989	WA	Clallam County	S, I	Removal of any marine life by permit only, except fish caught by sport fishing or clams, crabs, or mussels gathered in season.
Yellow Island	1980	WA	TNC	I	No collection of plants or animals, no fishing while on preserve property; limited public access
Chuckanut Island	1972	WA	TNC	I	No collection of plants or animals, no fishing while on preserve property; limited public access
Foulweather Bluff	1966	WA	TNC	I	No collection of plants or animals, no fishing while on preserve property; limited public access
Goose Island	1975	WA	TNC	I	No public access
Deadman Island	1975	WA	TNC	I	No public access
Sentinel Island	1979	WA	TNC	I	No public access
Waldron Island	1968	WA	TNC	I	No collection of plants or animals, no fishing while on preserve property; limited public access
Lummi Island	199?	WA	WDFW	I	Generally closed to public access, although not enforced at this site
Kimball Preserve, Decatur Island	1985	WA	SJPT	I	No public access
South Puget Sound	1988	WA	WDFW	I	Non-consumptive recreational and educational use only
Titlow Beach	1994	WA	METRO/ Tacoma	S, I	No take of shellfish or food fish, except salmon with artificial lures.
Cypress Island	1987	WA	DNR	I	None
Woodard Bay	1987	WA	DNR	I	No access in sensitive intertidal areas; access discouraged at sensitive adjacent subtidal areas.
Skagit	1948-1992	WA	WDFW	I	None at this time. Pending management plan may prohibit commercial clamming.
Sequim Bay State Park		WA	WPRC	S, I	No harvest of non-game invertebrates; no algae harvest
Fort Flagler State Park		WA	WPRC	S, I	No harvest of non-game invertebrates
Fort Worden State Park		WA	WPRC	S, I	No harvest of non-game invertebrates

Mystery Bay Marine State Park		WA	WPRC	S, I	No harvest of non-game invertebrates; no algae harvest
Old Fort Townsend State Park		WA	WPRC	S, I	No harvest of non-game invertebrates; no algae harvest
Pleasant Harbor State Park		WA	WPRC	S, I	No harvest of non-game invertebrates; no algae harvest
Triton Cove State Park		WA	WPRC	S, I	No harvest of non-game invertebrates; no algae harvest
Dash Point State Park		WA	WPRC	S, I	No harvest of non-game invertebrates; no algae harvest
Saltwater State Park		WA	WPRC	S, I	No harvest of non-game invertebrates; no algae harvest
Blake Island State Park		WA	WPRC	S, I	No harvest of non-game invertebrates; no algae harvest
Fay-Bainbridge State Park		WA	WPRC	S, I	No harvest of non-game invertebrates; no algae harvest
Camano Island State Park		WA	WPRC	S, I	No harvest of non-game invertebrates; no algae harvest
Fort Ward State Park		WA	WPRC	S, I	No harvest of non-game invertebrates; no algae harvest
Harper State Park		WA	WPRC	S, I	No harvest of non-game invertebrates; no algae harvest
Illahee State Park		WA	WPRC	S, I	No harvest of non-game invertebrates; no algae harvest
Kitsap Memorial State Park		WA	WPRC	S, I	No harvest of non-game invertebrates; no algae harvest
Manchester State Park		WA	WPRC	S, I	No harvest of non-game invertebrates; no algae harvest
Old Man House State Park		WA	WPRC	S, I	No harvest of non-game invertebrates; no algae harvest
Scenic Beach State Park		WA	WPRC	S, I	No harvest of non-game invertebrates; no algae harvest
Belfair State Park		WA	WPRC	S, I	No harvest of non-game invertebrates; no algae harvest
Harstine Island State Park		WA	WPRC	S, I	No harvest of non-game invertebrates; no algae harvest
Hope Island (S.) Marine State Park		WA	WPRC	S, I	No harvest of non-game invertebrates; no algae harvest
Deception Pass State Park		WA	WPRC	S, I	No harvest of non-game invertebrates; no algae harvest
Jarrell Cove State Park		WA	WPRC	S, I	No harvest of non-game invertebrates; no algae harvest
McMicken Is. Marine State Park		WA	WPRC	S, I	No harvest of non-game invertebrates; no algae harvest
Potlach State Park		WA	WPRC	S, I	No harvest of non-game invertebrates; no algae harvest
Squaxin Island State Park		WA	WPRC	S, I	No harvest of non-game invertebrates; no algae harvest
Stretch Point State Park		WA	WPRC	S, I	No harvest of non-game invertebrates; no algae harvest

Twanoh State Park	WA	WPRC	S, I	No harvest of non-game invertebrates; no algae harvest
Cutts Island Marine State Park	WA	WPRC	S, I	No harvest of non-game invertebrates; no algae harvest
Eagle Island Marine State Park	WA	WPRC	S, I	No harvest of non-game invertebrates; no algae harvest
Joemma Beach State Park	WA	WPRC	S, I	No harvest of non-game invertebrates; no algae harvest
Kopachuch State Park	WA	WPRC	S, I	No harvest of non-game invertebrates; no algae harvest
Ebey's Landing	WA	WPRC	S, I	No harvest of non-game invertebrates; no algae harvest
Penrose Point State Park	WA	WPRC	S, I	No harvest of non-game invertebrates; no algae harvest
Blind Island Marine State Park	WA	WPRC	S, I	No harvest of non-game invertebrates; no algae harvest
Clark Island Marine State Park	WA	WPRC	S, I	No harvest of non-game invertebrates; no algae harvest
Doe Island Marine State Park	WA	WPRC	S, I	No harvest of non-game invertebrates; no algae harvest
James Island Marine State Park	WA	WPRC	S, I	No harvest of non-game invertebrates; no algae harvest
Jones Island Marine State Park	WA	WPRC	S, I	No harvest of non-game invertebrates; no algae harvest
Lime Kiln State Park	WA	WPRC	S, I	No harvest of non-game invertebrates; no algae harvest
Matia Island Marine State Park	WA	WPRC	S, I	No harvest of non-game invertebrates; no algae harvest
Moran State Park	WA	WPRC	S, I	No harvest of non-game invertebrates; no algae harvest
Patos Island Marine State Park	WA	WPRC	S, I	No harvest of non-game invertebrates; no algae harvest
Fort Casey State Park	WA	WPRC	S, I	No harvest of non-game invertebrates; no algae harvest
Posev Island Marine State Park	WA	WPRC	S, I	No harvest of non-game invertebrates; no algae harvest
Spencer Spit State Park	WA	WPRC	S, I	No harvest of non-game invertebrates; no algae harvest
Stuart Island Marine State Park	WA	WPRC	S, I	No harvest of non-game invertebrates; no algae harvest
Sucia Island Marine State Park	WA	WPRC	S, I	No harvest of non-game invertebrates; no algae harvest
Turn Island Marine State Park	WA	WPRC	S, I	No harvest of non-game invertebrates; no algae harvest
Bay View State Park	WA	WPRC	S, I	No harvest of non-game invertebrates; no algae harvest
Larrabee State Park	WA	WPRC	S, I	No harvest of non-game invertebrates; no algae harvest
Saddlebag Island Marine State Park	WA	WPRC	S, I	No harvest of non-game invertebrates; no algae harvest

Mukilteo State Park	WA	WPRC	S, I	No harvest of non-game invertebrates; no algae harvest
Tolmie State Park	WA	WPRC	S, I	No harvest of non-game invertebrates; no algae harvest
Fort Ebey State Park	WA	WPRC	S, I	No harvest of non-game invertebrates
Birch Bay State Park	WA	WPRC	S, I	No harvest of non-game invertebrates; no algae harvest
Joseph Whidbey State Park	WA	WPRC	S, I	No harvest of non-game invertebrates; no algae harvest
South Whidbey State Park	WA	WPRC	S, I	No harvest of non-game invertebrates; no algae harvest
Dosewallips State Park	WA	WPRC	S, I	No harvest of non-game invertebrates; no algae harvest
Pacific Beach State Park	WA	WPRC		
Griffiths-Priday State Park	WA	WPRC		
Ocean City State Park	WA	WPRC		
Wethaven State Park	WA	WPRC		
Westport Light State Park	WA	WPRC		
Twin Harbors State Park	WA	WPRC		
Grayland Beach State Park	WA	WPRC		
Leadbetter Point State Park	WA	WPRC		
Pacific Pines State Park	WA	WPRC		
Loomis Lake State Park	WA	WPRC		
Fort Canby State Park	WA	WPRC		
Fort Columbia State Park	WA	WPRC		
Washington State Seashore Conservation Area	WA	WPRC		
Elk River Natural Resources Conservation Area	WA	DNR		
Bone River Natural Area Preserve	WA	DNR		
Goose Island Natural Area Preserve	WA	DNR		
Gunpowder Island Natural Area Preserve	WA	DNR		
Niawiakum River Natural Area Preserve	WA	DNR		

Sand Island Natural Area Preserve		WA	DNR		
Whitcomb Flats		WA	DNR		

DNR = Washington Dept. of Natural Resources
Ecology = Washington Dept. of Ecology
TNC = The Nature Conservancy
SJPT = San Juan Preservation Trust
FHL = UW Friday Harbor Laboratories
USFWS = US Fish & Wildlife Service
WDFW = Washington Dept. of Fish and Wildlife
METRO/Tacoma = Metorpolitan Park District of Tacoma
WPRC = Washington State Parks & Recreation Commission

Table 4. Undersea Cables

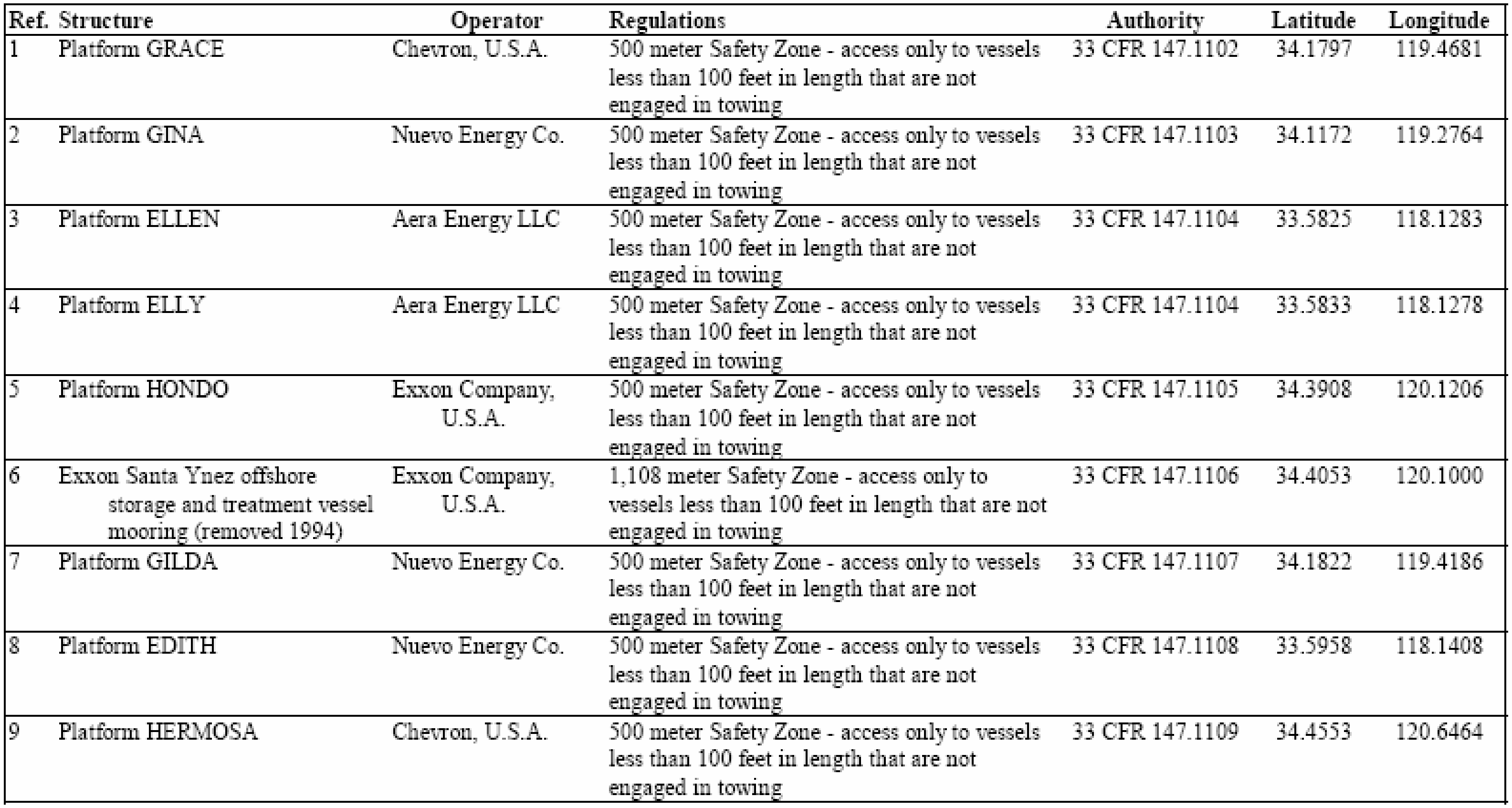
While there are no government regulations that prohibit fishing in the vicinity of marine cables, AT&T advises fishing gear be kept a distance of one nautical mile (1NM) from both sides of the charted location of all submarine cables. Pursuant to the International Convention of 1884 For the Protection of Submarine Cables and the United States Submarine Cable Act (47 USC 21-23), it is a criminal offense to willfully and wrongfully break or injure a submarine cable in such a manner as might interrupt service. It is also a misdemeanor to break or injure a cable through culpable negligence. Penalties upon conviction include fine and/or imprisonment. In addition, civil action may be taken by the cable system owners to recover damages.

Cable	Agency	In-Service Date	Status
ATOC Pillar Point	APL	1995	Scientific
ATOC San Simeon Wet Storage 1	APL		Scientific
ATOC San Simeon Wet Storage 2	APL		Scientific
AZCAN	Teleglobe	1983	Retired
COMPAC (Retired 1983)	AT&T	1963	Retired
HAW-1 East West	AT&T	1957	Retired, Scientific
HAW-1 West East	AT&T	1957	Retired, Scientific
HAW-3	AT&T	1974	Retired, Scientific
HAW-4	AT&T	1989	In-Service
HAW-5	AT&T	1993	In-Service
NPC Pacific City	NPC	1991	In-Service
NPS, Sur Ridge to Point Sur	NPS		Scientific
TPC-4	AT&T	1992	In-Service
TPC-4 Canada	AT&T	1992	In-Service
TPC-5 Bandon	AT&T	1996	In-Service
TPC-5 Hawaii	AT&T	1996	In-Service
TPC-5 Japan	AT&T	1996	In-Service
TPC-5 Morro Bay	AT&T	1996	In-Service
Washington-Alaska (N-S) (Retired 1977)	AT&T	1956	Retired
Washington-Alaska (S-N) (Retired 1977)	AT&T	1956	Retired

APL = Applied Physics Laboratory, University of Washington
ATOC = Acoustic Thermometry of Ocean Climate, AZCAN = Australia-New Zealand-Canada
COMPAC = Commonwealth Pacific Cable, HAW = Hawaii
NPC = North Pacific Cable, NPS = Naval Postgraduate School, TPC = Trans-Pacific Cable

Table 5. Offshore Drilling Platforms

While there are no regulations that specifically prohibit fishing in the vicinity of these structures, some are protected by regulations that restrict access to the general vicinity by large vessels or by vessels in tow (33 CFR 147). While the superstructures have been removed at some of these sites in recent years, underwater debris that remains may be a hazard to some fishing gears. The Minerals Management Service (MMS), a bureau of the U.S. Department of the Interior, manages the mineral resources of the Outer Continental Shelf. All of the 24 oil and gas production facilities in the Pacific OCS region are located off the coast of California. The State of California, Department of Conservation, Oil and Gas Division oversees the construction, operation and closure of additional wells in state waters.



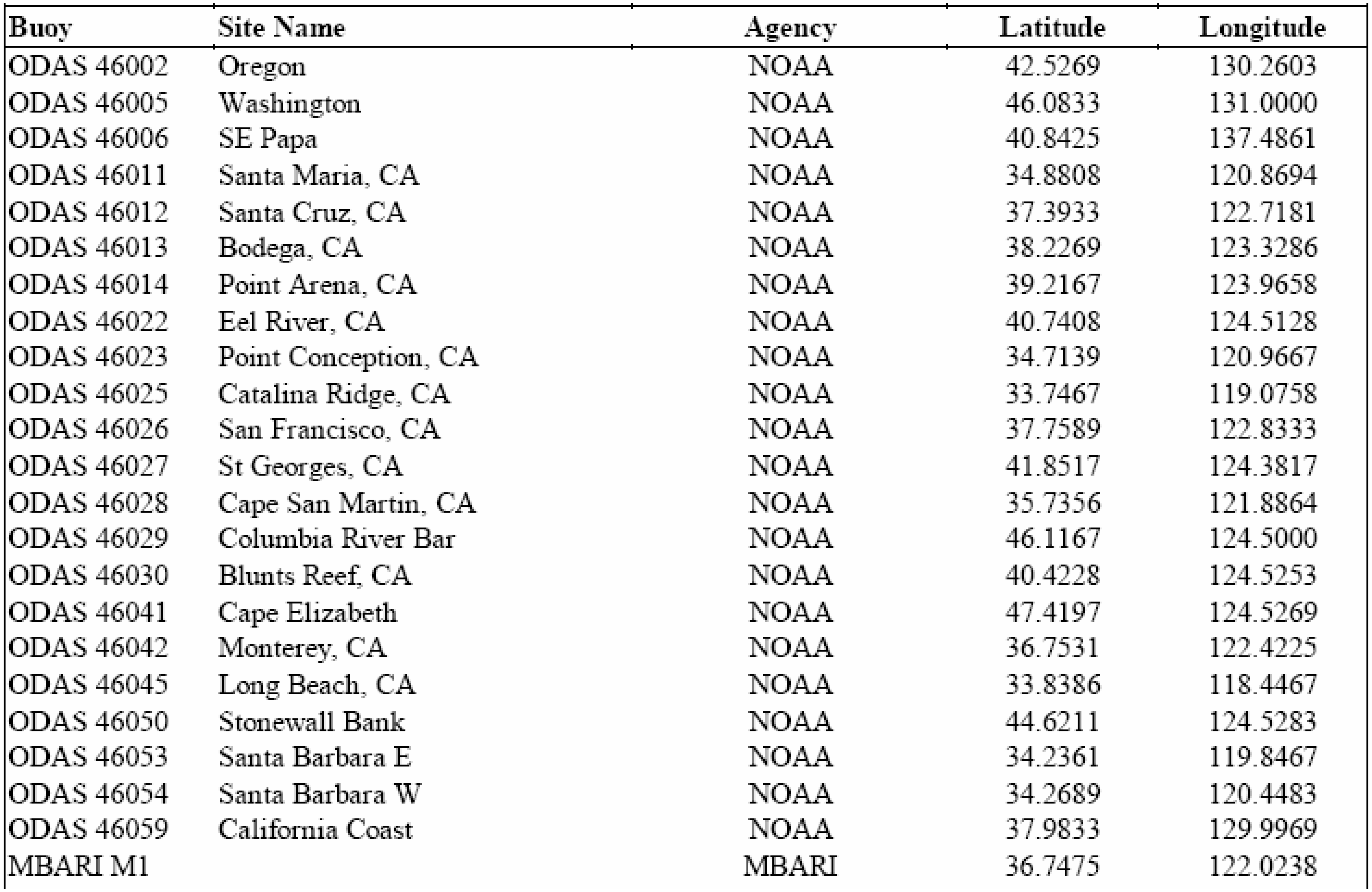
Ref.	Structure	Operator	Regulations	Authority	Latitude	Longitude
1	Platform GRACE	Chevron, U.S.A.	500 meter Safety Zone - access only to vessels less than 100 feet in length that are not engaged in towing	33 CFR 147.1102	34.1797	119.4681
2	Platform GINA	Nuevo Energy Co.	500 meter Safety Zone - access only to vessels less than 100 feet in length that are not engaged in towing	33 CFR 147.1103	34.1172	119.2764
3	Platform ELLEN	Aera Energy LLC	500 meter Safety Zone - access only to vessels less than 100 feet in length that are not engaged in towing	33 CFR 147.1104	33.5825	118.1283
4	Platform ELLY	Aera Energy LLC	500 meter Safety Zone - access only to vessels less than 100 feet in length that are not engaged in towing	33 CFR 147.1104	33.5833	118.1278
5	Platform HONDO	Exxon Company, U.S.A.	500 meter Safety Zone - access only to vessels less than 100 feet in length that are not engaged in towing	33 CFR 147.1105	34.3908	120.1206
6	Exxon Santa Ynez offshore storage and treatment vessel mooring (removed 1994)	Exxon Company, U.S.A.	1,108 meter Safety Zone - access only to vessels less than 100 feet in length that are not engaged in towing	33 CFR 147.1106	34.4053	120.1000
7	Platform GILDA	Nuevo Energy Co.	500 meter Safety Zone - access only to vessels less than 100 feet in length that are not engaged in towing	33 CFR 147.1107	34.1822	119.4186
8	Platform EDITH	Nuevo Energy Co.	500 meter Safety Zone - access only to vessels less than 100 feet in length that are not engaged in towing	33 CFR 147.1108	33.5958	118.1408
9	Platform HERMOSA	Chevron, U.S.A.	500 meter Safety Zone - access only to vessels less than 100 feet in length that are not engaged in towing	33 CFR 147.1109	34.4553	120.6464

10	Platform HARVEST	Chevron, U.S.A.	500 meter Safety Zone - access only to vessels less than 100 feet in length that are not engaged in towing	33 CFR 147.1110	34.4693	120.6795
11	Platform EUREKA	Aera Energy LLC	500 meter Safety Zone - access only to vessels less than 100 feet in length that are not engaged in towing	33 CFR 147.1111	33.5639	118.1167
12	Platform HIDALGO	Chevron, U.S.A.	500 meter Safety Zone - access only to vessels less than 100 feet in length that are not engaged in towing	33 CFR 147.1112	34.4950	120.7022
13	Platform GAIL	Chevron, U.S.A.	500 meter Safety Zone - access only to vessels less than 100 feet in length that are not engaged in towing	33 CFR 147.1113	34.1250	119.4003
14	Platform HARMONY	Exxon Company, U.S.A.	500 meter Safety Zone - access only to vessels less than 100 feet in length that are not engaged in towing	33 CFR 147.1114	34.3767	120.1675
15	Platform HERITAGE	Exxon Company, U.S.A.	500 meter Safety Zone - access only to vessels less than 100 feet in length that are not engaged in towing	33 CFR 147.1115	34.3503	120.2792
16	Platform IRENE	Torch Operating Company	500 meter Safety Zone - access only to vessels less than 100 feet in length that are not engaged in towing	33 CFR 147.1116	34.6104	120.7294
17	Platform HOGAN	Pacific Operators Offshore, Inc.			34.3377	119.5415
18	Platform HOUCHIN	Pacific Operators Offshore, Inc.			34.3350	119.5521
19	Platform HABITAT	Nuevo Energy Co.			34.2866	119.5881
20	Platform HENRY	Nuevo Energy Co.			34.3333	119.5604
21	Platform HILLHOUSE	Nuevo Energy Co.			34.3313	119.6032
22	Platform A	Nuevo Energy Co.			34.3319	119.6125
23	Platform B	Nuevo Energy Co.			34.3323	119.6215
24	Platform C	Nuevo Energy Co.			34.3329	119.6308

25	Platform HEIDI (removed)	Chevron, U.S.A.	34.3424	119.5186
26	Platform HOPE (removed)	Chevron, U.S.A.	34.3408	119.5308
27	Platform HILDA (removed)	Chevron, U.S.A.	34.3888	119.5950
28	Platform HAZEL (removed)	Chevron, U.S.A.	34.3832	119.5670
29	Platform EMMY	Shell Oil Corp.	33.6613	118.0448
30	Platform ESTHER	Chevron, U.S.A.	33.7247	118.1167
31	Platform EVA	Unocal	33.6623	118.0615
32	Platform WHITE	Thums Tract	33.7526	118.159
33	Platform GRISSOM	Thums Tract	33.7591	118.182
34	Platform BELMONT	Exxon Company, U.S.A.	33.7216	118.125
35	Platform FREEMAN	Thums Tract	33.7412	118.162
36	Platform CHAFFEE	Thums Tract	33.7397	118.139
37	Platform HOLLY	Mobil, Corp.	34.3913	119.9052

Table 6. Weather and Scientific Buoys

While there are no regulations that specifically prohibit fishing in the vicinity of these moorages, NOAA advises vessels to give weather buoys a wide berth to avoid entangling the buoy's mooring or other equipment that may be suspended from it. The agency recommends that vessels trailing gear allow 500 yards clearance, and that all others allow at least 20 yards.



Buoy	Site Name	Agency	Latitude	Longitude
ODAS 46002	Oregon	NOAA	42.5269	130.2603
ODAS 46005	Washington	NOAA	46.0833	131.0000
ODAS 46006	SE Papa	NOAA	40.8425	137.4861
ODAS 46011	Santa Maria, CA	NOAA	34.8808	120.8694
ODAS 46012	Santa Cruz, CA	NOAA	37.3933	122.7181
ODAS 46013	Bodega, CA	NOAA	38.2269	123.3286
ODAS 46014	Point Arena, CA	NOAA	39.2167	123.9658
ODAS 46022	Eel River, CA	NOAA	40.7408	124.5128
ODAS 46023	Point Conception, CA	NOAA	34.7139	120.9667
ODAS 46025	Catalina Ridge, CA	NOAA	33.7467	119.0758
ODAS 46026	San Francisco, CA	NOAA	37.7589	122.8333
ODAS 46027	St Georges, CA	NOAA	41.8517	124.3817
ODAS 46028	Cape San Martin, CA	NOAA	35.7356	121.8864
ODAS 46029	Columbia River Bar	NOAA	46.1167	124.5000
ODAS 46030	Blunts Reef, CA	NOAA	40.4228	124.5253
ODAS 46041	Cape Elizabeth	NOAA	47.4197	124.5269
ODAS 46042	Monterey, CA	NOAA	36.7531	122.4225
ODAS 46045	Long Beach, CA	NOAA	33.8386	118.4467
ODAS 46050	Stonewall Bank	NOAA	44.6211	124.5283
ODAS 46053	Santa Barbara E	NOAA	34.2361	119.8467
ODAS 46054	Santa Barbara W	NOAA	34.2689	120.4483
ODAS 46059	California Coast	NOAA	37.9833	129.9969
MBARI M1		MBARI	36.7475	122.0238

MBARI M2	MBARI	36.6900	122.3950
MBARI M3	MBARI	36.5680	122.9568
MBARI S1	MBARI	36.6670	122.3753
MBARI S2	MBARI	36.4998	122.9335

MBARI = Monterey Bay Aquarium Research Institute
NOAA = National Oceanic and Atmospheric Administration
ODAS = Ocean Data Acquisition System

Table 7. Regulated Navigation Areas

US Coast Guard regulations restrict navigation in the vicinity of military reservations, or in areas with high levels of vessel traffic. Relevant regulations are published in 33 CFR 165.

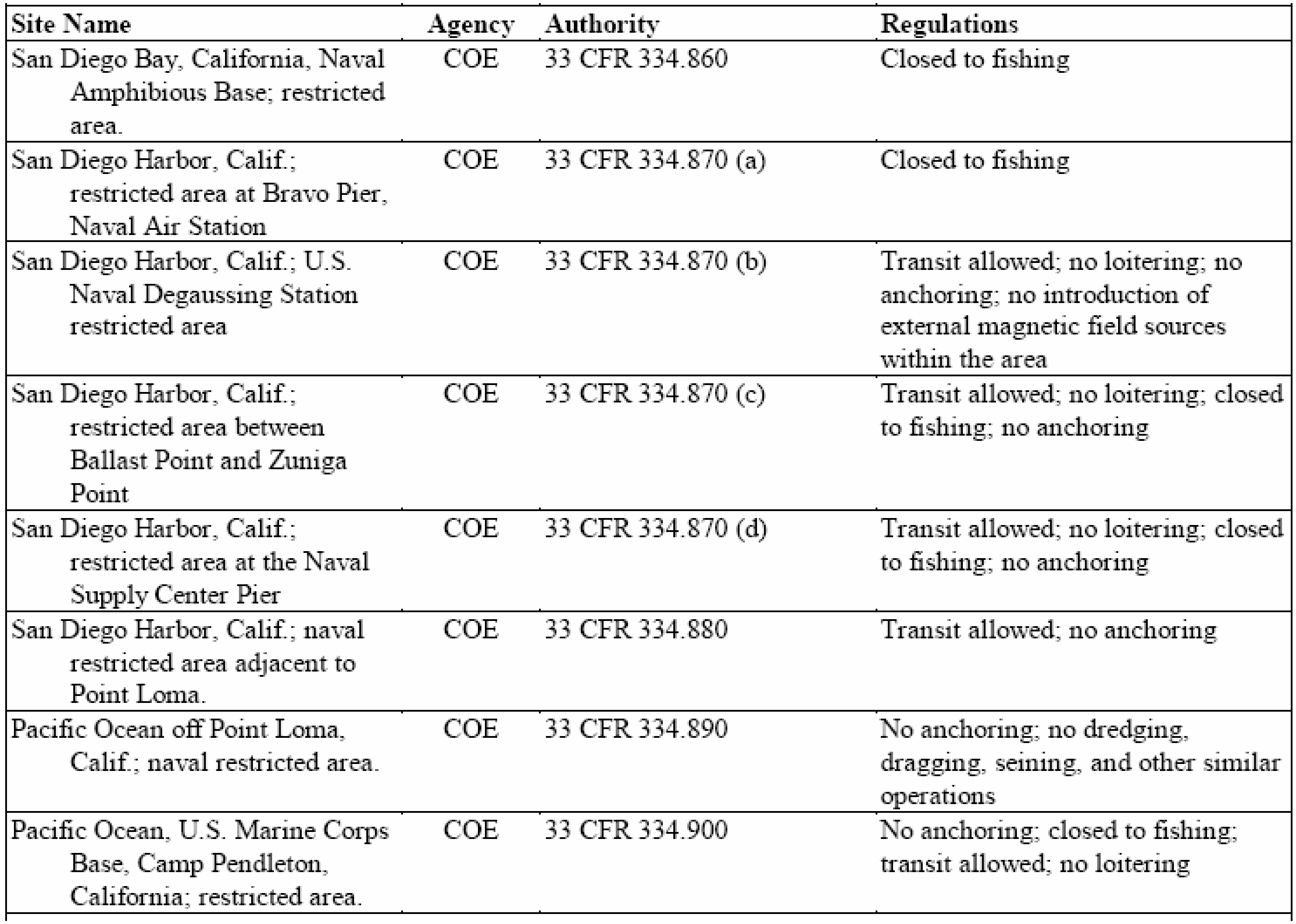
Site Name	Agency	Authority	Regulations
Security Zone: San Diego Bay, California.	USCG	33 CFR 165.1102	Area closed; access permission required
Security Zone: San Diego Bay, California	USCG	33 CFR 165.1103	Area closed; access permission required
Security Zone: San Diego Bay, California	USCG	33 CFR 165.1104	Area closed; access permission required
Security Zone: San Diego Bay, California.	USCG	33 CFR 165.1105	Area closed; access permission required
Security Zone: San Diego Bay, California	USCG	33 CFR 165.1106	Area closed; access permission required
San Diego Bay, California -safety zone	USCG	33 CFR 165.1107	Transit allowed with permission, but no anchoring or stopping
San Diego Bay, California.	USCG	33 CFR 165.1108	Mariners transiting within the regulated navigation area shall proceed at a speed that generates no wake from their vessel, and comply with USCG orders during submarine docking/undocking.
San Pedro Bay, California - Los Angeles Pilot Area	USCG	33 CFR 165.1109 (b)(1)	Entry or departure from LA Main Channel via the LA Harbor Entrance only; no stopping or loitering except to disembark a pilot; leave LA Approach Lighted Bell Buoy "LA" to port when entering or departing LA Main Channel

in Northwestern Washington—Regulated Navigation Area.			gillnet and purse seine fishing, are prohibited in the Prohibited Fishing Area
San Pedro Bay, California - Long Beach Pilot Area	USCG	33 CFR 165.1109 (b)(2)	Entry or departure via Long Beach Harbor Entrance only; no stopping or loitering except to disembark a pilot; leave Long Beach Approach Lighted Whistle Buoy "LB" to port when entering or departing Long Beach Channel
San Pedro Bay, California - Regulated Navigation Area	USCG	33 CFR 165.1109 (e)(4)	Transit only area for vessels over 30 meters in length, towing vessels over 8 meters in length, vessels over 100 gross tons carrying passengers for hire while navigating, and dredges and floating plants.
Los Angeles Harbor; San Pedro Bay, CA. - Pier 400 Safety Zone	USCG	33 CFR 165.1110 (a)(1)	Area closed; access permission required
Los Angeles Harbor; San Pedro Bay, CA. - Shallow Water Habitat Extension	USCG	33 CFR 165.1110 (a)(2)	Area closed; access permission required
Security Zone: Wilson Cove, San Clemente Island, California	USCG	33 CFR 165.1111	Area closed; access permission required
San Francisco Bay, California--Regulated Navigation Area.	USCG	33 CFR 165.1114 (c)(1)(i)	Regulations govern use of traffic lanes
Puget Sound and Adjacent Waters	USCG	33 CFR 165.1301 (c)(3)	Vessels engaged in fishing, including

in Northwestern Washington—Regulated Navigation Area.			gillnet and purse seine fishing, are prohibited in the Prohibited Fishing Area
Bangor Naval Submarine Base, Bangor, WA security zone	USCG	33 CFR 165.1302 (a)	Area closed; access permission required
Bangor Naval Submarine Base, Bangor, WA security zone anchorage Area No. 2	USCG	33 CFR 165.1302 (b)	Area closed; access permission required
Bellingham Bay, Bellingham, WA. safety zone	USCG	33 CFR 165.1304	Area closed; access permission required annually on July fourth from 9:30 p.m. to 11 p.m.
Commencement Bay, Tacoma, WA. safety zone	USCG	33 CFR 165.1305	Area closed; access permission required
Lake Union, Seattle, WA. Safety zone	USCG	33 CFR 165.1306	Area closed; access permission required annually on July fourth from 9:30 p.m. to 11 p.m.
Elliott Bay, Seattle, WA. Safety zone	USCG	33 CFR 165.1307	Area closed; access permission required
Columbia River, Vancouver, WA. safety zone	USCG	33 CFR 165.1308	Area closed; access permission required
USCG = U.S. Coast Guard			

Table 8. Danger Zones and Restricted Areas

Waters in the vicinity of military installations may be closed under the Department of the Army, Corps of Engineers on either a temporary or permanent basis. The reasons for these closures include station security, or as a safety precaution when military operations are underway. Relevant regulations are published in 33 CFR 334.



Site Name	Agency	Authority	Regulations
San Diego Bay, California, Naval Amphibious Base; restricted area.	COE	33 CFR 334.860	Closed to fishing
San Diego Harbor, Calif.; restricted area at Bravo Pier, Naval Air Station	COE	33 CFR 334.870 (a)	Closed to fishing
San Diego Harbor, Calif.; U.S. Naval Degaussing Station restricted area	COE	33 CFR 334.870 (b)	Transit allowed; no loitering; no anchoring; no introduction of external magnetic field sources within the area
San Diego Harbor, Calif.; restricted area between Ballast Point and Zuniga Point	COE	33 CFR 334.870 (c)	Transit allowed; no loitering; closed to fishing; no anchoring
San Diego Harbor, Calif.; restricted area at the Naval Supply Center Pier	COE	33 CFR 334.870 (d)	Transit allowed; no loitering; closed to fishing; no anchoring
San Diego Harbor, Calif.; naval restricted area adjacent to Point Loma.	COE	33 CFR 334.880	Transit allowed; no anchoring
Pacific Ocean off Point Loma, Calif.; naval restricted area.	COE	33 CFR 334.890	No anchoring; no dredging, dragging, seining, and other similar operations
Pacific Ocean, U.S. Marine Corps Base, Camp Pendleton, California; restricted area.	COE	33 CFR 334.900	No anchoring; closed to fishing; transit allowed; no loitering

California; restricted area.			
Pacific Ocean, Offshore of Camp Pendleton, California; Fallbrook restricted area.	COE	33 CFR 334.905	No anchoring; closed to fishing; transit allowed; no loitering
Pacific Ocean, Camp Pendleton Boat Basin, U.S. Marine Corps Base, Camp Pendleton, Calif.; restricted area.	COE	33 CFR 334.910	No access without permission
Pacific Ocean off the east coast of San Clemente Island, Calif.; naval restricted area.	COE	33 CFR 334.920	Closed to dredging, dragging, seining or other fishing operations
Pacific Ocean at San Clemente Island, Calif.; naval restricted area.	COE	33 CFR 334.921	No anchorage
Anaheim Bay Harbor, Calif.; Naval Weapons Station, Seal Beach.	COE	33 CFR 334.930	Transit only; recreational craft and any activity involving persons in the water are specifically prohibited; smoking; open flames and barbecues in boats are prohibited during the transit
Federal Correctional Institution, Terminal Island, San Pedro Bay, California; restricted	COE	33 CFR 334.938	Access prohibited

Pacific Ocean in vicinity of San Pedro, Calif.; practice firing range for United States Army Reserve, National Guard, and Coast Guard units.	COE	33 CFR 334.940	Area closed only when in use
Pacific Ocean at San Clemente Island, California; Navy shore bombardment areas.	COE	33 CFR 334.950	Area closed only when in use; no anchoring
Pacific Ocean, San Clemente Island, Calif.; naval danger zone off West Cove.	COE	33 CFR 334.960	Area closed only when in use

Pacific Ocean, San Clemente Island, California, naval danger zone off the northwest shore.	COE	33 CFR 334.961	Area closed only when in use
Pacific Ocean; around San Nicolas Island, Calif., naval restricted area - ALPHA section	COE	33 CFR 334.980 (b)(1)	Seaplanes prohibited; dredging, dragging, seining, anchoring and other fishing operations are prohibited
Pacific Ocean; around San Nicolas Island, Calif., naval restricted area - BRAVO section	COE	33 CFR 334.980 (b)(2)	Seaplanes prohibited; area closed only when in use
Pacific Ocean; around San Nicolas Island, Calif., naval restricted area - CHARLIE section	COE	33 CFR 334.980 (b)(3)	Seaplanes prohibited; area closed only when in use
Long Beach Harbor, Calif.; naval restricted area.	COE	33 CFR 334.990	Area closed
San Francisco Bay in vicinity of Hunters Point; naval restricted area	COE	33 CFR 334.1010	Area closed
San Francisco Bay and Oakland Inner Harbor; restricted area #1 in vicinity of Naval Air Station, Alameda	COE	33 CFR 334.1020 (a)(1)	Area closed
San Francisco Bay and Oakland Inner Harbor; restricted area #2 in vicinity of Naval Air Station, Alameda	COE	33 CFR 334.1020 (a)(2)	Area closed
Oakland Inner Harbor adjacent to Alameda Facility, Naval Supply Center, Oakland; restricted area.	COE	33 CFR 334.1030	Area closed

Oakland Outer Harbor adjacent to the Military Ocean Terminal, Bay Area, Pier No. 8 (Port of Oakland Berth No. 10); restricted area.	COE	33 CFR 334.1050	Area closed
Oakland Outer Harbor adjacent to the Oakland Army Base; restricted area.	COE	33 CFR 334.1060	Area closed
San Francisco Bay between Treasure Island and Yerba Buena Island; naval restricted area.	COE	33 CFR 334.1070	Area closed
San Francisco Bay adjacent to northeast corner of Treasure Island; naval restricted area.	COE	33 CFR 334.1080	Area closed
San Francisco Bay in vicinity of the NSC Fuel Department, Point Molate restricted area.	COE	33 CFR 334.1090	Area closed
San Pablo Bay, Carquinez Strait, and Mare Island Strait in vicinity of U.S. Naval Shipyard, Mare Island; restricted area.	COE	33 CFR 334.1100	Area closed
Suisun Bay at Naval Weapons Station, Concord; restricted area.	COE	33 CFR 334.1110	Area closed
Pacific Ocean in the vicinity of Point Mugu, Calif.; naval small arms firing range.	COE	33 CFR 334.1120	Area closed only when in use

Pacific Ocean, Western Space and Missile Center (WSMC), Vandenberg AFB, Calif.; danger zones - Zone 5	COE	33 CFR 334.1130 (a)(1)(v)	Area closed only when in use
Pacific Ocean, Western Space and Missile Center (WSMC), Vandenberg AFB, Calif.; danger zones - Zone 6	COE	33 CFR 334.1130 (a)(1)(vi)	Area closed only when in use
Pacific Ocean, Western Space and Missile Center (WSMC), Vandenberg AFB, Calif.; danger zones - Zone 7	COE	33 CFR 334.1130 (a)(1)(vii)	Area closed only when in use
Pacific Ocean Naval Air Weapons Station, Point Mugu, Small Arms Range, Ventura County, California; danger zone.	COE	33 CFR 334.1125	Area closed only when in use
Pacific Ocean, Western Space and Missile Center (WSMC), Vandenberg AFB, Calif.; danger zones - Zone 1	COE	33 CFR 334.1130 (a)(1)(i)	Area closed only when in use
Pacific Ocean, Western Space and Missile Center (WSMC), Vandenberg AFB, Calif.; danger zones - Zone 2	COE	33 CFR 334.1130 (a)(1)(ii)	Area closed only when in use
Pacific Ocean, Western Space and Missile Center (WSMC), Vandenberg AFB, Calif.; danger zones - Zone 3	COE	33 CFR 334.1130 (a)(1)(iii)	Area closed only when in use
Pacific Ocean, Western Space and Missile Center (WSMC), Vandenberg AFB, Calif.; danger zones - Zone 4	COE	33 CFR 334.1130 (a)(1)(iv)	No stopping or loitering; area closed only when in use

Pacific Ocean, Western Space and Missile Center (WSMC), Vandenberg AFB, Calif.; danger zones - Zone 5	COE	33 CFR 334.1130 (a)(1)(v)	Area closed only when in use
Pacific Ocean, Western Space and Missile Center (WSMC), Vandenberg AFB, Calif.; danger zones - Zone 6	COE	33 CFR 334.1130 (a)(1)(vi)	Area closed only when in use
Pacific Ocean, Western Space and Missile Center (WSMC), Vandenberg AFB, Calif.; danger zones - Zone 7	COE	33 CFR 334.1130 (a)(1)(vii)	Area closed only when in use
Pacific Ocean, Western Space and Missile Center (WSMC), Vandenberg AFB, Calif.; danger zones - Zone 8	COE	33 CFR 334.1130 (a)(1)(viii)	Area closed only when in use
Pacific Ocean, Western Space and Missile Center (WSMC), Vandenberg AFB, Calif.; danger zones - Zone 9	COE	33 CFR 334.1130 (a)(1)(ix)	Area closed only when in use
Pacific Ocean at San Miguel Island, Calif.; naval danger zone.	COE	33 CFR 334.1140	Area closed only when in use
Monterey Bay, Calif. : Firing range, Fort Ord, Calif - short range	COE	33 CFR 334.1150 (a)(1)(ii)	Area closed between dawn and midnight from Monday through Friday and between dawn and dusk on Saturday and Sunday
Monterey Bay, Calif. : Firing range, Fort Ord, Calif - long range	COE	33 CFR 334.1150 (a)(1)(ii)	Area closed only when in use

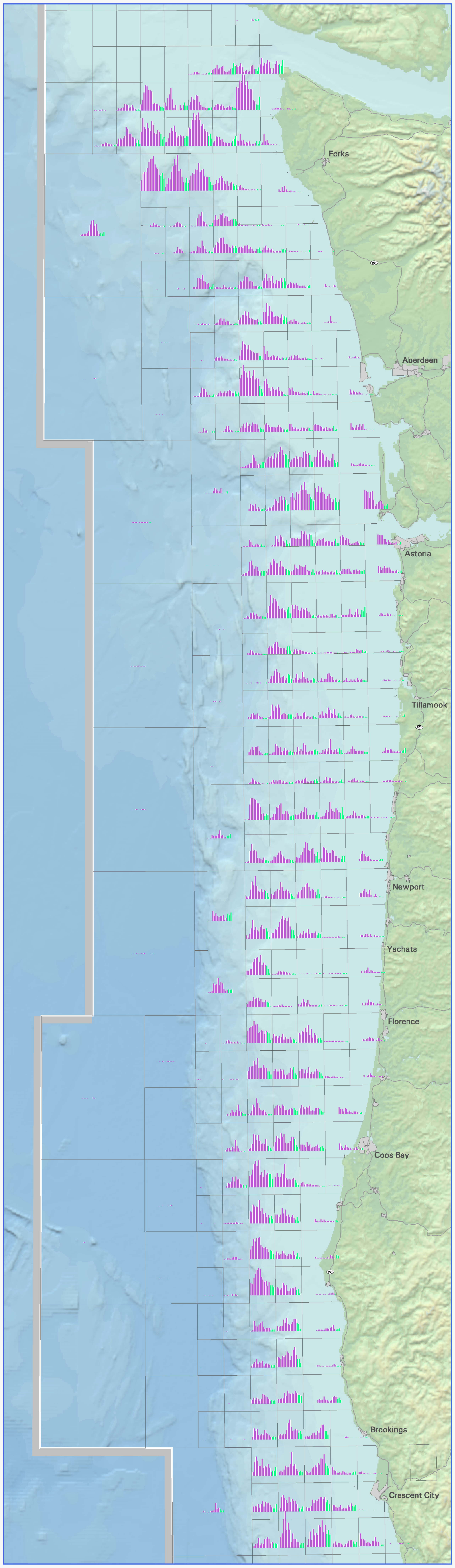
Monterey Bay, Calif. : Navy mining operations area	COE	33 CFR 334.1150 (b)(1)	Area closed only when in use
San Pablo Bay, Calif.; target practice area, Mare Island Naval Shipyard, Vallejo.	COE	33 CFR 334.1160	Area closed only when in use
San Pablo Bay, Calif.; gunnery range, Naval Inshore Operations Training Center, Mare Island, Vallejo.	COE	33 CFR 334.1170	Area closed only when in use
Strait of Juan de Fuca, Washington; air-to-surface weapon range, restricted area.	COE	33 CFR 334.1180	Area closed only when in use
Hood Canal, Wash.; naval non-explosive torpedo testing area	COE	33 CFR 334.1190 (a)	Area closed only when in use
Dabob Bay, Wash.; naval non-explosive torpedo testing area	COE	33 CFR 334.1190 (b)	Area closed to trawling or dragging; no anchoring in water deeper than 10 fathoms; no excess noise generated during testing periods
Strait of Juan de Fuca, eastern end; off the westerly shore of Whidbey Island; naval restricted areas: Area No. 1	COE	33 CFR 334.1200 (a)	Access at own risk

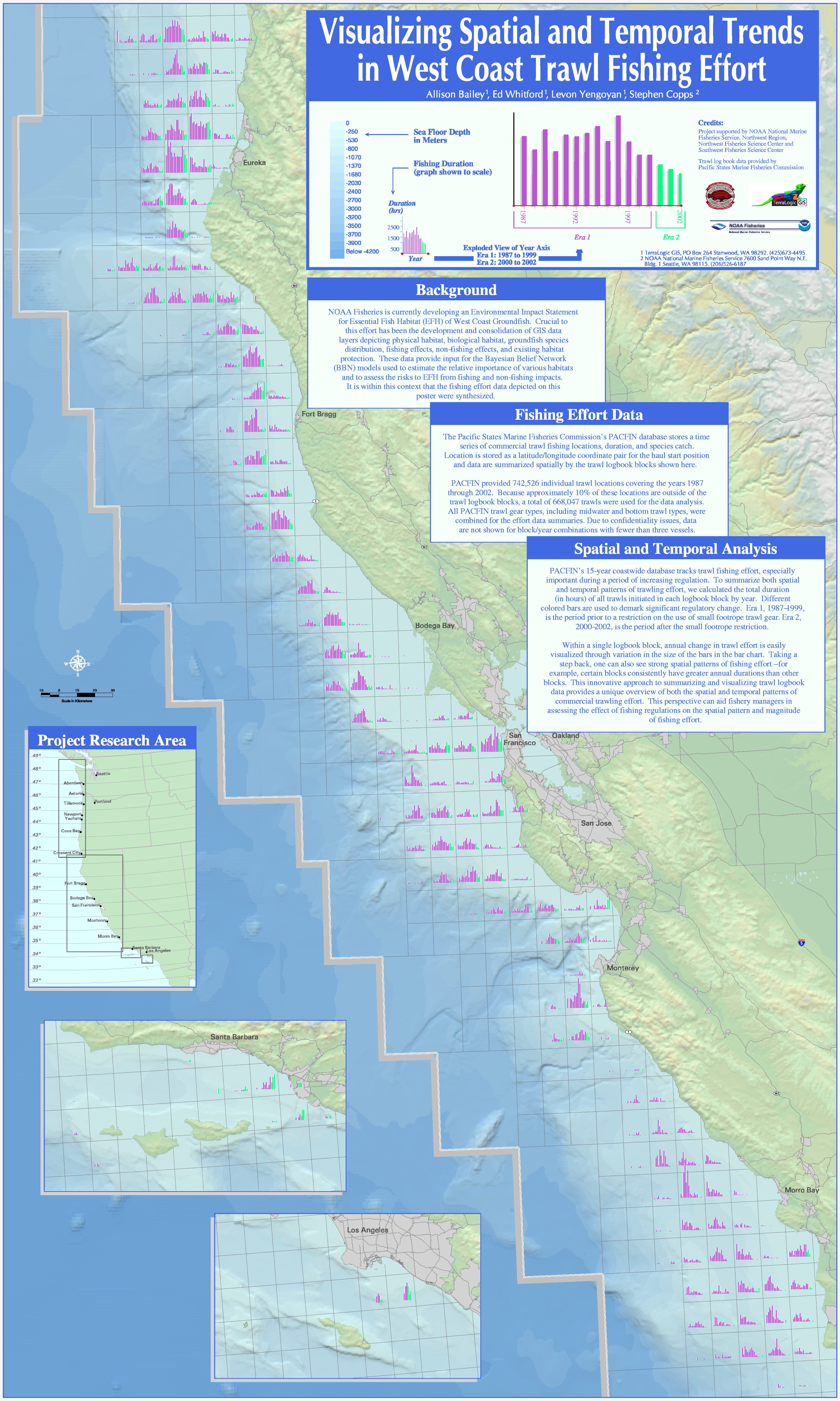
Strait of Juan de Fuca, eastern end; off the westerly shore of Whidbey Island; naval restricted areas: (a) Area No. 2	COE	33 CFR 334.1200 (b)	Access at own risk
Admiralty Inlet, entrance; naval restricted area.	COE	33 CFR 334.1210	Use of any equipment such as anchors, fishing gear, grapnels, etc., which may foul underwater installations within the restricted area, is prohibited. Dumping of any non-buoyant objects in this area is prohibited
Hood Canal, Bangor; naval restricted areas - Area No. 1	COE	33 CFR 334.1220 (a)(1)	Area closed
Hood Canal, Bangor; naval restricted areas - Area No. 2 (a circle of 1,000 yards diameter centered on the following point)	COE	33 CFR 334.1220 (a)(2)	Area closed only when in use; use of any equipment such as anchors, grapnels, etc., which may foul underwater installations within the restricted area, is prohibited at all times
Port Orchard; naval restricted area.	COE	33 CFR 334.1230	No vessel shall anchor or tow a drag of any kind in this area
Sinclair Inlet; naval restricted areas - Area No. 1 (all waters of Sinclair Inlet westerly of a line between the following points)	COE	33 CFR 334.1240 (a)(1)	Area closed to vessels of more than 100 gross tons

Sinclair Inlet; naval restricted areas - Area No. 2 (all waters of Sinclair Inlet north and west of a line between the following points)	COE	33 CFR 334.1240 (a)(2)	Area closed
Carr Inlet, naval restricted areas.	COE	33 CFR 334.1250	Closed when in use; no use of explosives at any time; no approach within 100 yards of hydrophone buoys; no anchoring or towing a drag of any kind within 1,000 yards of the buoy testing area
Dabob Bay, Whitney Point, Naval Restricted Area.	COE	33 CFR 334.1260	No anchoring; no towing a drag of any kind
Port Townsend, Indian Island, Walan Point, naval restricted area.	COE	33 CFR 334.1270	Closed when in use
COE = US Army Corps of Engineers			

Visualizing Spatial and Temporal Trends in West Coast Trawl Fishing Effort

Allison Bailey[1], Ed Whitford[1], Levon Yengoyan[1], Stephen Copps[2]





Credits:
Project supported by NOAA National Marine Fisheries Service, Northwest Region, Northwest Fisheries Science Center and Southwest Fisheries Science Center

Trawl log book data provided by Pacific States Marine Fisheries Commission

1 TerraLogic GIS, PO Box 264 Stanwood, WA 98292. (425)673-4495
2 NOAA National Marine Fisheries Service 7600 Sand Point Way N.E. Bldg. 1 Seattle, WA 98115. (206)526-6187

Background

NOAA Fisheries is currently developing an Environmental Impact Statement for Essential Fish Habitat (EFH) of West Coast Groundfish. Crucial to this effort has been the development and consolidation of GIS data layers depicting physical habitat, biological habitat, groundfish species distribution, fishing effects, non-fishing effects, and existing habitat protection. These data provide input for the Bayesian Belief Network (BBN) models used to estimate the relative importance of various habitats and to assess the risks to EFH from fishing and non-fishing impacts. It is within this context that the fishing effort data depicted on this poster were synthesized.

Fishing Effort Data

The Pacific States Marine Fisheries Commission's PACFIN database stores a time series of commercial trawl fishing locations, duration, and species catch. Location is stored as a latitude/longitude coordinate pair for the haul start position and data are summarized spatially by the trawl logbook blocks shown here.

PACFIN provided 742,526 individual trawl locations covering the years 1987 through 2002. Because approximately 10% of these locations are outside of the trawl logbook blocks, a total of 668,047 trawls were used for the data analysis. All PACFIN trawl gear types, including midwater and bottom trawl types, were combined for the effort data summaries. Due to confidentiality issues, data are not shown for block/year combinations with fewer than three vessels.

Spatial and Temporal Analysis

PACFIN's 15-year coastwide database tracks trawl fishing effort, especially important during a period of increasing regulation. To summarize both spatial and temporal patterns of trawling effort, we calculated the total duration (in hours) of all trawls initiated in each logbook block by year. Different colored bars are used to demark significant regulatory change. Era 1, 1987–1999, is the period prior to a restriction on the use of small footrope trawl gear. Era 2, 2000–2002, is the period after the small footrope restriction.

Within a single logbook block, annual change in trawl effort is easily visualized through variation in the size of the bars in the bar chart. Taking a step back, one can also see strong spatial patterns of fishing effort –for example, certain blocks consistently have greater annual durations than other blocks. This innovative approach to summarizing and visualizing trawl logbook data provides a unique overview of both the spatial and temporal patterns of commercial trawling effort. This perspective can aid fishery managers in assessing the effect of fishing regulations on the spatial pattern and magnitude of fishing effort.

Exhibit C.4.b
Attachment 3
June 2004

EFH EIS Timeline (Revised May 2004)

2004	
January-March	• SSC Groundfish Subcommittee reviews Analytical Framework. • **March Council meeting**- SSC Groundfish Subcommittee reports to SSC.
April-June	• **April Council meeting**- EFH model and GIS database delivered to Council. • SSC GF Subcommittee reviews trawl fishing gear impacts model. • **June Council meeting-** trawl fishing gear impacts model presented to Council.*
July-September	• EIS Oversight Committee develops EFH designation, impacts mitigation, and HAPC designation alternatives (July-August).* • **September Council meeting-** Council adopts range of alternatives for analysis in the DEIS.*
October-December	• **November Council meeting**- Council identifies preferred alternatives for identification in DEIS and FMP amendment.* • Final drafting and technical editing of DEIS.
2005	
January-March	• Publish DEIS (February). • Public comment.
April-June	• Public comment. • Document improvement.
July-September	• **September Council meeting-** Council adopts draft FEIS/FMP amendments.
October-December	• Publish proposed rule and NOA for FMP amendment (begin Secretarial review). • EPA publishes NOA for FEIS (December).
2006	
January-March	• RA decision on FMP amendment; AA signs ROD. • Publish final rule (March).
April	• Final rule becomes effective.

*Changed from timeline presented at April 2004 Council meeting.

Exhibit C.4.b
Supplemental PowerPoint Presentation
June 2004

Pacific Council SSC

June 14 to 18 2004

Evaluating Impacts on EFH

MRAG Americas, Terralogic GIS,
Reading University Statistical Services Center,
University of New Hampshire

Presentations

1. Council Report
2. Revised decision-making framework Jump to slides
3. Data Update Jump to slides
4. Comprehensive Risk Assessment Jump to slides
5. Development of Alternatives Jump to slides

Data for Impacts Analysis

- GIS data
  - West Coast Fish Habitat — Jump to slides
  - Fishing Effort Data — Jump to slides
- Fishing Gear Impacts: sensitivity and recovery — Jump to slides
- Indexing Spatial Data for Non-fishing Impacts — Jump to slides

Presentations

1. NMFS Report
2. Revised decision-making framework Jump to slides
3. Data Update Jump to slides
4. Comprehensive Risk Assessment Jump to slides
5. Development of Alternatives Jump to slides

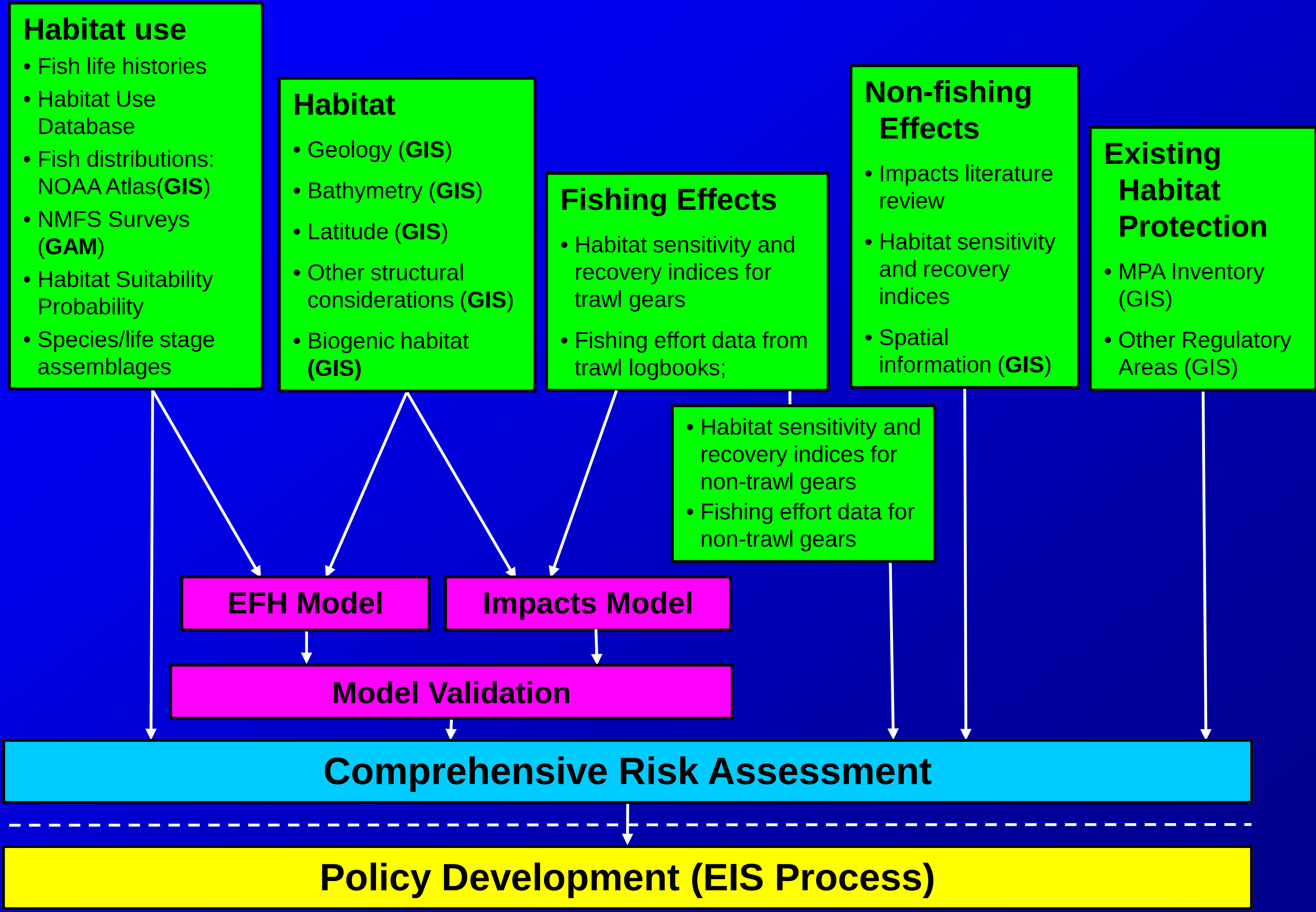
THE
END

Recap on Action Needed

“Councils must act to prevent, mitigate, or minimize any adverse effects from fishing, to the extent practicable, if there is evidence that a fishing activity adversely affects EFH in a manner that is more than **minimal** and not **temporary** in nature.

- **Temporary** effects are those that are limited in duration and that allow the particular environment to recover without measurable impact.
- **Minimal** effects are those that may result in relatively small changes in the affected environment and insignificant changes in ecological functions.

Decision-making Framework for EFH



Habitat use
- Fish life histories
- Habitat Use Database
- Fish distributions: NOAA Atlas(**GIS**)
- NMFS Surveys (**GAM**)
- Habitat Suitability Probability
- Species/life stage assemblages

Habitat
- Geology (**GIS**)
- Bathymetry (**GIS**)
- Latitude (**GIS**)
- Other structural considerations (**GIS**)
- Biogenic habitat (**GIS**)

Fishing Effects
- Habitat sensitivity and recovery indices for trawl gears
- Fishing effort data from trawl logbooks;

- Habitat sensitivity and recovery indices for non-trawl gears
- Fishing effort data for non-trawl gears

Non-fishing Effects
- Impacts literature review
- Habitat sensitivity and recovery indices
- Spatial information (**GIS**)

Existing Habitat Protection
- MPA Inventory (GIS)
- Other Regulatory Areas (GIS)

EFH Model

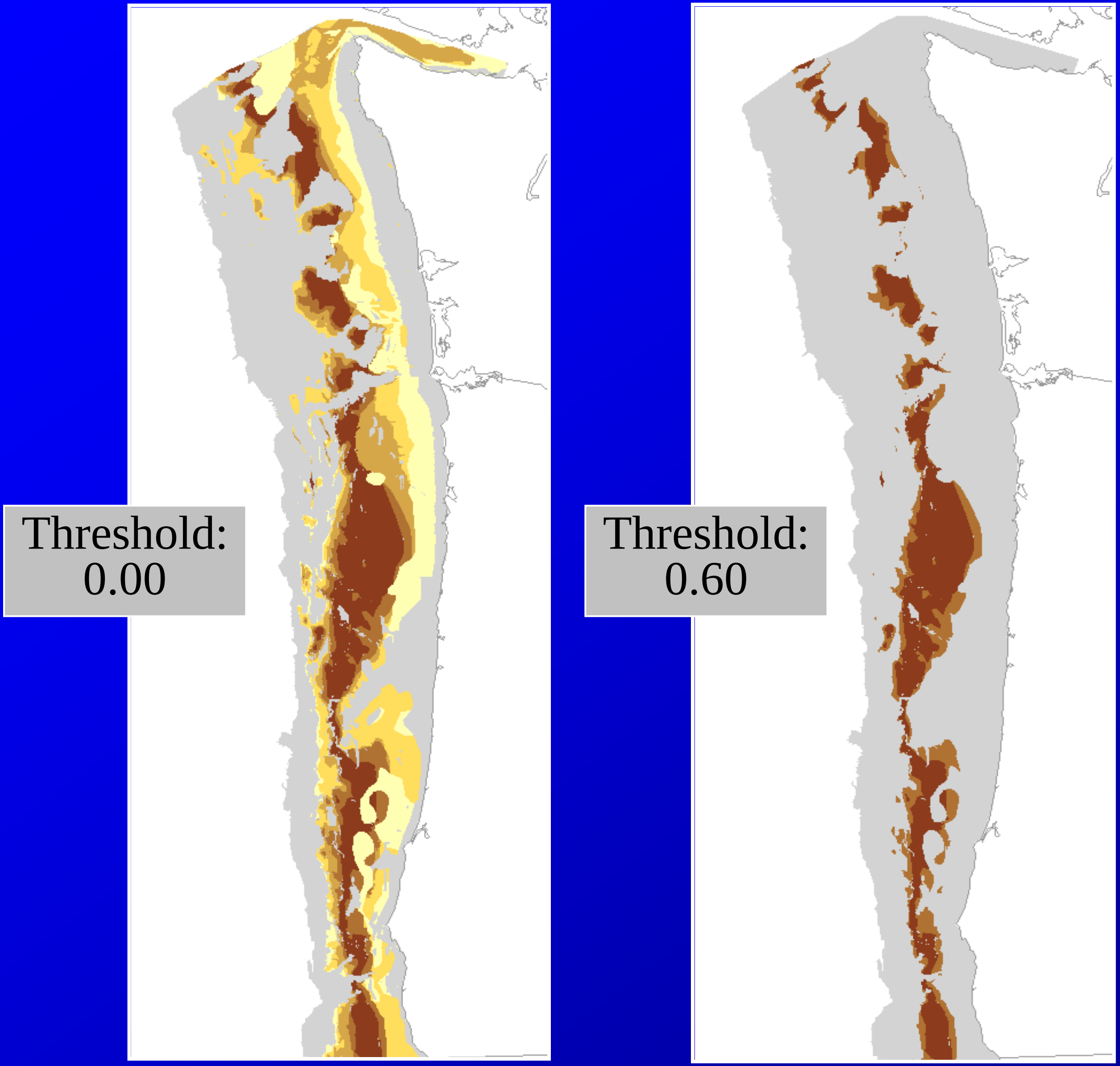
Impacts Model

Model Validation

Comprehensive Risk Assessment

Policy Development (EIS Process)

EFH Model Output: HSP Threshold



Threshold: 0.00

Threshold: 0.60

Shortspine Thornyhead

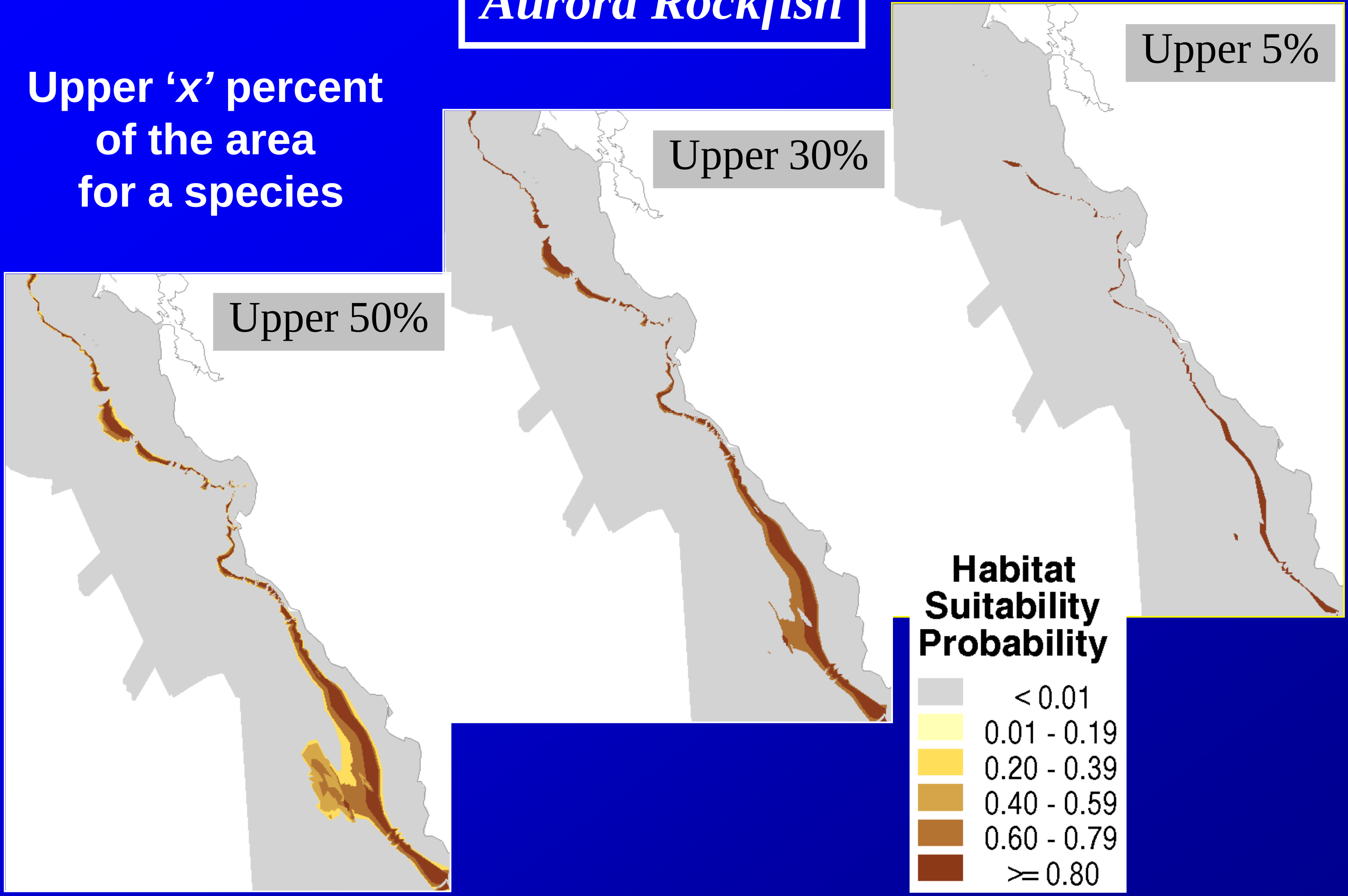
Habitat Suitability Probability

▨	< 0.01
▨	0.01 - 0.19
▨	0.20 - 0.39
▨	0.40 - 0.59
▨	0.60 - 0.79
▨	>= 0.80

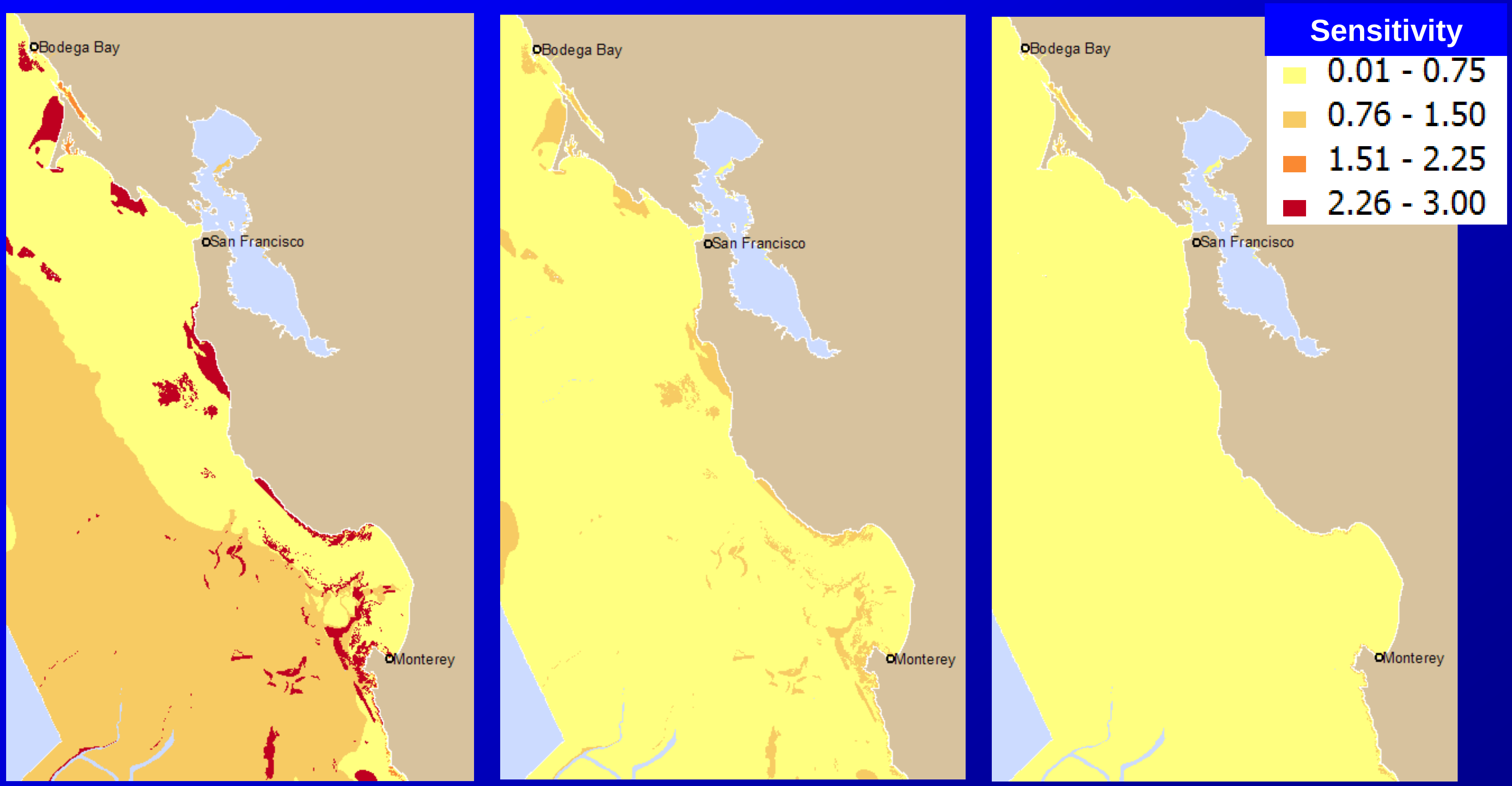
EFH Model Output: Area Threshold

Aurora Rockfish

**Upper '*x*' percent
of the area
for a species**



Mean Habitat Sensitivity by Gear Type

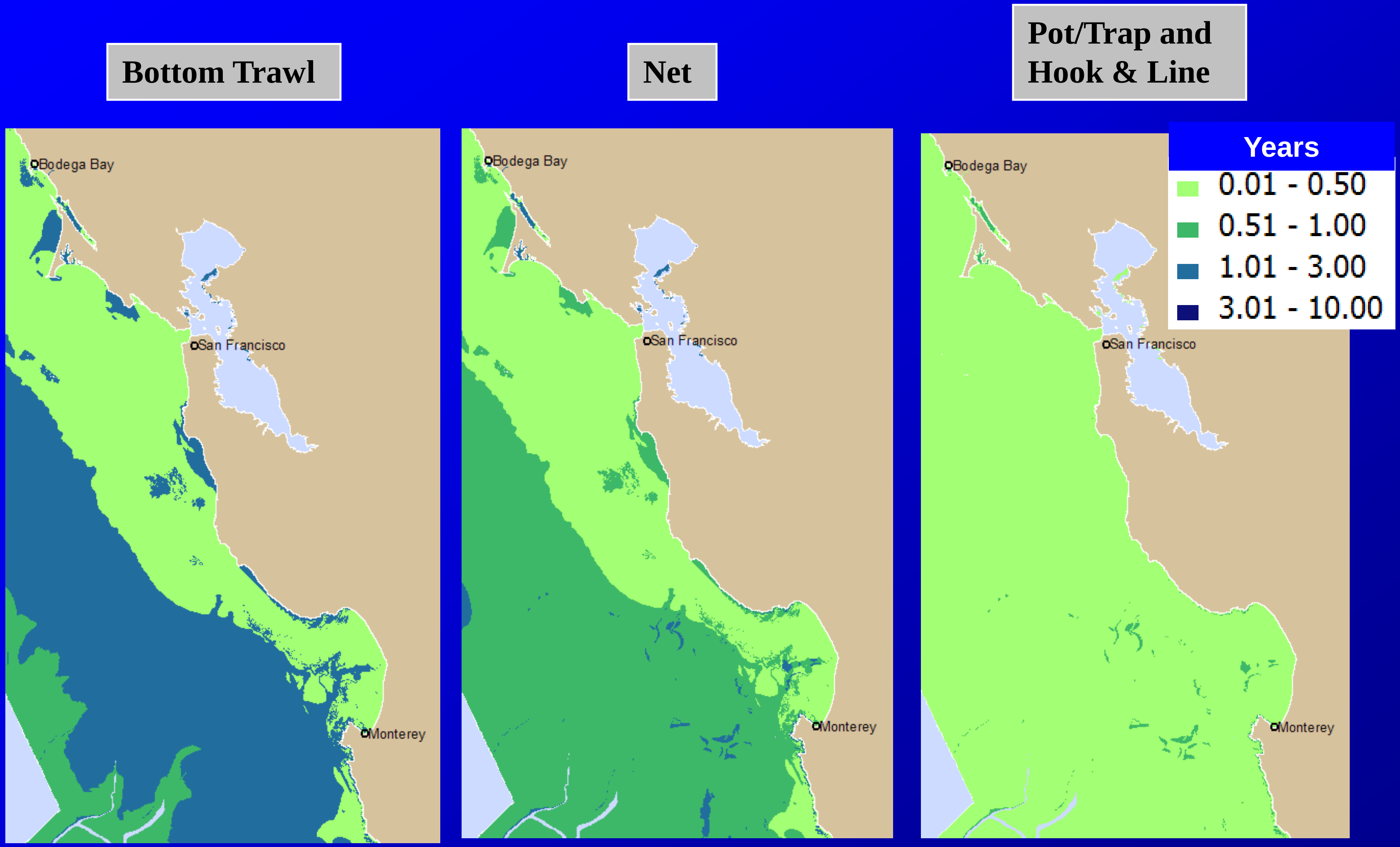


Bottom Trawl

Net

Pot/Trap and Hook & Line

Mean Habitat Recovery by Gear Type



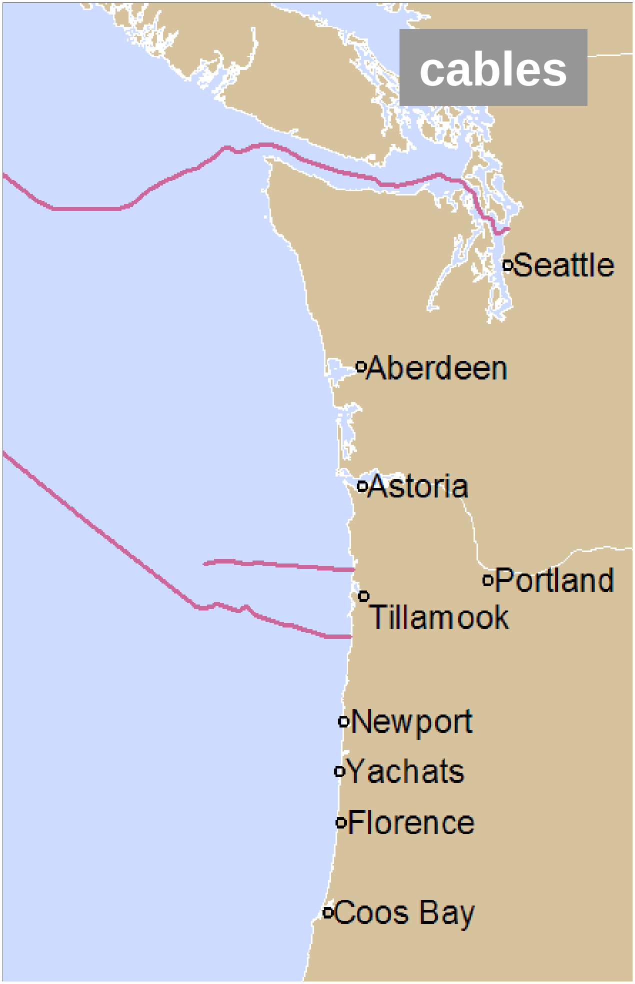
Bottom Trawl

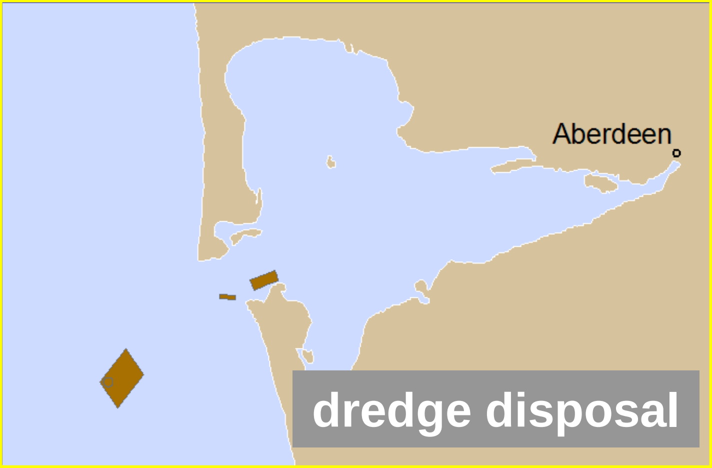
Net

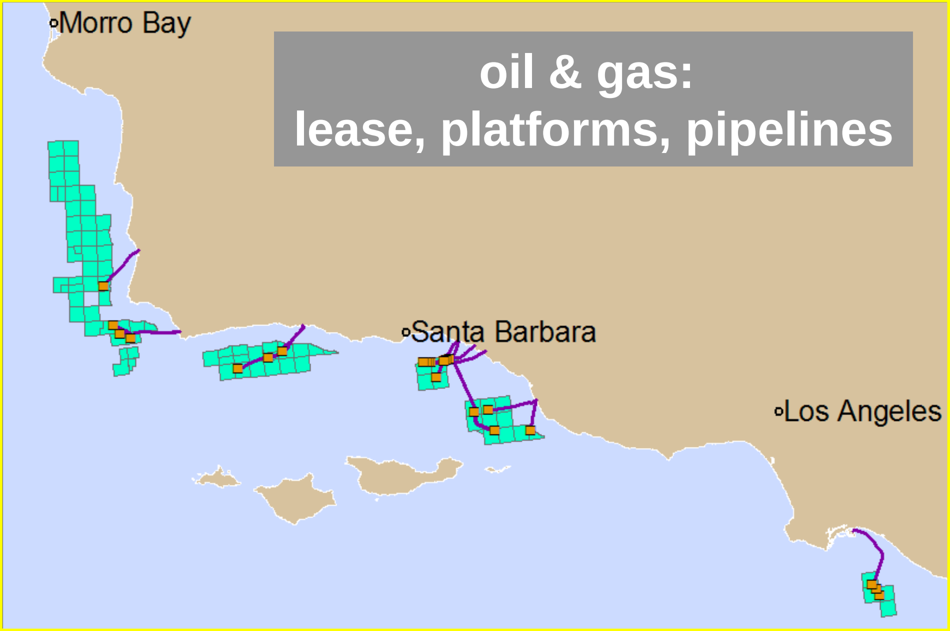
Pot/Trap and Hook & Line

TerraLogic GIS

Non-Fishing Impacts Data: Examples

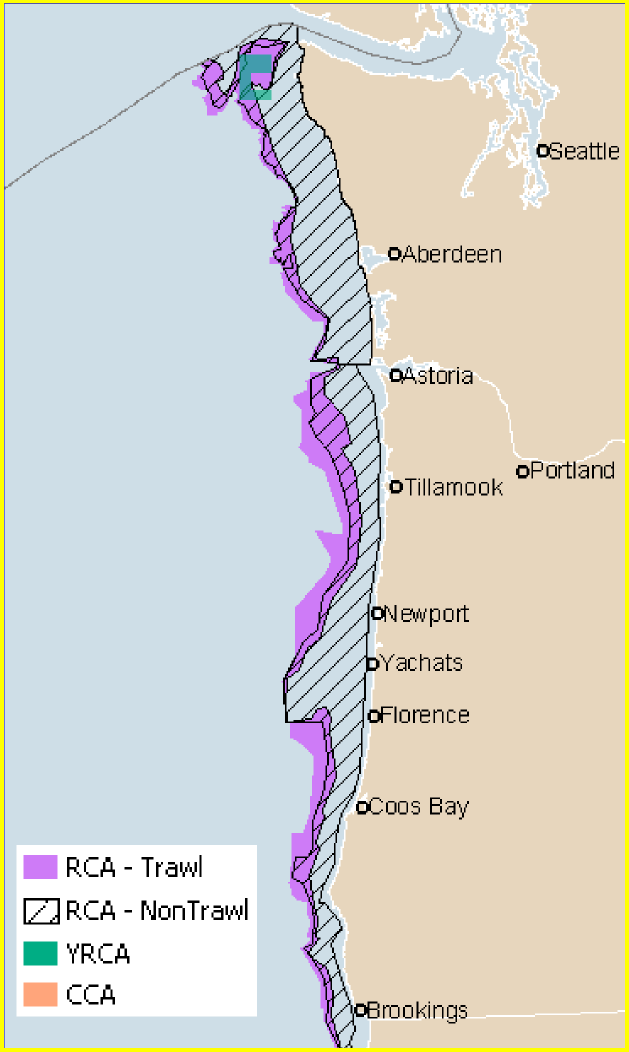




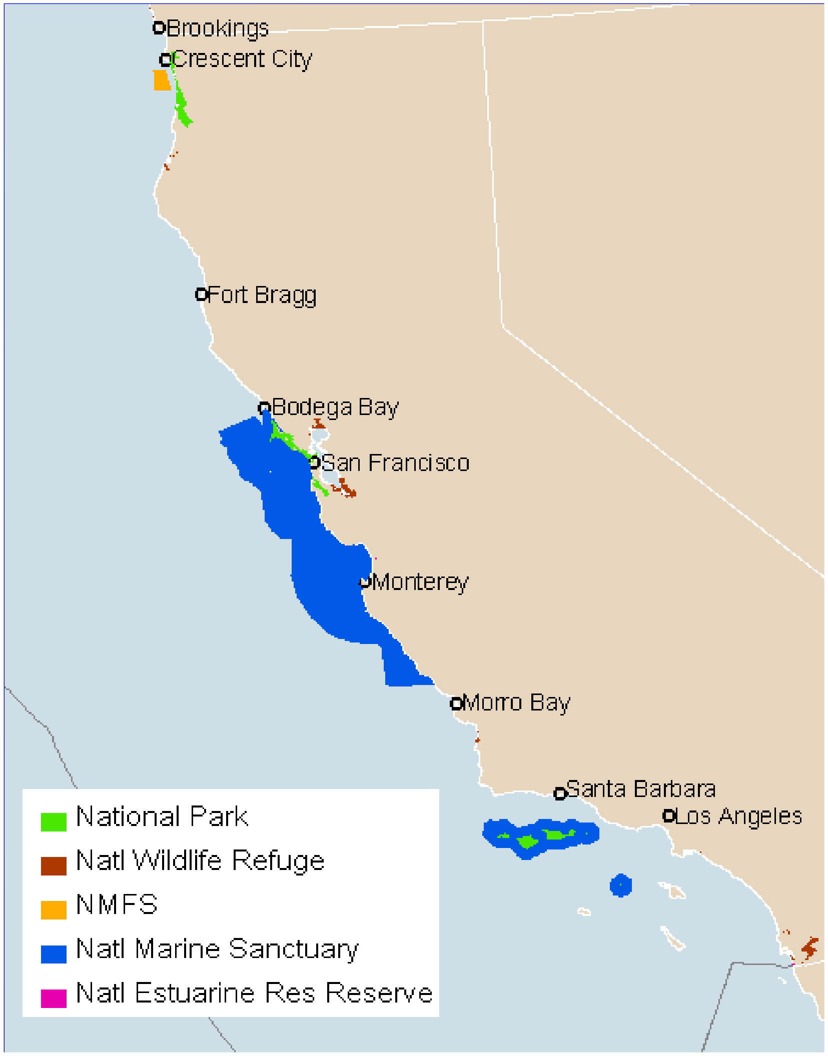


Existing Marine Management Areas

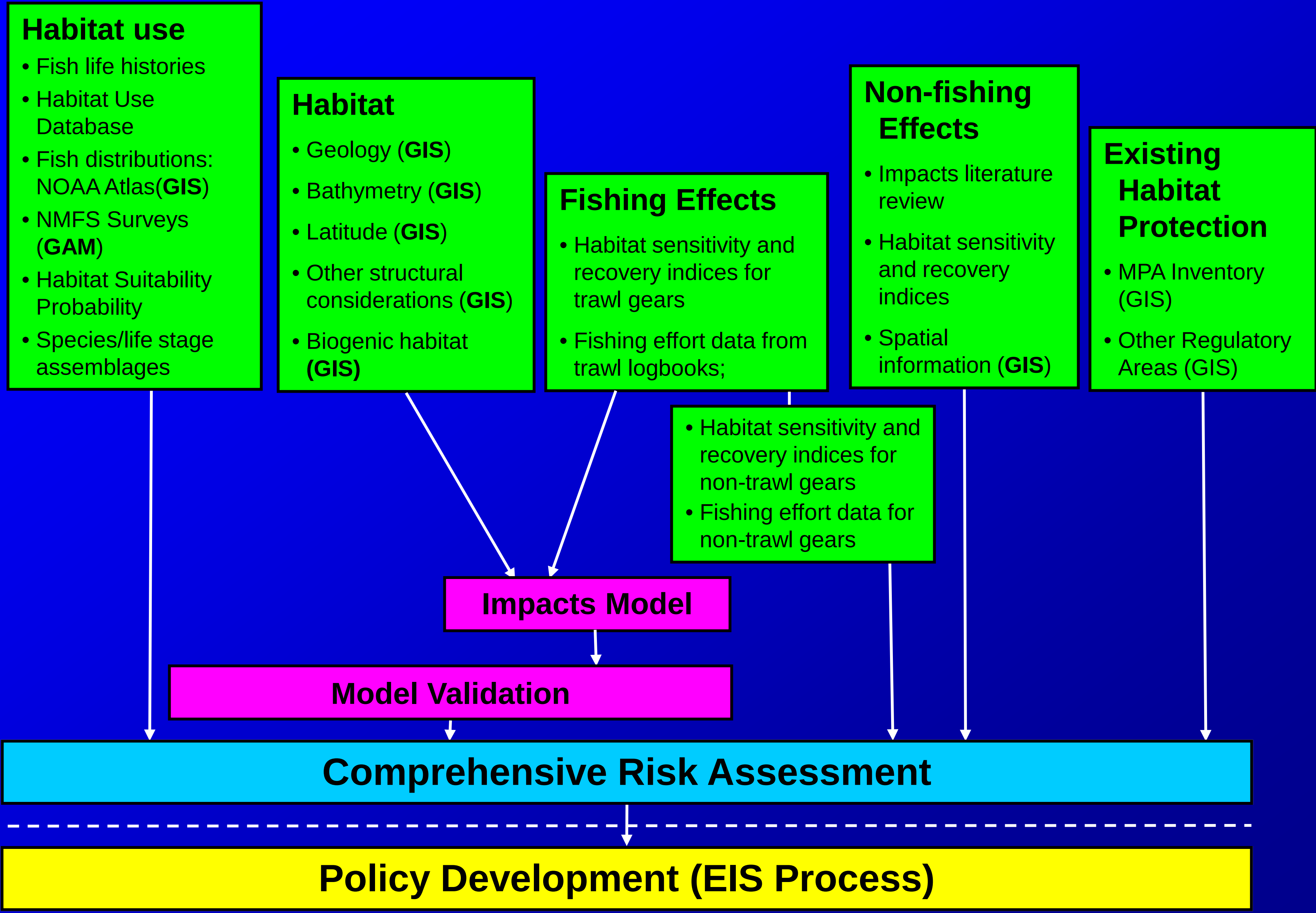
Federal Fishing Regs.



Federal MMA



Decision-making Framework for EFH



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- Other Regulatory Areas (GIS)

Impacts Model

Model Validation

Comprehensive Risk Assessment

Policy Development (EIS Process)

Impacts Model

Questions to be Answered:

- Given past inputs (anthropogenic and environmental), what is the probability that the condition of Pacific coast groundfish habitat has been degraded to an extent that function has been impaired?
- Given foreseeable inputs (anthropogenic and environmental) and regulatory regimes, how are trends in Pacific coast groundfish habitat expected to respond? What areas are at risk of impaired function and of particular concern?
- How might trends in habitat function be affected by altering anthropogenic inputs and regulatory regimes?
- What types of fisheries management alternatives could be applied to mitigate the effects of fishing on habitat? What are the likely impacts to habitat of specific fisheries management alternatives?
- What are the scientific limitations of assessing habitat?

Impacts Model

Impact depends on

- *fishing effort* (by gear)
- *sensitivity* (by gear and habitat) and
- *recovery* (by gear and habitat).

We require a mathematical function with suitable properties to estimate Impact, called the *impact function*.

Impacts Model

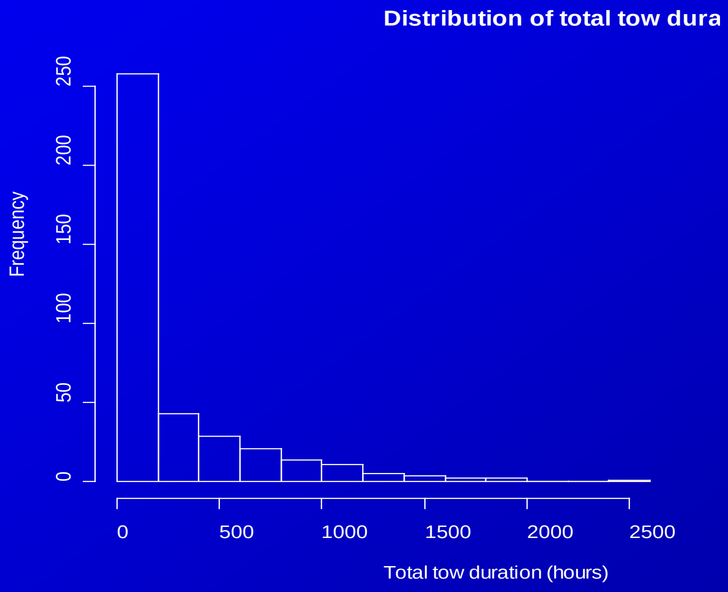
Desired qualities of the Impact Function:

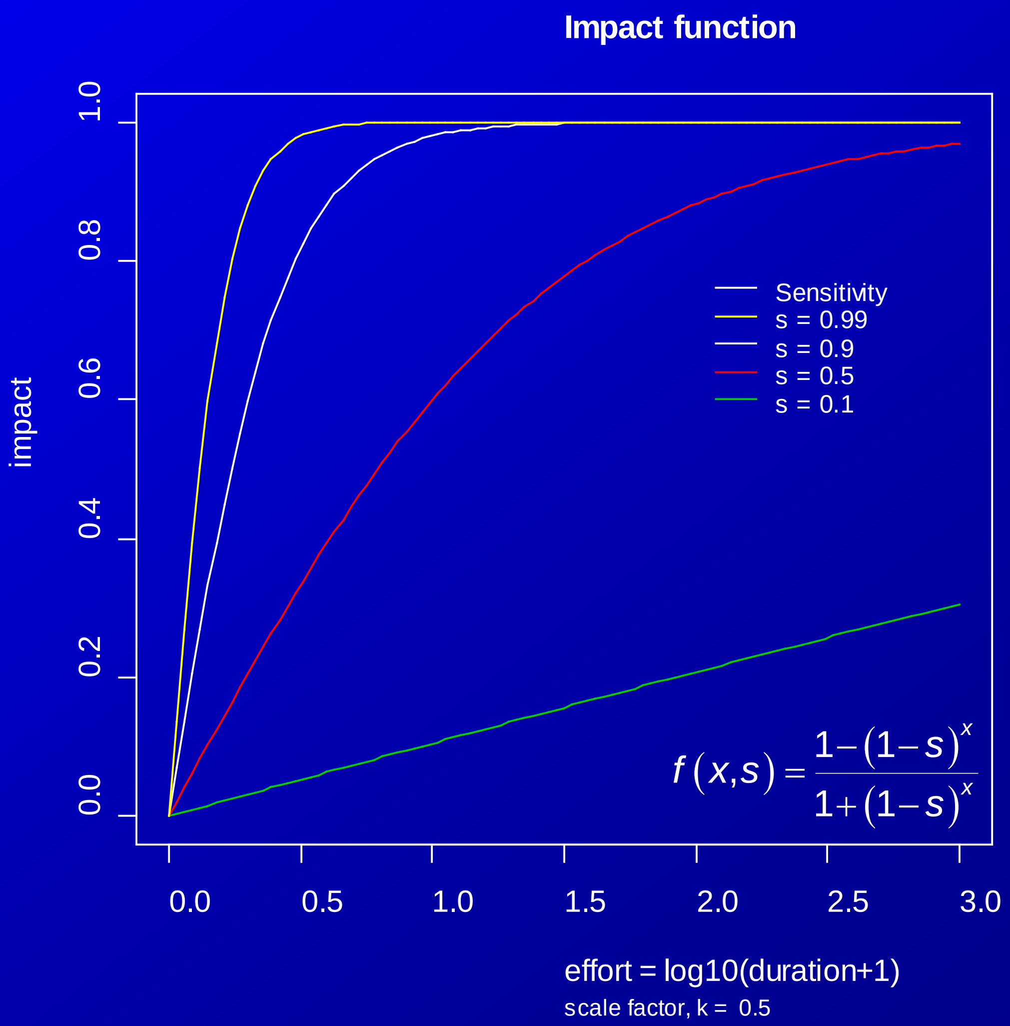
- zero effort implies zero impact, irrespective of sensitivity
- large effort tends to produce maximum change in habitat from pristine condition.
- the rate of increase of impact on a pristine area is greater for habitats with a higher sensitivity score.
- the rate of impact “levels off” as effort increases.

Impact Function

For a given area, *Impact* is measured (arbitrarily) on a scale 0 to 1

- 0 represents pristine
- 1 represents maximally changed from pristine – i.e. the maximum amount of change that a particular gear type can cause.





Effects of Data on Model Specification

Sensitivity and Recovery:

- The sensitivity index provides a **relative measure** of the effects of fishing gears on habitats.
- There is no quantitative link between the sensitivity measure and habitat utility for managed species.
- Unanswered questions remain: e.g. Is it possible for some fraction of a habitat area to be impacted and to remain in an impacted state without significantly affecting the utility of the whole area as habitat for managed species?
- Recovery index provides a measure of the extent to which impacts by gears may be temporary, but suffers from the limited capability of experiments to measure and detect change

Effects of Data on Model Specification

Fishing Effort Data:

- Database contains lat & long of actual trawl set points and duration of trawl (not for all hauls).
- Various candidate measures for effort in a given area over a given period, but total footprint of gear is not readily measured;
- We chose to measure effort by *total duration of all trawls* that started in the area in question during the given period;
- We note that not all trawls that start in an area also terminate in it (overrun errors), but trawls which start in adjacent areas not counted.
- **Choice of basic unit of area for fishing effort:**
    - To minimize overrun errors, unit of area should be large.
    - Also require reasonable spatial resolution.

Effects of Data on Model Specification

Considered overlaying trawl start points on habitat map and using habitat polygons as the units of area,

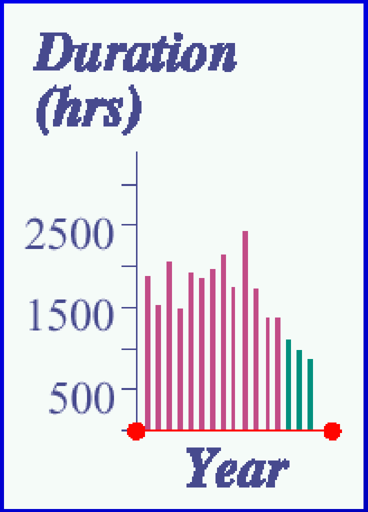
but

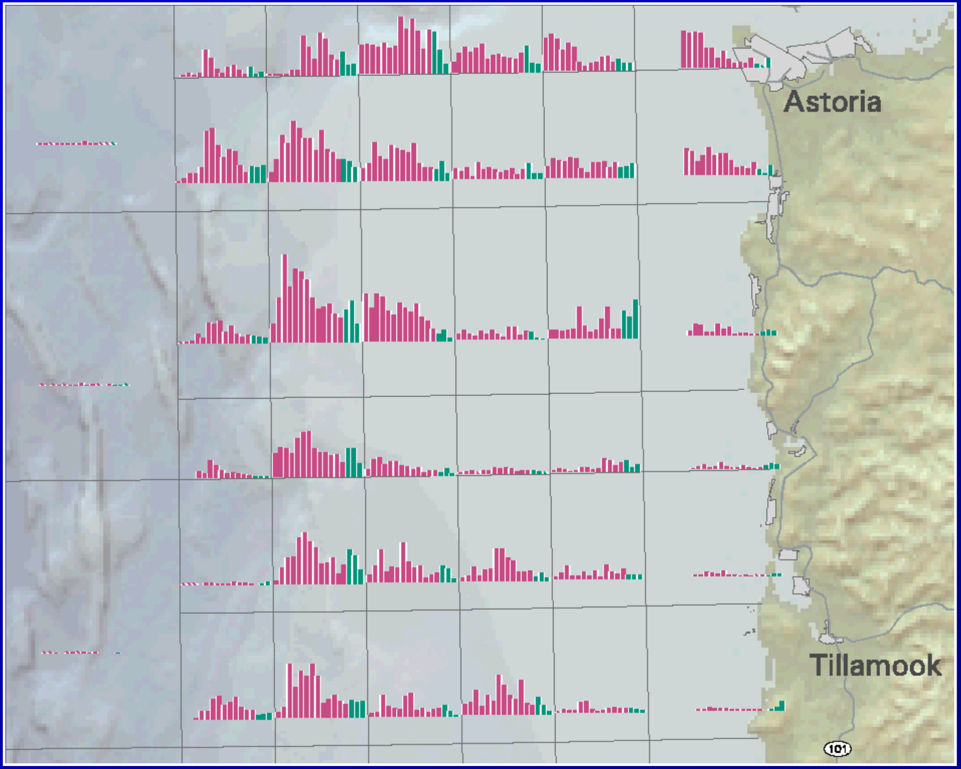
- Habitat polygons cover a wide range of different spatial scales; some are small relative to trawl hauls
- Assumption that the overlay correctly matches up a given trawl with a given piece of habitat needs detailed analysis:
  - PACFIN does not contain end points of hauls
  - not all trawl positions are genuine start points
  - habitat data quality varies greatly
  - decided previously that without substantial additional work, such an overlay would not be valid for survey data; for commercial data it may be even less valid

Effects of Data on Model Specification

Compromise:

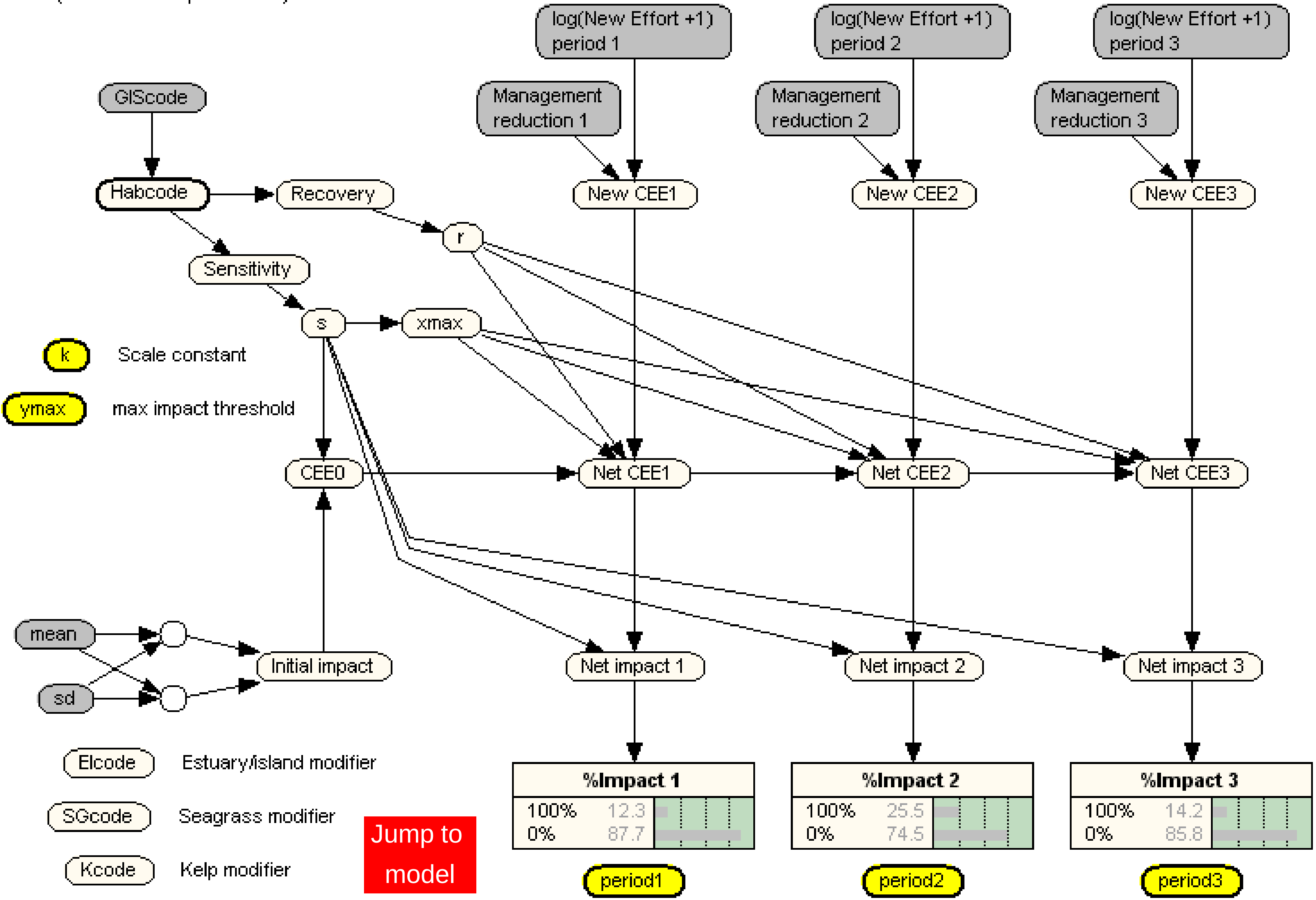
- We chose to represent the effort data on a grid of dimensions of the order of two average trawl lengths
- Corresponds roughly to 15 minutes of latitude
- 10-minute by 10-minute areas chosen for convenience (similar to logbook grid).



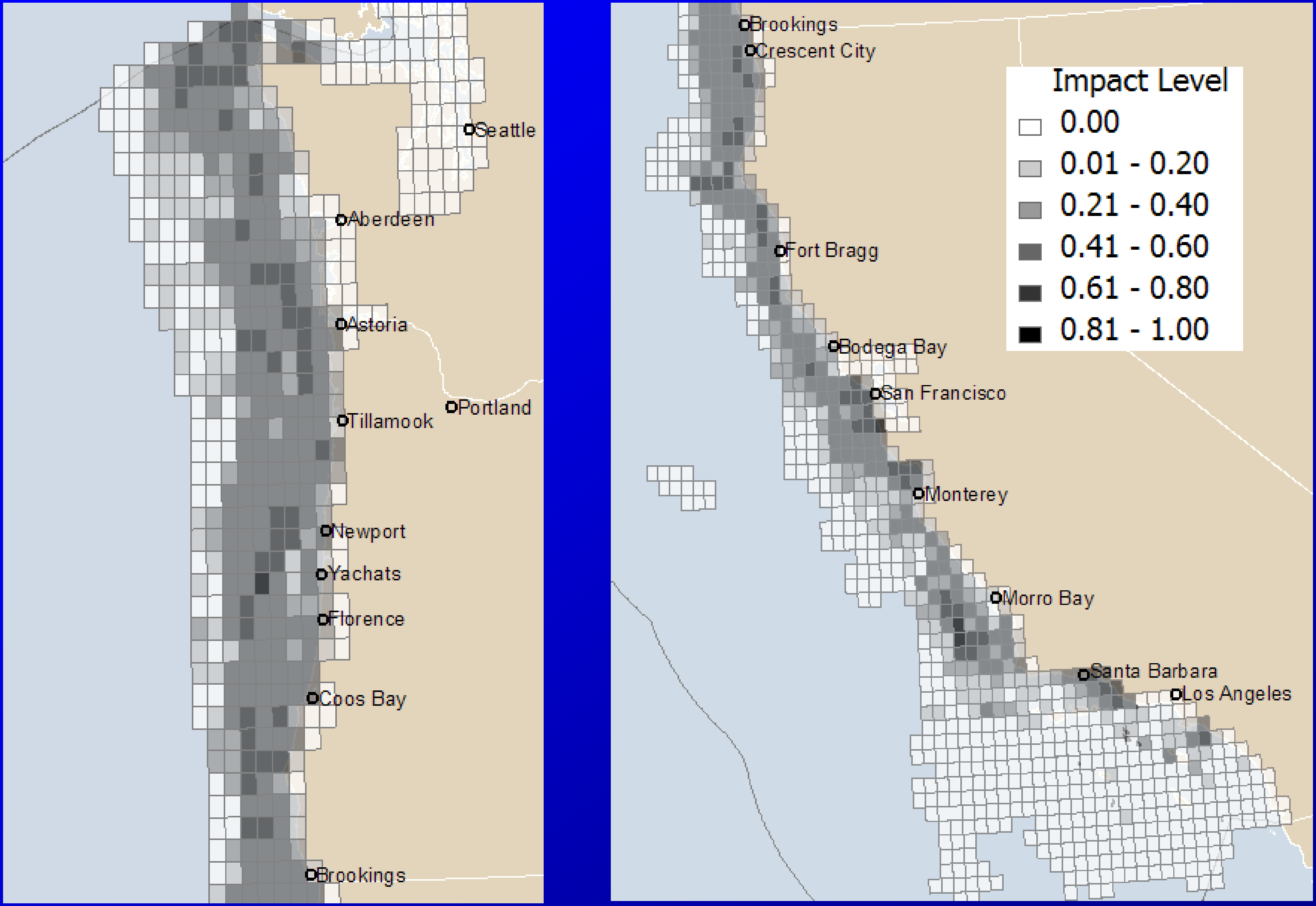


TRAWL IMPACTS MODEL

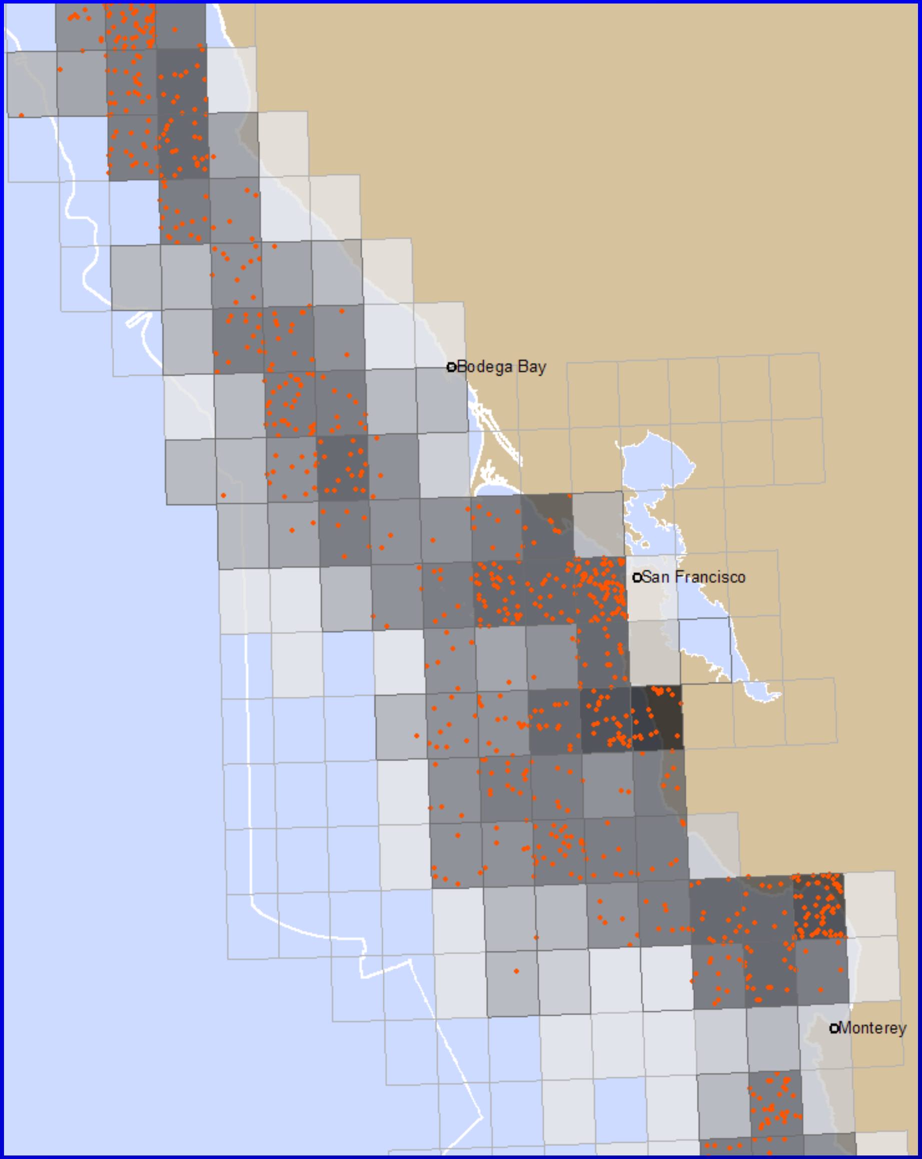
(for 3 time periods)



Trawl Impacts Model Output: 2002



Trawl Effort and Impacts Model Output: 2002



Trawl fishing effort

▨ 1 Dot = 20 hours

Impact

☐ 0.00
▨ 0.01 - 0.10
▨ 0.11 - 0.20
▨ 0.21 - 0.30
▨ 0.31 - 0.40
▨ 0.41 - 0.50
▨ 0.51 - 0.60
▨ 0.61 - 0.70
■ 0.71 - 0.80
■ 0.81 - 0.90
■ 0.91 - 1.00

TerraLogic GIS

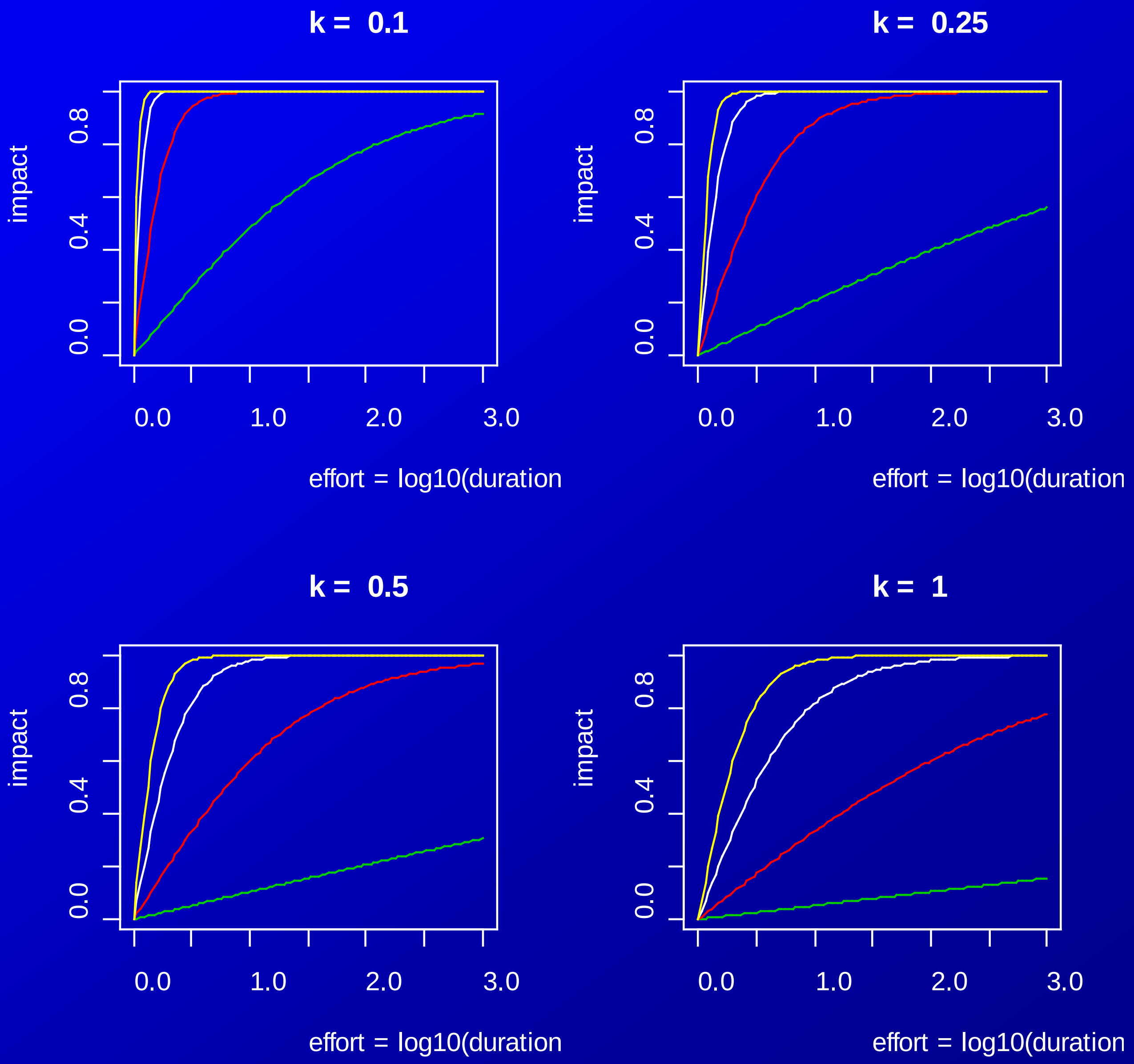
Tuning the Impacts Model

- The output maps look great, **BUT**
- Currently we have no empirical basis for associating a quantum of effort with a measurable impact on habitat.
- Therefore, can only hope to model *relative* impacts.
- A *scaling or tuning constant* k was introduced into the model to allow some flexibility in calibrating effort with impact.
- Due to the non-linear relationship between effort and impact, the choice of k has an important effect on the model outputs

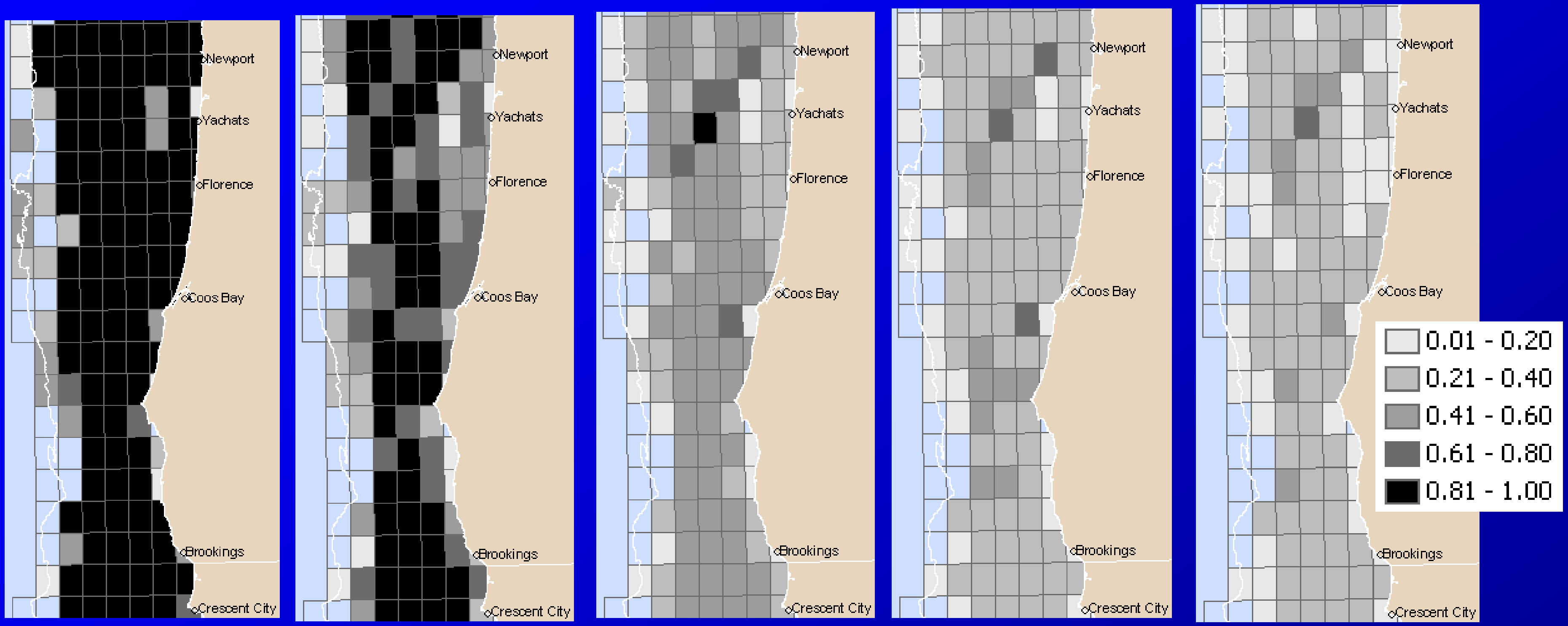
Tuning the Impacts Model

Choice of *k* depends on range of total duration (i.e. effort), and hence on period;

For a yearly interval, *k* in the range 0.1 to 1.5 seems OK.



Tuning the Impacts Model



$k = 0.1$

$k = 0.25$

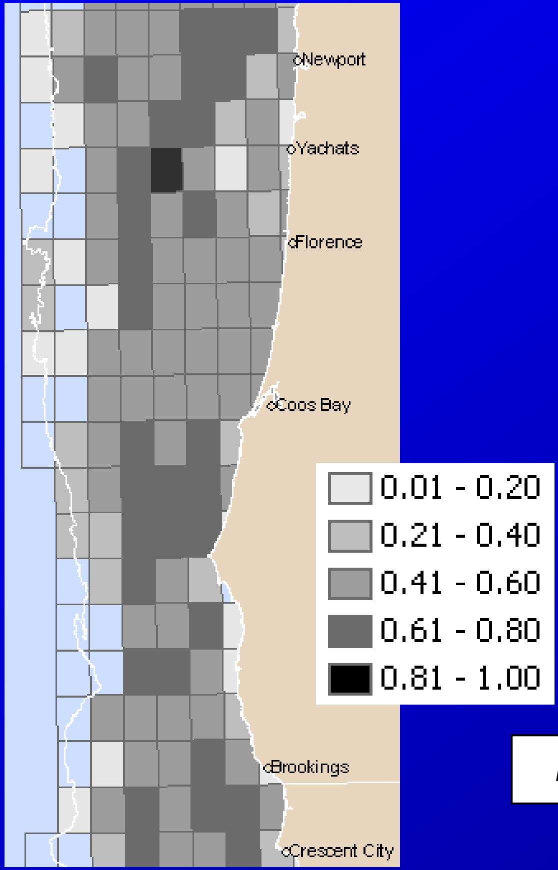
$k = 0.50$

$k = 0.75$

$k = 1$

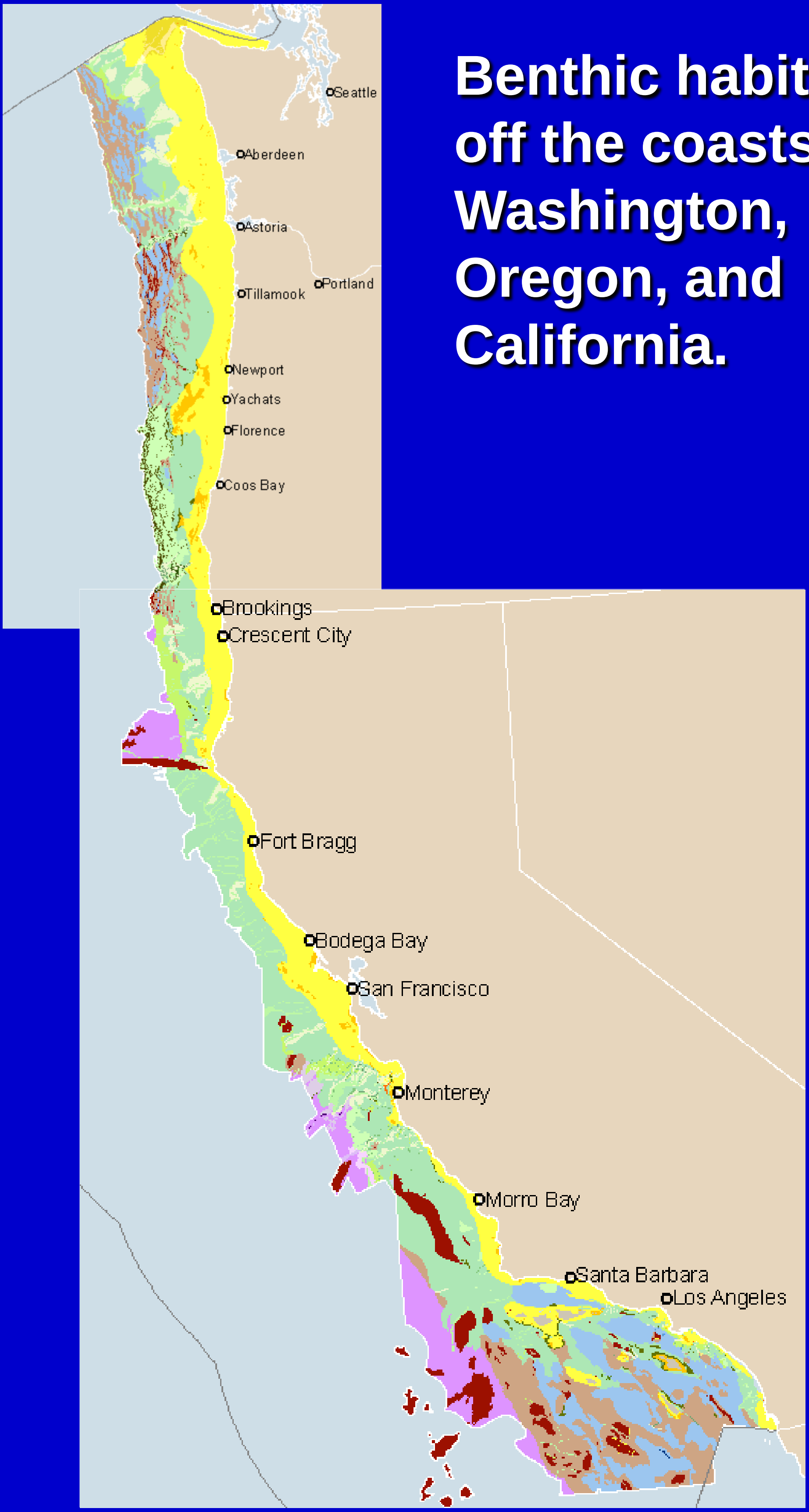
Example maps depicting net cumulative impact from bottom trawls for various levels of the tuning constant k

Tuning the Impacts Model



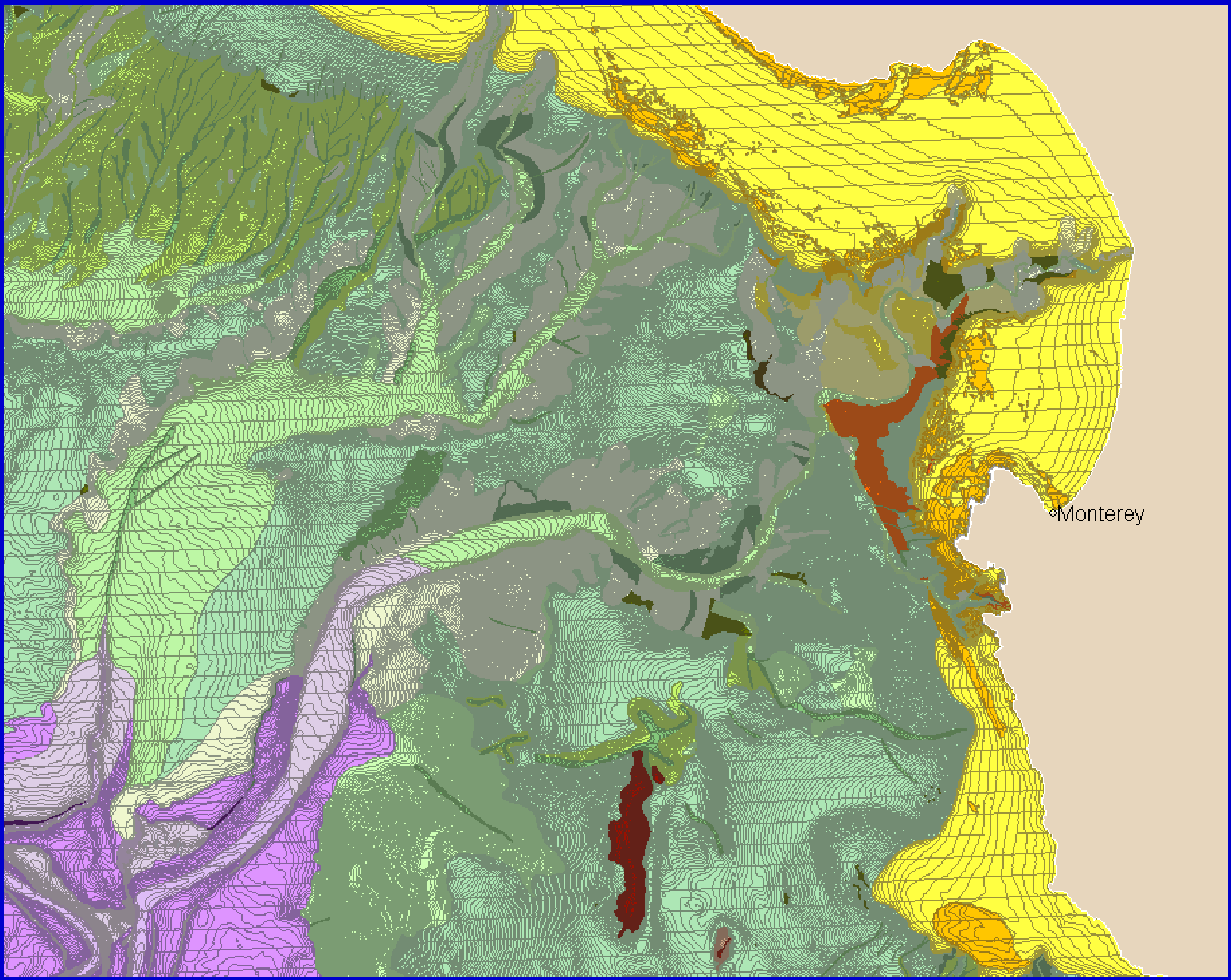
$k = 0.35$

Benthic habitat off the coasts of Washington, Oregon, and California.



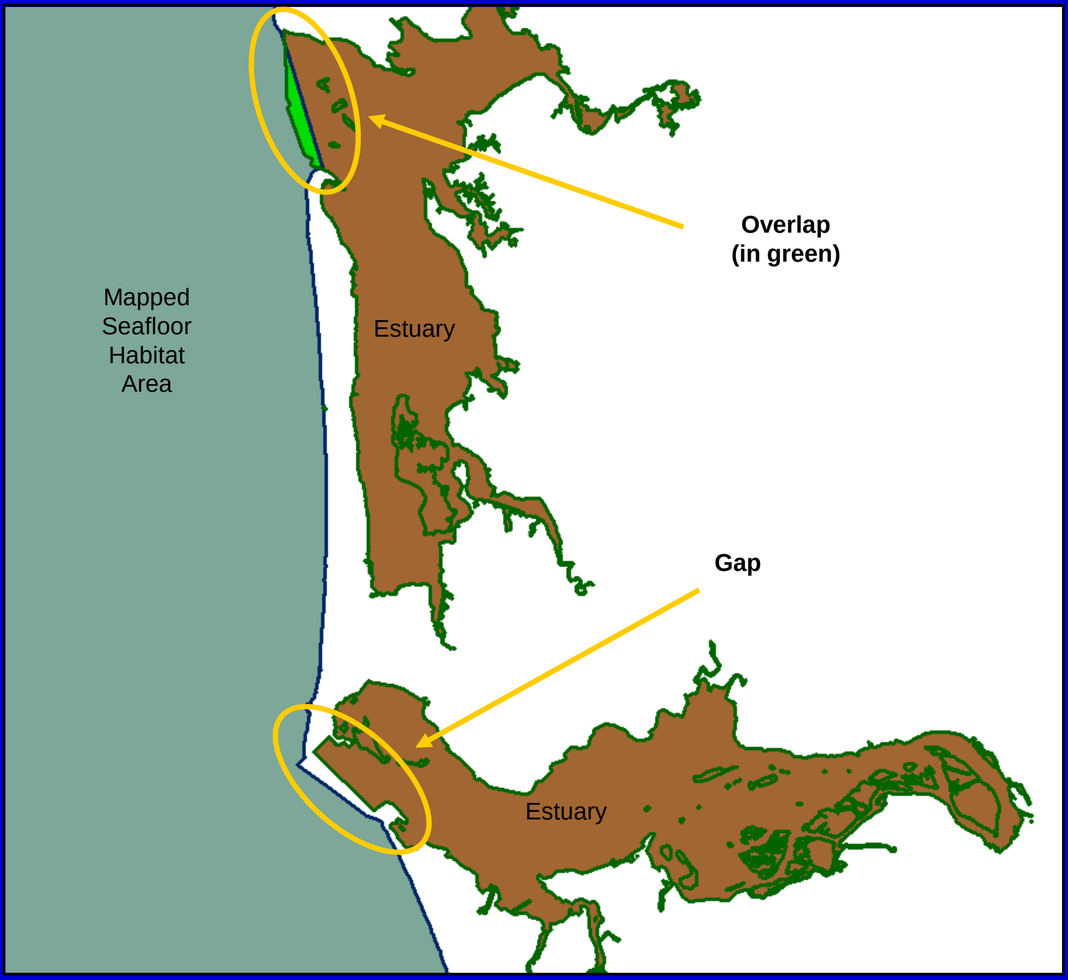
TerraLogic GIS

West Coast Habitat Polygons
(total = 973,165)



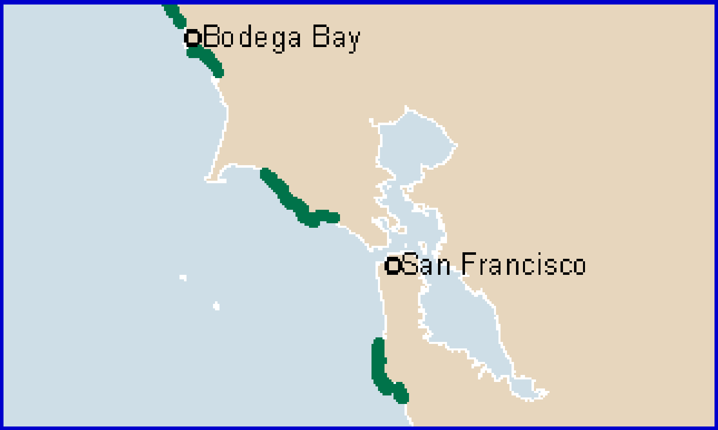
Estuaries

- Estuaries generally not mapped by marine geologists (a few exceptions)
- Used data from 1998 EFH project – original source: National Wetlands Inventory and NOS Coastal Assessment Framework
- Some overlap and some gaps between estuary boundaries and seafloor habitat maps
- Lacks associated seafloor habitat information

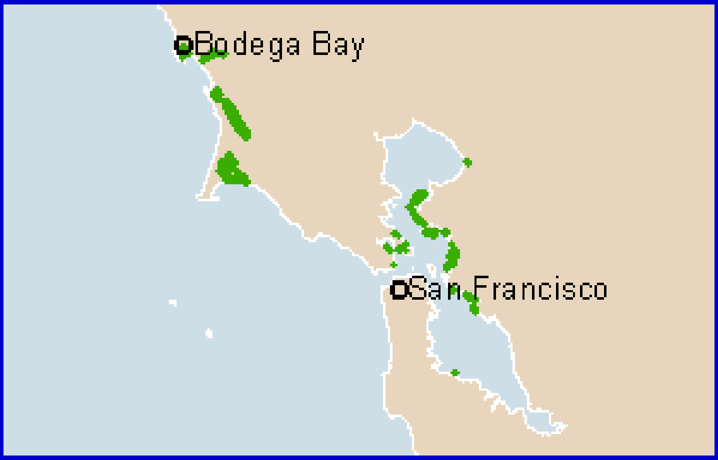


Biogenic Habitat

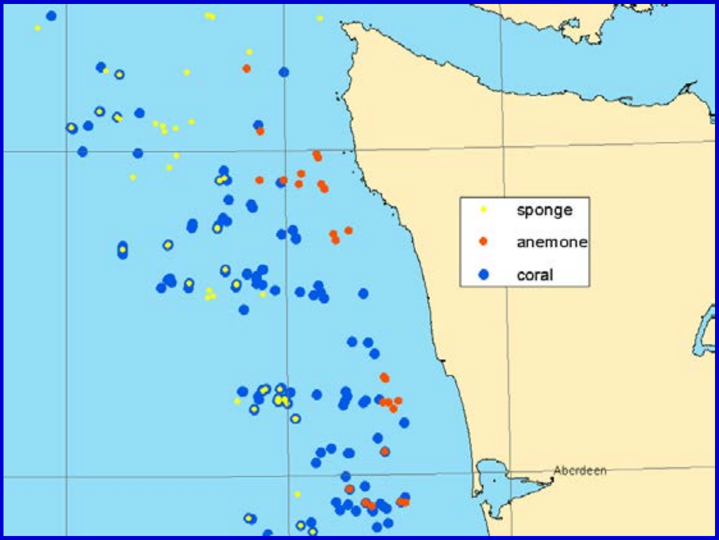
- Canopy kelp



- Seagrass



- Structure-forming invertebrates

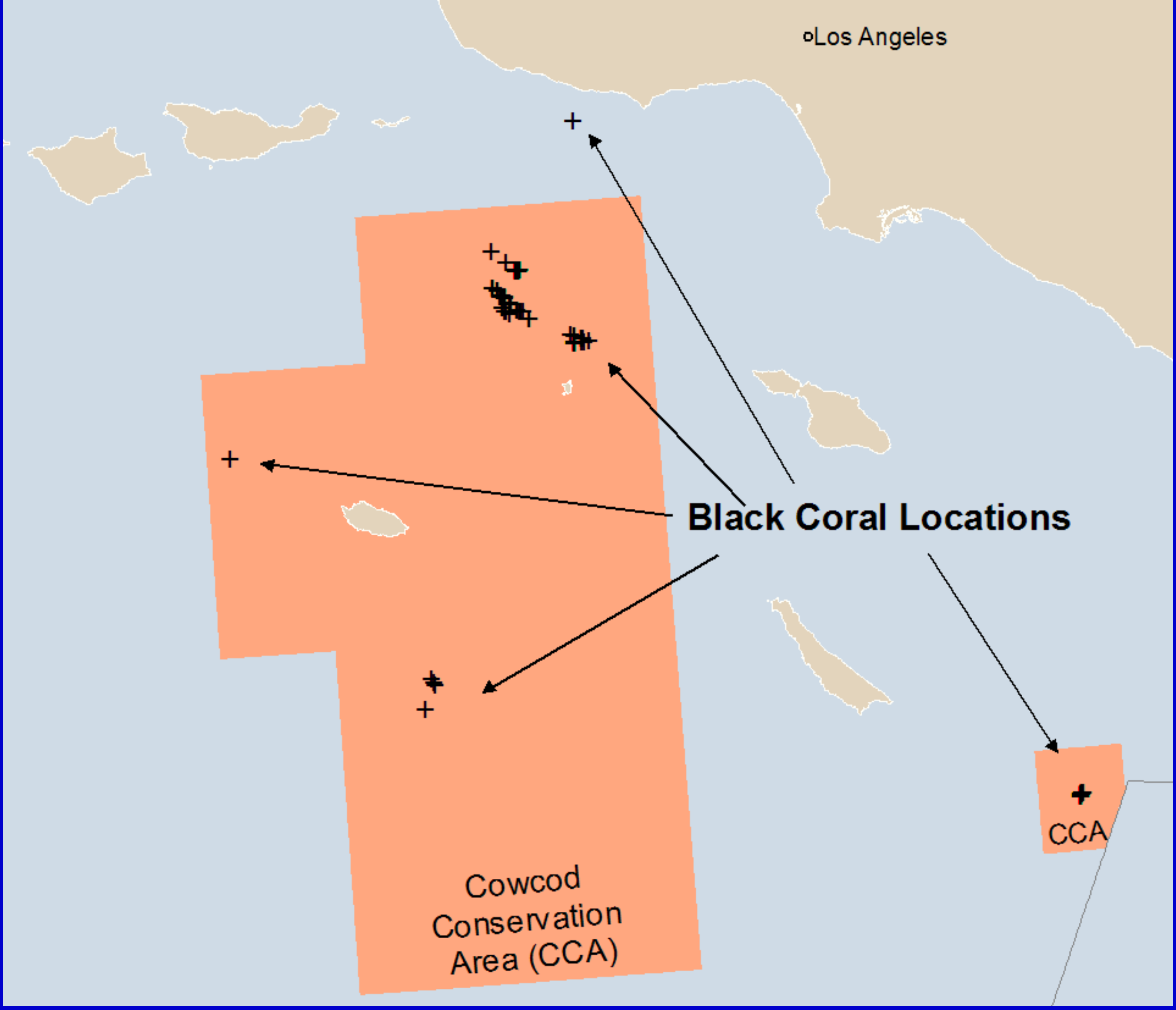


- Limited information is available to spatially delineate these biological habitats coastwide.
- incomplete coverage was preferable to leaving these data out of the GIS

TerraLogic GIS

Black Corals Dive Data

Data Source: Brian Tissot, WSU



TerraLogic GIS

Pelagic Habitat

- Some species do not associate with the sea bed
- biological, physical and chemical oceanographic processes may be important for fish in the water column
- frontal boundaries, temperature regimes and biological productivity all vary on seasonal and inter-annual scales
- Impacts from non-fishing sources (e.g. pollution) may be significant
- Impacts from fishing gears likely to be minimal and temporary
- No attempt made to map pelagic habitat

Return

Fishing Effort Data

- Spatial delineation of fishing effort data is necessary for the assessment of risk of impacts to EFH.
- Several data sets are available for potential inclusion into BBN impacts model each with its strengths and limitations.
  - Trawl Logbook data from PACFIN
  - Ecotrust’s fishing effort model output
  - Fisherman Focus Group data

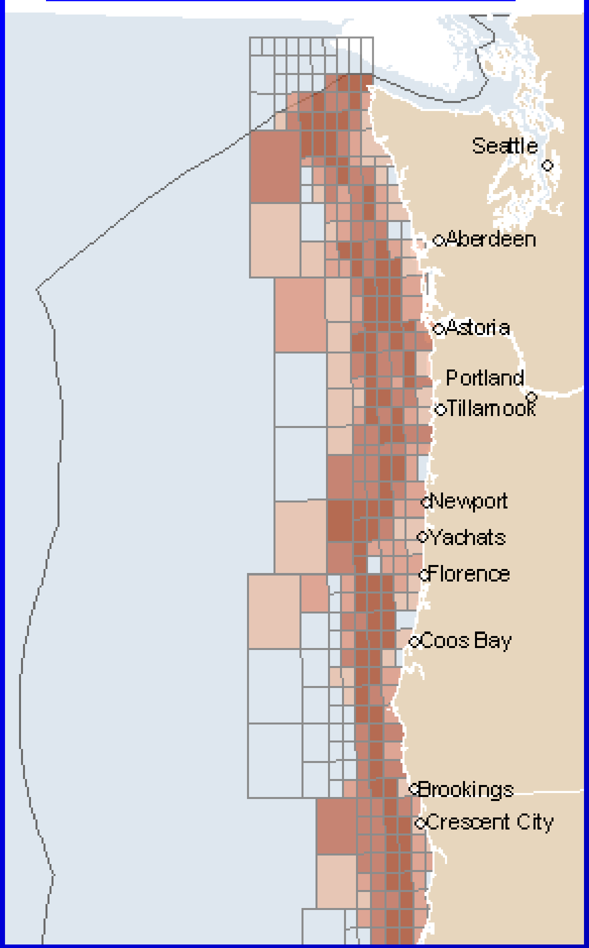
Data Sources: WNDR, ODFW, CDFG

Summary of Fishing Effort Data

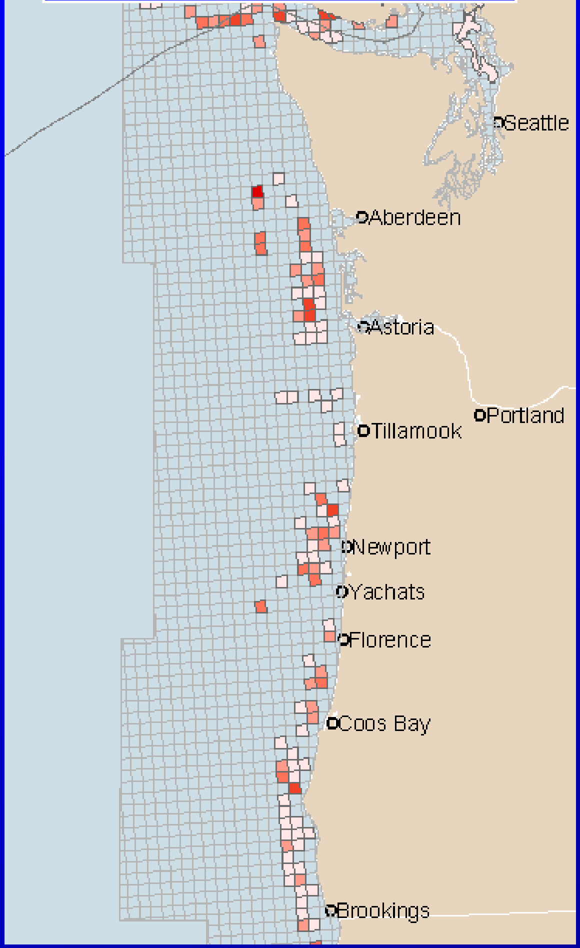
Data Set	Extent	Spatial Resolution	Gear Types	Temporal Attributes	Effort Measure	Catch Measure
Focus Group	Oregon from Newport to Columbia River (NOAA Chart 18520)	Polygons delineated by fishermen on 1:185,238 scale chart	Trawl: Large Footrope Small Footrope Pelagic Pink Shrimp Fixed: Crab Pot Groundfish Pot Longline	Data by Era: Era 1 (1986-1999) Era 2 (2000-2002) Era 3 (2003) Data by Season: Summer Transition Winter	Average number of boats per day by polygon Average tows per boat Average hours per tow	None
Ecotrust Model	West Coast (OR, WA, and CA)	9 x 9 km blocks	Trawl: Trawl Fixed: Pot/Trap Longline Hook and Line Other Gear	Model results summarized by year: 1997 2000	None – Catch used as a proxy for intensity	Pounds caught per year by 9 km block Revenue per year by 9 km block
Trawl Logbook	West Coast (OR, WA, and CA)	Original data source are set points for each tow. Set points assigned to the Trawl Logbook Blocks (mostly 10 minute blocks). All effort assigned to the block in which the set point occurs.	Trawl: Flatfish Groundfish Roller Other Midwater	Set point data for each tow from 1987 – 2002 *All records contain tow year, but only 57% contain actual date of tow..	Number of tows Tow duration	Pounds caught per tow

Commercial Fishing Effort: Potential Data Sources

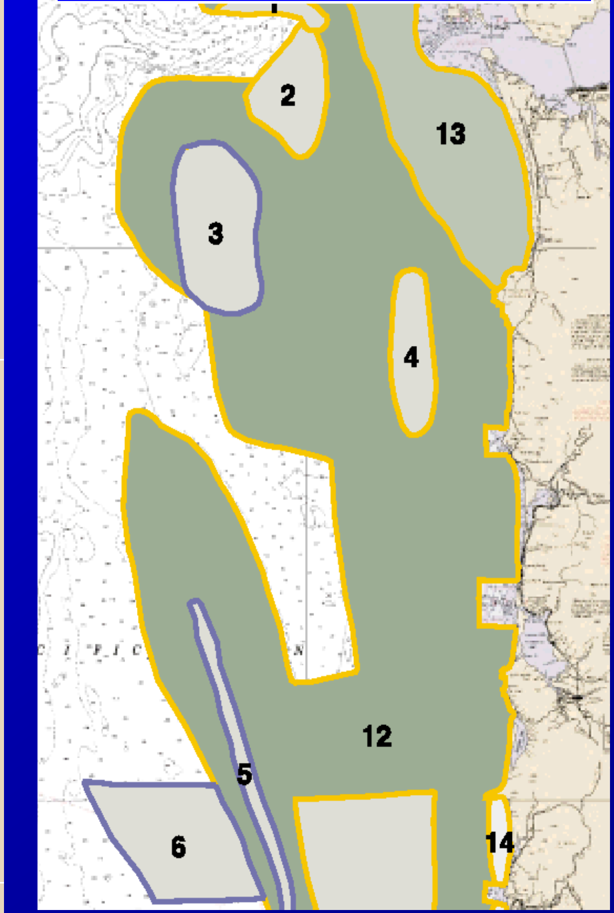
Logbook – Total hours, 2000, Trawl Gear



Ecotrust model – Catch (lbs), 2000, Longline

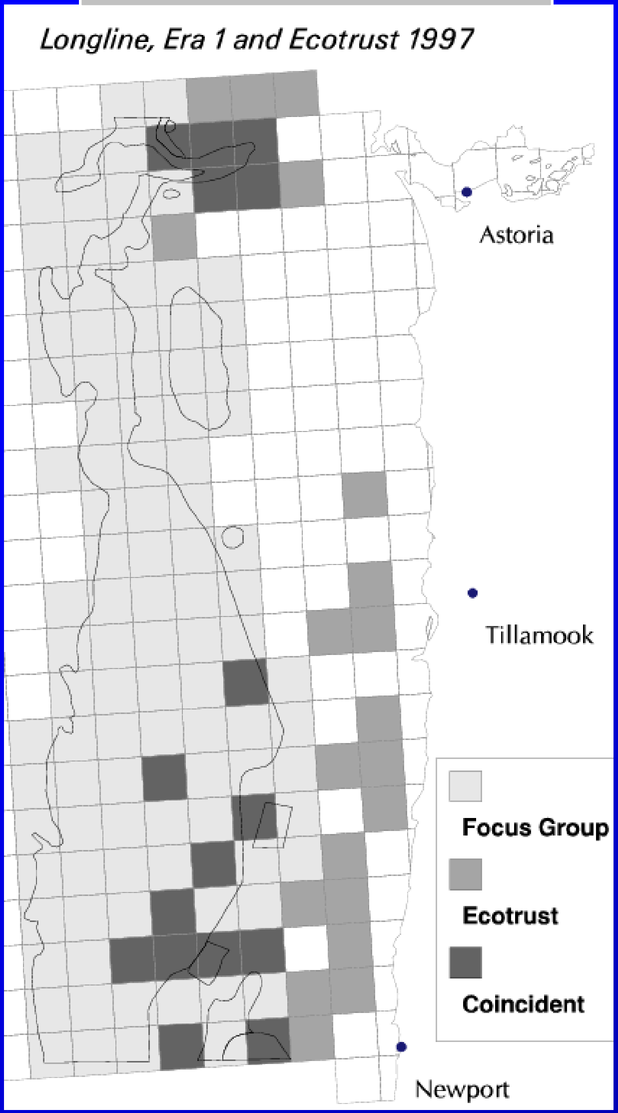


Fishermen’s Focus Group – number of boats/day, Era 1, small footrope trawl

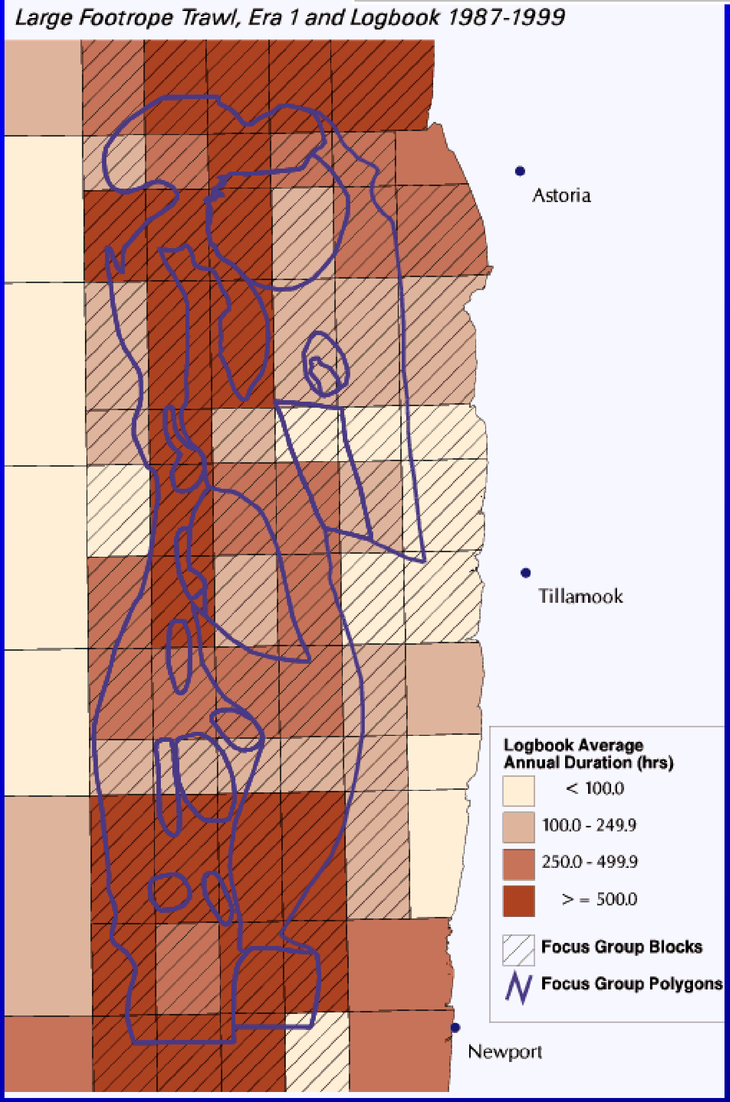


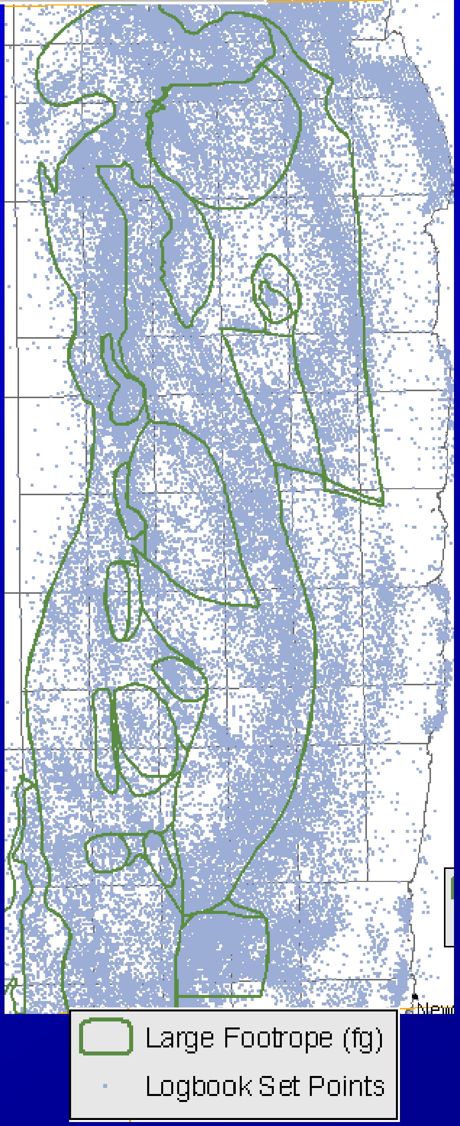
Spatial Comparison of Fishing Effort Data

Focus Group / Ecotrust



Focus Group / Trawl Logbook





- Appendix 5: first order of comparison and validation of effort data sets

TerraLogic GIS

Fishing Effort Data Comparison

- Focus group data compared with both trawl logbook data and the Ecotrust model for spatial coincidence and consistency in estimates of the area impacted by fishing
- Focus group polygons for bottom trawl fishing showed good spatial consistency with trawl logbook data, particularly when overlaid with the trawl set point locations.
- Spatial coincidence and the consistency of fishing area estimates between focus group and Ecotrust results was fairly low for fixed gear types.
- SSC Groundfish Subcommittee has recommended:
  - against using the Ecotrust model output in the impacts model.
  - the use of the focus group approach for collecting coastwide fixed gear information.
- Because the focus group information is limited to a small portion of the coast, it has not been included in the current version of the impacts model

Fishing Effort Data

Trawl logbook data are what remain, but there are problems even with these:

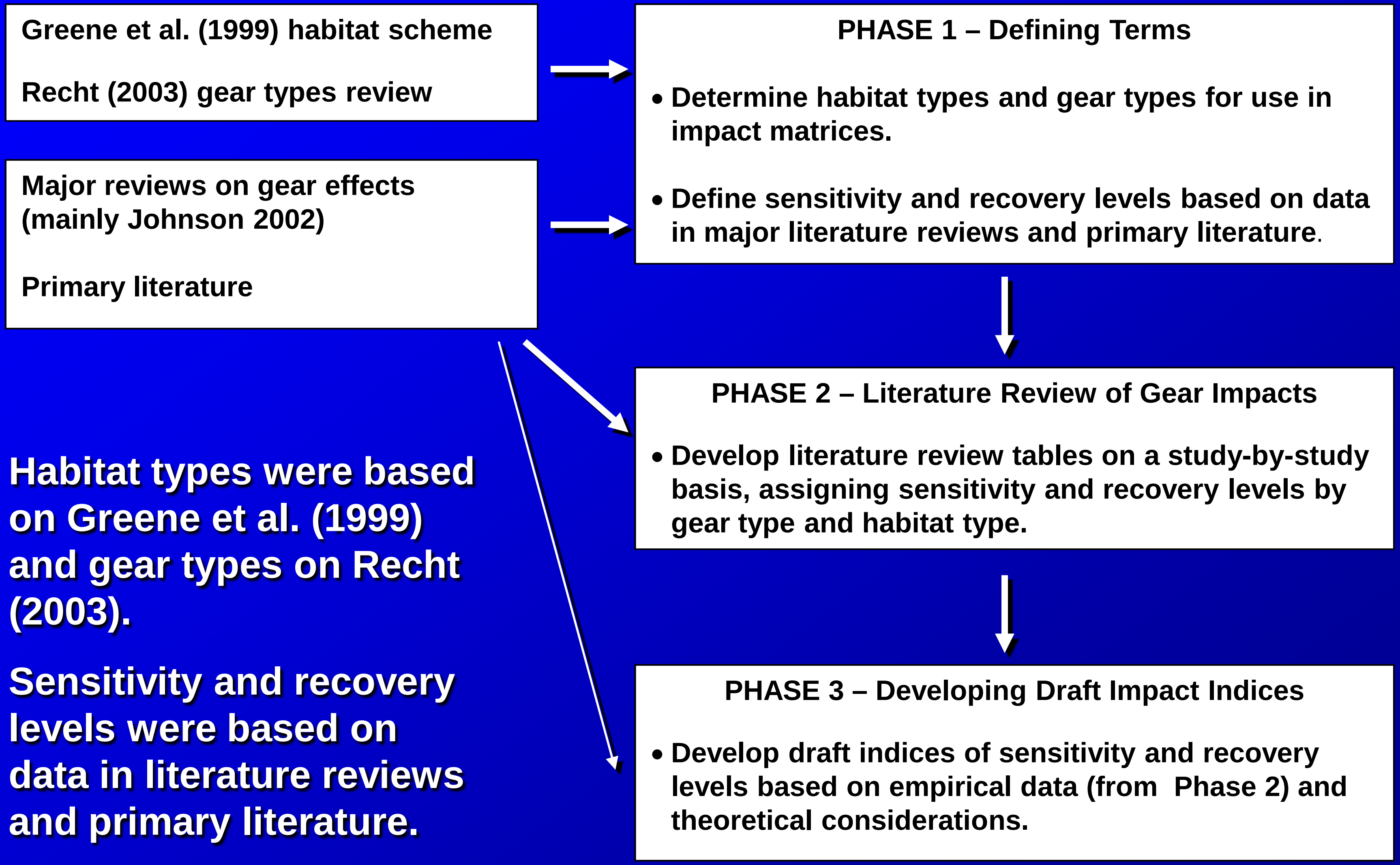
- Coastwide start points and duration from 1987, but prior to 1997 position data for trawls off California were provided by logbook block only, not by precise haul location.
- Prior to 1998, date recorded as year only
- Only a small subset of the PACFIN gear types are included in the logbook data

Gear type	**Number of tows (percent of tows)**
groundfish trawl	363709 (54.4%)
flatfish trawl	138856 (20.8%)
roller trawl	126478 (18.9%)
midwater trawl	33157 (5.0%)
other trawl	3674 (0.5%)
no gear given	2173 (0.3%)

Return

West Coast Perspective on Fishing Impacts: Sensitivity and Recovery Indices

Information Flow in Development of Sensitivity and Recovery Indices



Greene et al. (1999) habitat scheme

Recht (2003) gear types review

Major reviews on gear effects (mainly Johnson 2002)

Primary literature

PHASE 1 – Defining Terms

- **Determine habitat types and gear types for use in impact matrices.**
- **Define sensitivity and recovery levels based on data in major literature reviews and primary literature.**

PHASE 2 – Literature Review of Gear Impacts

- **Develop literature review tables on a study-by-study basis, assigning sensitivity and recovery levels by gear type and habitat type.**

PHASE 3 – Developing Draft Impact Indices

- **Develop draft indices of sensitivity and recovery levels based on empirical data (from Phase 2) and theoretical considerations.**

- **Habitat types were based on Greene et al. (1999) and gear types on Recht (2003).**
- **Sensitivity and recovery levels were based on data in literature reviews and primary literature.**

Gear Types Used on the West Coast

Trawls (TWL)

- Otter Trawl
- Shrimp Trawl
- Beam Trawl
- Midwater Trawl

Nets (NET)

- Demersal Seine
- Round Hall Seine
- Gillnet
- Trammel Net
- Dip Net
- Salmon Reef Net

Dredges (DRG)

- New Bedford Dredge
- Hydraulic Clam Dredg
- Oyster Dredge

Traps & Pots (POT)

- Pots

Hook & Line (HKL)

- Hook & Line
- Bottom Longline
- Pelagic Longline
- Handline, Jig
- Stick (Pipe)
- Rod & Reel
- Vertical Hook & Line
- Mooching

Trolling (TLS)

- Trolling

Miscellaneous (MSC)

- Diving, Hand/ Mech.
- Herring Spawn Kelp
- Herring Brush Weir
- Ghost Shrimp Pump
- Poke Pole
- Bait Pen
- Live Fish, Shellfish

(from Recht 2003)

- Gear types shown here (p 3-4) were considered initially, but studies have been done on only a few.
- Draft impact matrices consisted of five major gear types: dredges, trawls, nets, traps & pots, and hook & line.

Habitat Descriptors Based on Greene et al. (1999)

MEGAH X SUBSTRATE X MACROH

Estuarine (0 to 10+ m water depth)
  Estuarine, Hard
  Estuarine, Soft Sediment
  Estuarine, Biogenic
Shelf (10 to 200 m water depth)
  Shelf, Hard, Exposed
  Shelf, Soft Sediment
  Shelf, Hard, Canyon Wall
  Shelf, Soft Sediment, Canyon Wall
  Shelf, Hard, Canyon Floor
  Shelf, Soft, Canyon Floor
  Shelf, Hard, Gully
  Shelf, Soft, Gully
  Shelf, Hard, Glacial Pavement
  Shelf, Soft, Glacial Outwash
  Shelf, Biogenic

- Only the first two Megahabitats in Table 1d (p 3-10) shown here.
- Table 1d lists the ~ 50 habitat types (=megahabitat x substrate x macrohabitat combinations) used in construction of draft impact matrices.

Descriptions of Sensitivity Levels and Recovery Time

Sensitivity Level	Sensitivity Description
0	No detectable adverse impacts on seabed; i.e. no significant differences between impact and control areas in any metrics.
1	Minor impacts such as shallow furrows on bottom; small differences between impact and control sites, <25% in most metrics measured.
2	Substantial changes such as deep furrows on bottom; differences between impact and control sites 25 to 50% in most metrics.
3	Major changes in bottom structure such as re-arranged boulders; large losses of many organisms with differences between impact and control sites >50% in most metrics.

Recovery Time (yrs)	Recovery Description
0	No recovery time required because no detectable adverse impacts on seabed.
n	n=years required for impact sites to return to pre-impact condition; i.e. no significant differences between impact and control sites in any metrics measured.

Protocol for Determining Draft Gear Impact Matricies (Sensitivity and Recovery)

1. Empirical data were used as the starting point for all gear x habitat combinations, when available.

2. Empirical data were analyzed for trends in relative impacts by major gear types across all habitats and by habitat for all gear types.

3. Expert opinion and/or theoretical considerations were used to determine relative impacts for gear x habitat combinations where no empirical data were available. This was done by assigning impact levels across a range of gear x habitat cells following the general trends identified in steps 2 and 3 and reducing the impact level by approximately 50% at each step along the trend gradient for gear and habitats.

4. When empirical data came from only one study or were apparently anomalous and departed strongly from the overall trends in impact levels (step 2), trend data were used.

Phase 3 – Developing Draft Impact Indices

Information Flow

Tables 3 & 4 (empirical data only: directly from means in Appendix A)

↓

Table 5 (empirical data only: reduced gear types and only 8 habitat types represented)

↓

Tables 6 & 7 (empirical data + theory: reduced gear types, all habitat types)

Implications of Tables 3 and 4

The Bad News…

- The number of gear types used in the final impact matrices must be reduced to only three (3) to yield sample sizes with reasonable error terms.
- The number of habitat types must be reduced to three substrate types (Soft, Hard, Biogenic) for each of only three megahabitat types (Estuarine, Shelf, and Slope) to yield sample sizes with reasonable error terms.

The Good News…

- The empirical data show trends useful for "filling in" the empty spaces in the draft impact matrices.

Trends in Tables 3 and 4…

- **For most habitat types, gear types can be ranked from most damaging to least:**

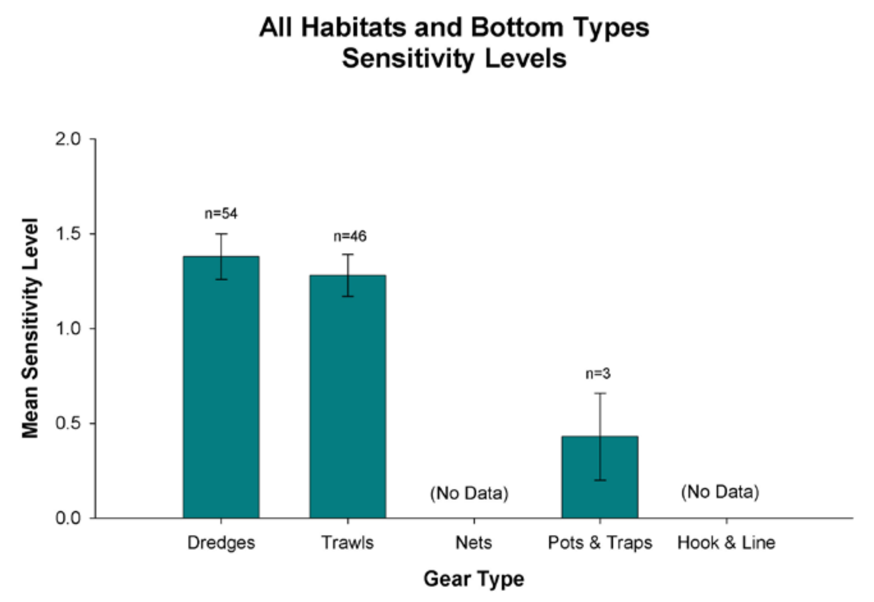
  Dredges ~ Trawls >> Nets > Pots & Traps ~ Hook & Line

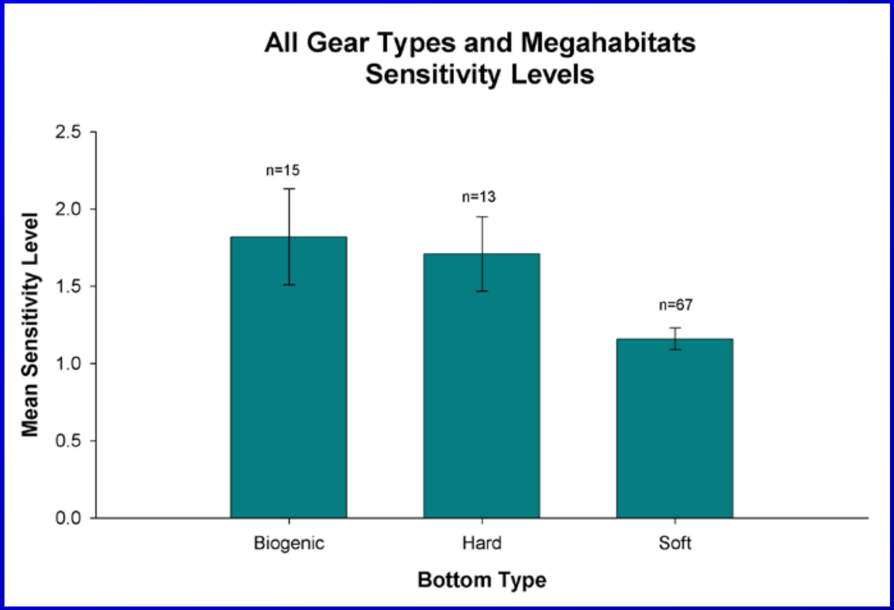
- **For most gear types, substrate types can be ranked from most sensitive to least:**

  Biogenic > Hard Bottom >> Soft Sediments

- **These trends were used to derive values for those gear x habitat cells for which no empirical data were available to construct the draft impact matrices (Tables 6 and 7).**

Trends in Table 3…





Dredges ~ Trawls >> Pots & Traps

Biogenic > Hard Bottom > Soft Sediments

Trends in Table 5…

Megahabitat, Induration, Meso/macrohabitat	Habitat Code	Dredges	Bottom Trawls	Nets
Estuarine, Biogenic/Macrophytes		**2.9 (SE=0.07 , n=4)**	**0.0 (SE=0.00, n=3)**	(nd)
Estuarine, Biogenic/Shellfish		**0.9 (SE=0.93, n=3)**	(nd)	(nd)
Estuarine, Soft		**1.3 (SE=0.34, n=9)**	**0.7 (SE=0.25, n=7)**	(nd)
Shelf, Biogenic/Macrophytes		**2.8 (SE= , n=1)**	**2.0 (SE= , n=1)**	(nd)
Shelf, Biogenic/Shellfish		**1.0 (SE= , n=1)**	**1.0 (SE= , n=1)**	(nd)
Shelf, Biogenic/Sponges		(nd)	**2.2 (SE=0.15 , n=2)**	(nd)
Shelf, Biogenic/Corals		(nd)	**1.0 (SE= , n=1)**	(nd)
Shelf, Hard, Exposure	She	**1.7 (SE=0.40, n=3)**	**2.5 (SE=0.50, n=2)**	(nd)
Shelf, Soft	Ss_u	**1.0 (SE=0.10, n=22)**	**1.2 (SE=0.14, n=29)**	(nd)
Slope, Biogenic, Sponges		(nd)	**3.0 (SE=0.00 , n=2)**	(nd)
Slope, Biogenic, Corals		(nd)	**3.0 (SE=0.00 , n=2)**	(nd)
Slope, Soft	Fs_u	(nd)	**1.0 (SE= , n=1)**	(nd)

Dredges ~ Trawls

Biogenic > Hard Bottom > Soft Sediments

Draft Impact Matrices = Empirical Data + Trends

Bad News: The draft impact matrices must be expanded to include many gear x habitat combinations for which empirical data are not available.

+

Good News: Trends in the empirical data can be used to derive sensitivity levels and recovery times for which no empirical data are available.

=

Draft Impact Matrices (Tables 6 and 7, p -25) consisting of empirically and theoretically derived values.

DRAFT 6 - Table 7. Recovery time (years) ranges for five major gear categories and all mapped habitat types. Values in green shaded cells are ranges from the literature, showing + or - one SE around the calculated means in Table 5. Others are derived va

MEGAHAB, SUBSTRATE, MESO/MACROHAB	Habitat Code	Dredges	Bottom Trawls	Nets	Pots & Traps	Hook & Line
Estuarine, Biogenic/Macrophytes		2.6-5.5 (n=3)	1.5-4.5	0.5-2.0	0.0-0.5	0.0-0.5
Estuarine, Biogenic/Shellfish		2.5-5.5	1.5-4.5	0.5-2.0	0.0-0.5	0.0-0.5
Estuarine, Hard		1.5-2.5	1.0-2.0	0.5-1.0	0.0-0.5	0.0-0.5
Estuarine, Soft		0.2-0.6 (n=8)	0.1-0.3 (n=6)	0.0-0.5	0.0-0.5	0.0-0.5
Shelf, Biogenic/Macrophytes		2.0-6.0 (n=1)	1.5-4.5 (n=1)	0.5-2.5	0.3-1.3	0.3-1.3
Shelf, Biogenic/Shellfish		2.0-6.0	1.0-3.0	0.5-1.5	0.0-0.2 (n=1)	0.0-0.2
Shelf, Biogenic/Sponges		2.0-3.0	1.0-1.6 (n=2)	0.5-1.5	0.4-1.2	0.2-1.0
Shelf, Biogenic/Corals		2.0-3.0	1.0-1.6	0.5-1.5	0.4-1.2	0.2-1.0
Shelf, Hard, Canyon Wall	Shc	1.0-3.0	1.0-2.0	0.5-1.5	0.0-0.5	0.0-0.5
Shelf, Hard, Exposure	She	1.0-3.0	1.0-2.0	0.5-1.5	0.0-0.1 (n=1)	0.0-0.5
Shelf, Hard, Ice-formed feature	Shi_b/p	1.0-3.0	1.0-2.0	0.5-1.5	0.0-0.5	0.0-0.5
Shelf, Soft	Ss_u	0.3-0.7 (n=9)	0.2-0.6 (n=8)	0.1-0.5	0.0-0.5	0.0-0.2
Shelf, Soft, Canyon Floor	Ssc/f_u	0.3-0.7	0.2-0.6	0.1-0.5	0.0-0.5	0.0-0.2
Shelf, Soft, Canyon Wall	Ssc_u	0.3-0.7	0.2-0.6	0.1-0.5	0.0-0.5	0.0-0.2
Shelf, Soft, Gully	Ssg	0.3-0.7	0.2-0.6	0.1-0.5	0.0-0.5	0.0-0.2
Shelf, Soft, Gully floor	Ssg/f	0.3-0.7	0.2-0.6	0.1-0.5	0.0-0.5	0.0-0.2
Shelf, Soft, Ice-formed feature	Ssi_o	0.3-0.7	0.2-0.6	0.1-0.5	0.0-0.5	0.0-0.2
Ridge, Biogenic		2.0-3.0	2.0-3.0	0.5-2.5	0.3-1.3	0.3-1.3
Ridge, Hard, Exposure	Rhe	1.3-2.1	2.0-3.0	0.8-1.6	0.0-0.6	0.0-0.6
Ridge, Soft	Rs_u	0.9-1.1	0.5-1.0	0.8-1.6	0.0-0.6	0.0-0.6
Slope, Biogenic/Sponges		3.5-10.5	3.5-10.5	2.0-8.0	0.0-3.0	0.0-3.0
Slope, Biogenic/Corals		3.5-10.5	3.5-10.5 (n=1)	2.0-8.0	0.0-3.0	0.0-3.0

DRAFT 6 - Table 6. Sensitivity level ranges for five major gear categories for all mapped habitat types. Sensitivity levels range from 0 to 3 (see Table 2 for descriptions). Values in green shaded cells are ranges from the literature, showing + or - one

MEGAHAB, SUBSTRATE, MESO/MACROHAB	Habitat Code	Dredges	Bottom Trawls	Nets	Pots & Traps	Hook & Line
Estuarine, Biogenic/Macrophytes		2.8-3.0 (n=4)	1.0-2.0 (n=3)	0.5-1.0	0.0-0.5	0.0-0.5
Estuarine, Biogenic/Shellfish		2.0-3.0 (n=3)	1.0-2.0	0.5-1.0	0.0-0.5	0.0-0.5
Estuarine, Hard		1.5-2.5	1.0-2.0	0.5-1.0	0.0-0.5	0.0-0.5
Estuarine, Soft		1.0-1.6 (n=9)	0.5-1.0 (n=7)	0.0-0.5	0.0-0.5	0.0-0.5
Shelf, Biogenic/Macrophytes		1.4-3.0 (n=1)	1.0-3.0 (n=1)	0.5-2.5	0.3-1.3	0.3-1.3
Shelf, Biogenic/Shellfish		1.4-3.0 (n=1)	1.4-2.2 (n=1)	0.9-1.8	0.4-1.2 (n=1)	0.2-1.0
Shelf, Biogenic/Sponges		2.0-3.0	2.0-2.4 (n=2)	0.9-1.8	0.4-1.2	0.2-1.0
Shelf, Biogenic/Corals		2.0-3.0	2.0-3.0 (n=1)	0.5-2.5	0.3-1.3	0.3-1.3
Shelf, Hard, Canyon Wall	Shc	1.3-2.1	2.0-3.0	0.8-1.6	0.0-0.6	0.0-0.6
Shelf, Hard, Exposure	She	1.3-2.1 (n=3)	2.0-3.0 (n=2)	0.8-1.6	0.0-0.6 (n=2)	0.0-0.6
Shelf, Hard, Ice-formed feature	Shi_b/p	1.3-2.1	2.0-3.0	0.8-1.6	0.0-0.6	0.0-0.6
Shelf, Soft	Ss_u	0.9-1.1 (n=22)	0.5-1.0 (n=29)	0.5-1.0	0.0-0.5	0.0-0.2
Shelf, Soft, Canyon Floor	Ssc/f_u	0.9-1.1	0.5-1.0	0.2-0.8	0.0-0.5	0.0-0.2
Shelf, Soft, Canyon Wall	Ssc_u	0.9-1.1	0.5-1.0	0.2-0.8	0.0-0.5	0.0-0.2
Shelf, Soft, Gully	Ssg	0.9-1.1	0.5-1.0	0.2-0.8	0.0-0.5	0.0-0.2
Shelf, Soft, Gully floor	Ssg/f	0.9-1.1	0.5-1.0	0.2-0.8	0.0-0.5	0.0-0.2
Shelf, Soft, Ice-formed feature	Ssi_o	0.9-1.1	0.5-1.0	0.2-0.8	0.0-0.5	0.0-0.2

Constructing the Draft Impact Matrices

MEGAHAB X SUBSTRATE X MACROHAB	Bottom Trawls	Nets	Dredges	Pots & Traps	Hook & Line
Estuarine (0-10+ m water depth)			↓		
Estuarine, Hard	0.5-1.4	0.3-0.9	1.2-2.1	0.2-0.5	0.0-0.2
Estuarine, Soft Sediment	0.5-1.0	0.3-0.8	0.7-1.2	0.1-0.4	0.0-0.2
Estuarine, Biogenic	0.0-0.0	0.0-0.0	1.7-2.9	0.0-0.0	0.0-0.0

- Ranges for empirically derived values (shaded) in Tables 6 and 7 are the means + or – one Standard Error from Table 5.
- Theoretically derived values reflect observed trends:

dredges > trawls > nets > pots & traps > hook & line

biogenic > hard bottom > soft sediments

Discussion and Conclusions

- A preliminary attempt to quantify the impacts of fishing gear on bottom habitats, but based on a comprehensive review of the literature
- Paucity of west coast studies does not place serious restrictions on the analysis
- May be useful to consider refining substrate categories and/or other environmental factors (e.g., water depth) used in present analysis

West Coast Perspective on Non-Fishing Impacts:

Development of Draft Index of Adverse Effects

General Considerations

- Major Deliverable: Draft Sensitivity Index of non-fishing impacts (adverse effects)
- Adverse effects: "…direct or indirect physical, chemical, or biological alteration of the waters or substrate and loss of, or injury to, benthic organisms, prey species and their habitat, and other ecosystem components, if such modifications reduce the quality and/or quantity of EFH."
- Major information source: *Non-Fishing Impacts to Essential Fish Habitat and Recommended Conservation Measures* (Boland et al., 2003)

West Coast Perspective on Non-Fishing Impacts:

Development of Draft Index of Adverse Effects

Boland et al. (2003) Non-Fishing Activities Reviewed…

Upland: Agricultural/Nursery Runoff; Silviculture/Timber Harvest; Pesticide Application; Urban/Suburban Development; Road Building & Maintenance

Riverine: Mineral Mining; Sand and Gravel Mining; Organic Debris Removal; Inorganic Debris Removal; Dam Operation; Commercial & Domestic Water Use

Estuarine: Dredging; Disposal of Dredged Material; Fill Material; Vessel Operation/Transportation/Navigation; Introduction of Exotic Species; Pile Driving; Pile Removal; Over-water Structures; Flood Control/Shoreline Protection; Water Control Structures; Log Transfer Facilities; Utility Lines/Cables/Pipeline Installation

Coastal and Marine: Point Source Discharges; Fish Processing Waste; Water Intake Structure/Discharges; Oil/Gas Exploration/Development/Production; Habitat Restoration/Enhancement; Marine Mining; Persistent Organic Pollutants

West Coast Perspective on Non-Fishing Impacts:

Development of Draft Index of Adverse Effects

Definitions

- Adverse effects: "…direct or indirect physical, chemical, or biological alteration of the waters or substrate and loss of, or injury to, benthic organisms, prey species and their habitat, and other ecosystem components, if such modifications reduce the quality and/or quantity of EFH."
    - Direct and indirect impacts defined and determined
    - Impacts on biotic AND physical components of habitats considered, especially as they affect EFH

West Coast Perspective on Non-Fishing Impacts:

Development of Draft Index of Adverse Effects

Rules for Quantifying Impacts

- Primary considerations:
  - Effects on organisms AND physical features
  - Potential for recovery
- Secondary considerations:
  - Range of values represents range of levels "typically" observed
  - Relative distance between activity and habitat considered
  - Others…?

West Coast Perspective on Non-Fishing Impacts:

Development of Draft Index of Adverse Effects

Table 1. Levels of impacts (direct and indirect adverse effects and their descriptions) for non-fishing activities on EFH functions of bottom habitats. (19 Feb 04)

Direct and Indirect Effects

Level of Impact	Description/Rules for Assigning Levels
0	No detectable direct or indirect adverse effects on EFH functions would be expected.
1	Minor impacts that potentially only affect fish or benthos in short-term manner. Minor or no impacts on physical structure of habitat. Recovery of EFH functions likely in months to a few years if activity ceased.
2	Moderate impacts that potentially kill fish and benthos, and cause some changes in physical structure of habitat. Recovery of EFH functions likely within several years if activity ceased.
3	Major impacts that potentially kill fish and benthic fauna, and cause serious alterations in physical structure of habitat. Recovery of EFH functions not likely unless restoration efforts conducted, or will require many years if activity ceased.

West Coast Perspective on Non-Fishing Impacts:

Development of Draft Index of Adverse Effects

Table 2. Classification by location (Upland, Riverine, etc), descriptions, and impact levels for non-fishing activities that impact bottom habitats (from Boland et al. 2003). "Direct effects" are short-term (seconds to hours) responses to the activity or

Upland	Description	Impact Level
Agricultural/Nursery Runoff	Direct effects: nutrient enrichment, sedimentation, salt loading ==> increased turbidity and salinity, altered physiological (e.g. photosynthesis) and ecological (e.g. predation) rates	1
	Indirect effects: algal blooms, excessive oxygen fluctuations, decreased benthic invertebrate diversity and production, decreased fish growth and production	
Silviculture/Timber Harvest	Direct effects: sedimentation, salt loading, altered hydrological regime, increased stream temperature ==> algal blooms, excessive oxygen fluctuations, increased turbidity, altered physiological (e.g. photosynthesis) and ecological (e.g. predation, fish m	1
	Indirect effects: decreased benthic invertebrate diversity and production, decreased fish growth and production	
Pesticide Application	Direct effects: toxic responses by plants, invertebrates, and fish ranging from sublethal (e.g. altered respiration) to lethal	2
	Indirect effects: decreased habitat value (e.g. loss of macrophytes, temperatures exceed tolerances of some fish), decreased invertebrate diversity and production and fish growth and production	
Urban/Suburban Development	Direct effects: loss of riparian vegetated habitat, polluted runoff from altered and impervious surfaces, altered and polluted groundwater seepage ==>	3
	Indirect effects:decreased benthic invertebrate diversity and production, decreased fish growth and production	
Road Building and Maintenance	Direct effects: sedimentation, altered temperature regimes, migration barriers, altered hydrological regime, introduction of non-native species ==> increased turbidity, altered physiological (e.g. photosynthesis) and ecological (e.g. predation) rates, los	1
	Indirect effects: decreased benthic invertebrate diversity and production, decreased fish growth and production	

West Coast Perspective on Non-Fishing Impacts:

Development of Draft Index of Adverse Effects

Table 3. Draft index of impact levels for non-fishing activities by megahabitat/substrate/macrohabitat (Greene et al. 1999) for Upland, Riverine, Estuarine, and Coastal and Marine locations. Ranges were assigned as + ("Max") or - ("Min") 50% of the impac

		Upland Activities									
MEGAH X SUBSTRATE X MACROH	**Habitat Code**	**Agricultural/ Nursery Runoff**		**Silviculture/ Timber Harvest**		**Pesticide Application**		**Urban/Suburban Development**		**Road Building & Maintenance**	
Estuarine (0-10+ m water depth)		**Min**	**Max**	**Min**	**Max**	**Min**	**Max**	**Min**	**Max**	**Min**	**Max**
Estuarine, Hard		0.5	1.5	0.5	1.5	1.0	3.0	1.5	3.0	0.5	1.5
Estuarine, Soft Sediment		0.5	1.5	0.5	1.5	1.0	3.0	1.5	3.0	0.5	1.5
Estuarine, Biogenic		0.5	1.5	0.1	1.5	1.0	3.0	1.5	3.0	0.5	1.5
Shelf (10 to 200 m water depth)											
Shelf, Hard, Exposed	She	0.2	0.9	0.2	0.9	0.8	2.0	0.9	2.1	0.2	0.9
Shelf, Soft Sediment	Ss_u	0.2	0.9	0.2	0.9	0.8	2.0	0.9	2.1	0.2	0.9
Shelf, Hard, Canyon Wall	Shc	0.2	0.9	0.2	0.9	0.8	2.0	0.9	2.1	0.2	0.9
Shelf, Soft Sediment, Canyon Wall	Ssc_u	0.2	0.9	0.2	0.9	0.8	2.0	0.9	2.1	0.2	0.9
Shelf, Hard, Canyon Floor		0.2	0.9	0.2	0.9	0.8	2.0	0.9	2.1	0.2	0.9
Shelf, Soft, Canyon Floor	Ssc/f_u	0.2	0.9	0.2	0.9	0.8	2.0	0.9	2.1	0.2	0.9
Shelf, Hard, Gully	Shg	0.2	0.9	0.2	0.9	0.8	2.0	0.9	2.1	0.2	0.9
Shelf, Soft, Gully	Ssg	0.2	0.9	0.2	0.9	0.8	2.0	0.9	2.1	0.2	0.9
Shelf, Hard, Glacial Pavement	Shi_b/p	0.2	0.9	0.2	0.9	0.8	2.0	0.9	2.1	0.2	0.9
Shelf, Soft, Glacial Outwash	Ssi_o	0.2	0.9	0.2	0.9	0.8	2.0	0.9	2.1	0.2	0.9
Shelf, Biogenic		0.2	0.9	0.2	0.9	0.8	2.0	0.9	2.1	0.2	0.9

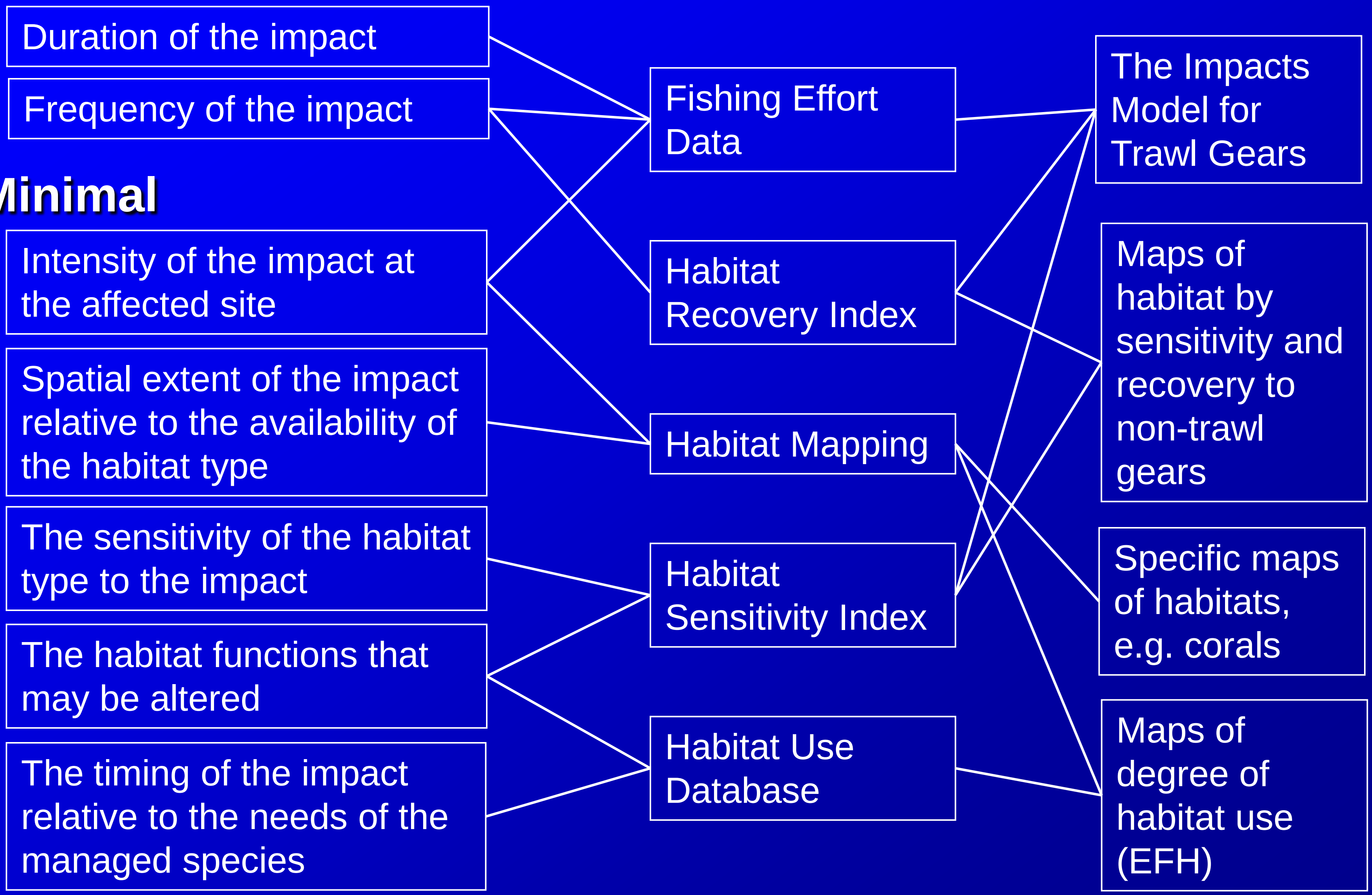
Non-Fishing Impacts Data Collection

Data Collected :

- Upland – USGS Land Use-Land Cover (1993) – coastwide
- Riverine – Dam Locations – coastwide
- Estuarine - Disposal of Dredged Material – Gray's Harbor, WA
  - Overwater Structures (marinas only) – WA, CA
  - Shoreline Protection – WA, CA
  - Aquaculture (approval level) – coastwide
- Coastal and Marine –
  - Water Intake Locations – CA
  - Cable Locations/Pipelines – WA, OR
  - Oil/Gas -- Leases, Platforms, and Pipelines – coastwide

EFH Final Rule

Example Impacts



Temporary

Duration of the impact

Frequency of the impact

Minimal

Intensity of the impact at the affected site

Spatial extent of the impact relative to the availability of the habitat type

The sensitivity of the habitat type to the impact

The habitat functions that may be altered

The timing of the impact relative to the needs of the managed species

Data Sources

Fishing Effort Data

Habitat Recovery Index

Habitat Mapping

Habitat Sensitivity Index

Habitat Use Database

Assessment Tools

The Impacts Model for Trawl Gears

Maps of habitat by sensitivity and recovery to non-trawl gears

Specific maps of habitats, e.g. corals

Maps of degree of habitat use (EFH)

Examples: mitigation in the short term

Example ways of identifying problems

Spatial patterns in the net impact for trawl gears

Where are the most sensitive habitats located?

Trends in net impact for trawl gears

Where are the habitats that take the longest to recover located?

What is the estimated level of impact across the EFH of a species (or species group)

Possible Types of Alternatives

Closed Areas?

Gear modification to reduce impact?

Rotating Closures?

Closed seasons?

Effort Reduction?

Modifying Factors

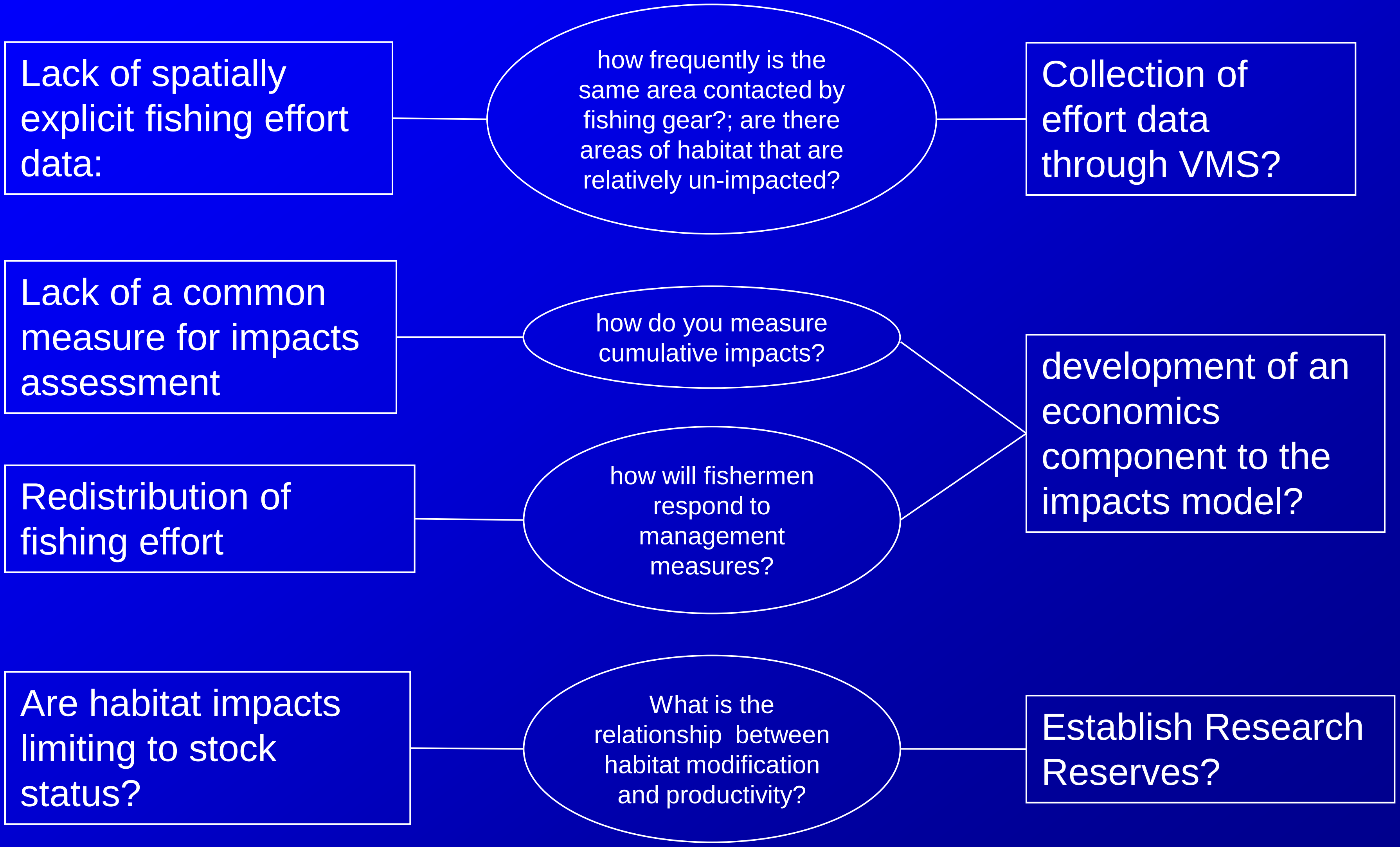
where are the habitats that are most heavily used by managed species?

what existing measures do these areas benefit from?

what other (non-fishing) activities impact these areas?

Examples: mitigation in the long term

Example problems | **Associated Questions** | **Possible Ways Forward**



Lack of spatially explicit fishing effort data:

how frequently is the same area contacted by fishing gear?; are there areas of habitat that are relatively un-impacted?

Collection of effort data through VMS?

Lack of a common measure for impacts assessment

how do you measure cumulative impacts?

Redistribution of fishing effort

how will fishermen respond to management measures?

development of an economics component to the impacts model?

Are habitat impacts limiting to stock status?

What is the relationship between habitat modification and productivity?

Establish Research Reserves?

How the EIS Oversight Committee might use these tools: Strawdog EFH EIS Alternative

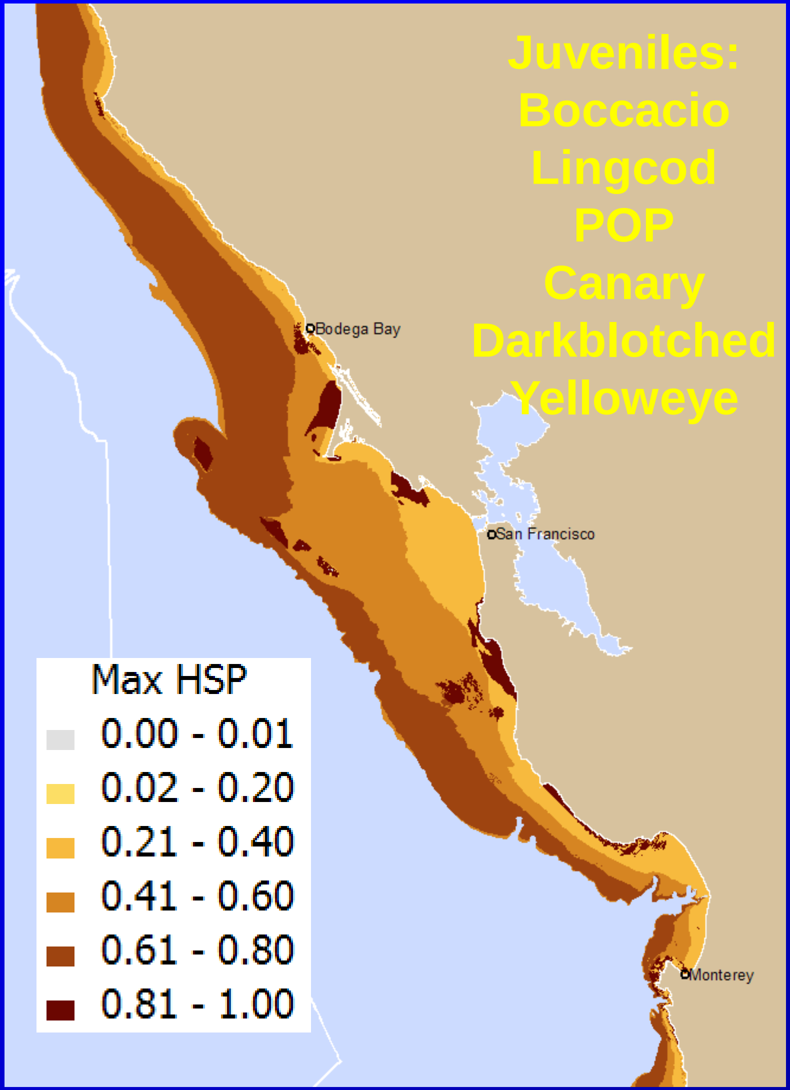
Define EFH:

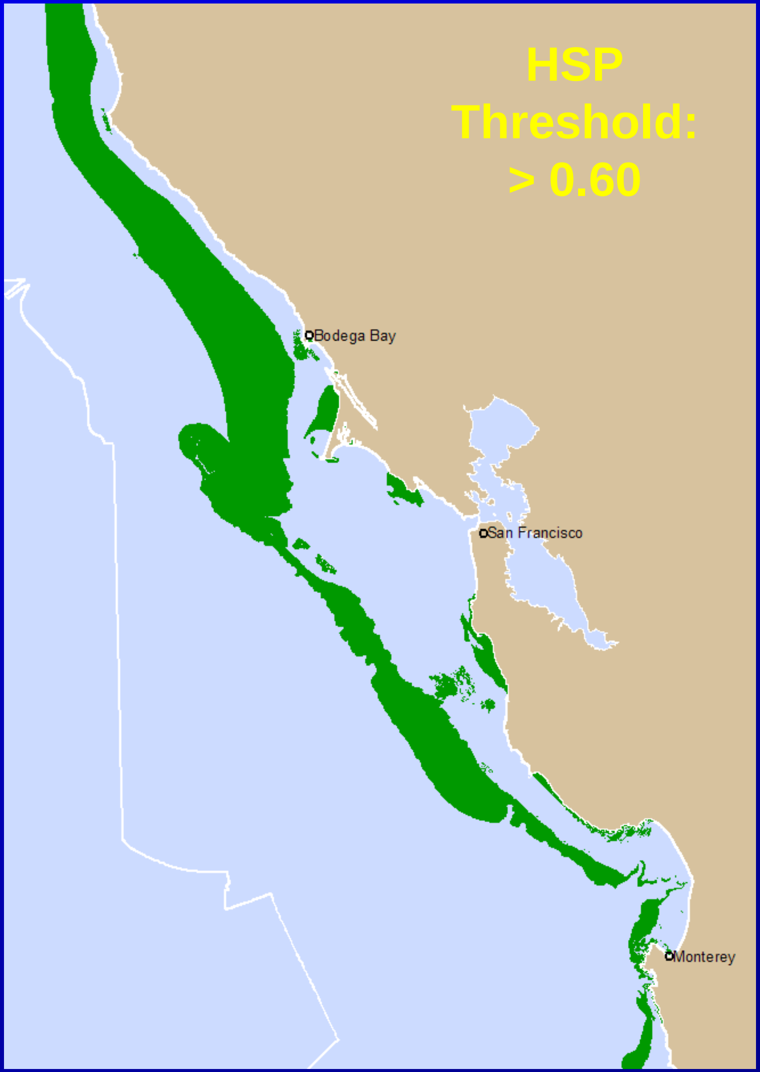
- Choose species: overfished species, juveniles
- Choose approach for combining species: Maximum HSP
- Set threshold: > 60% Max HSP

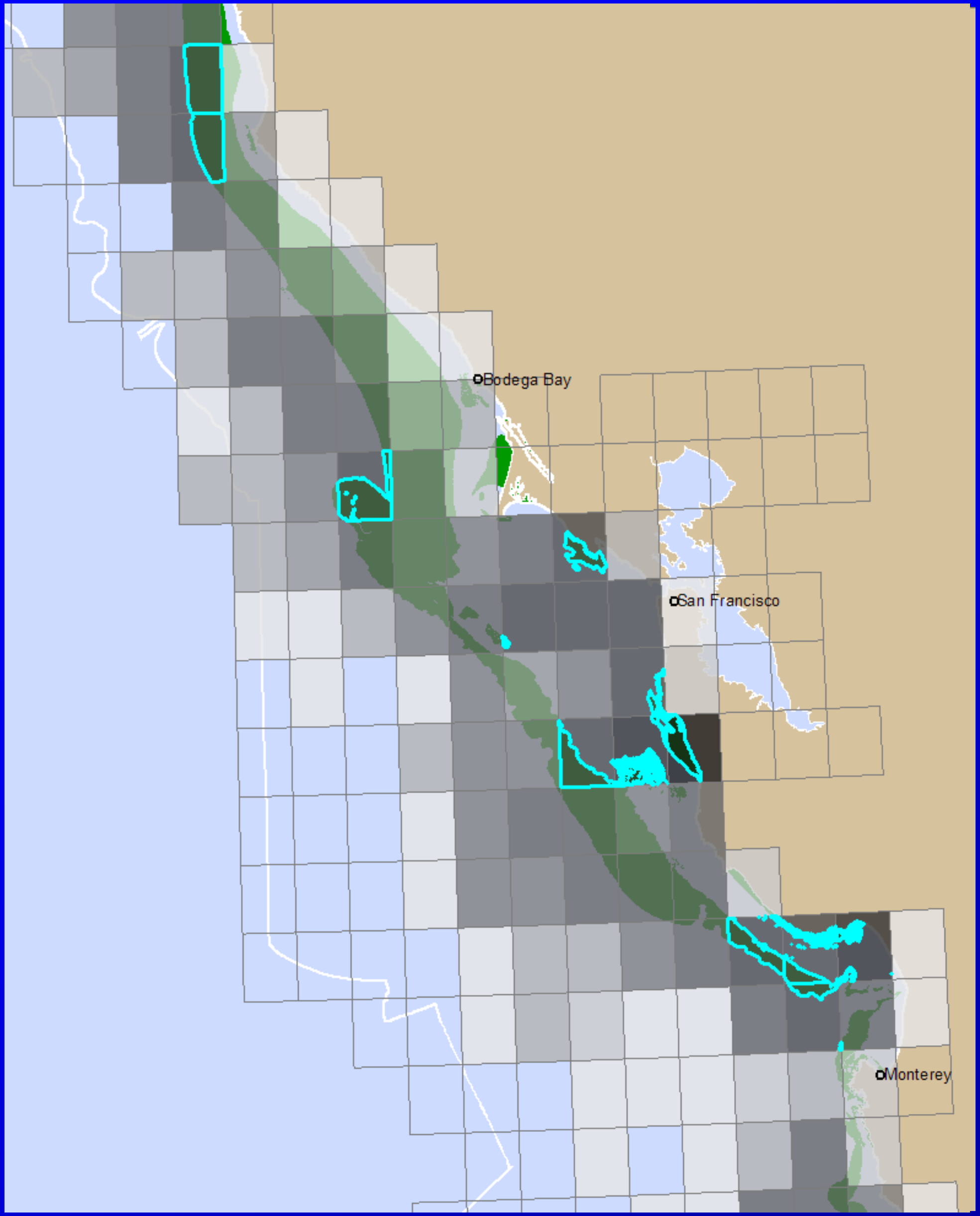
Status of EFH:

- Impacts Model Output and EFH: quantify % of EFH area at various impact levels
- Existing Managed/Protected Areas and EFH: quantify % of EFH area under existing MMA
- Non-Fishing Impacts and EFH: Visual assessment

Example: Defining EFH





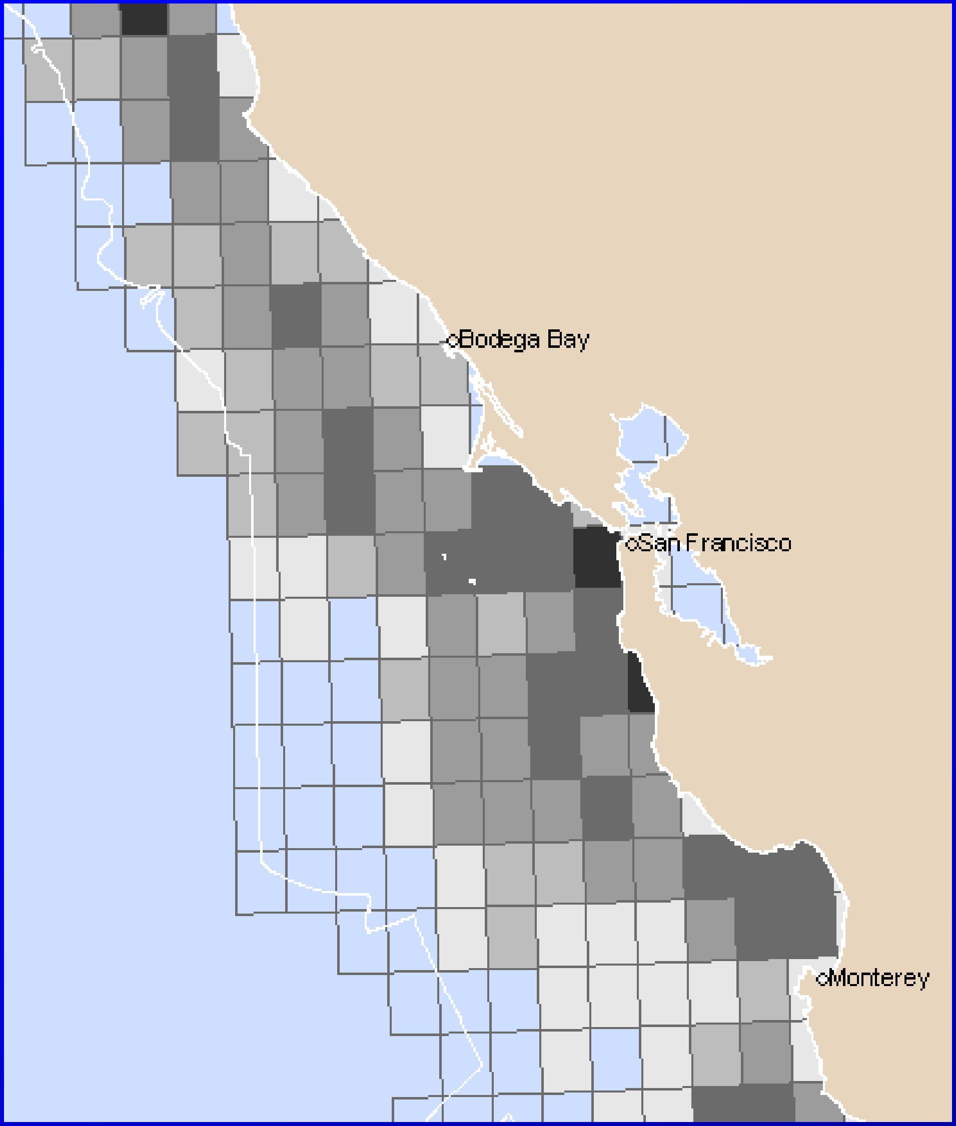


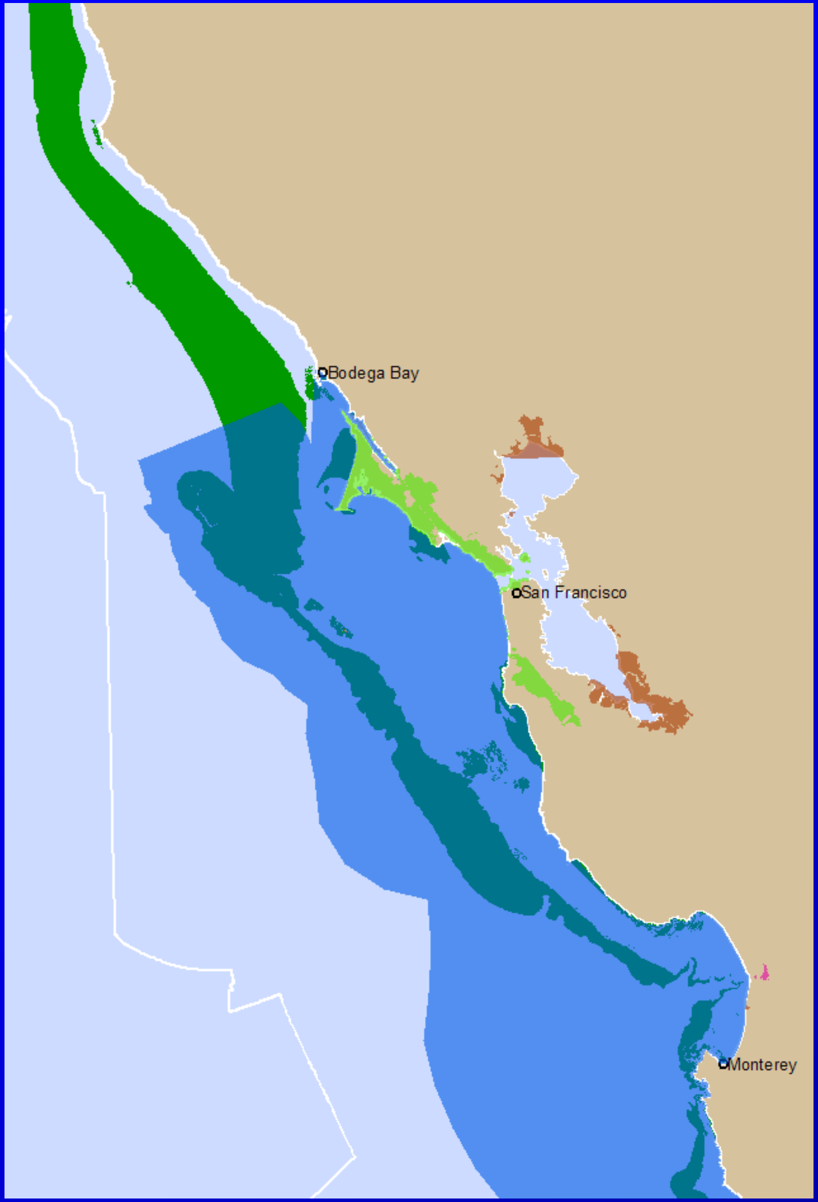
Impacts Model and Example EFH

Impact Level	% EFH Area
0	2.5%
0.001-0.2	8.0%
0.2-0.4	17.5%
0.4 - 0.6	49.0% ⇦
0.6 - 0.8	22.0%
0.8 - 1.0	0.9%

TerraLogic GIS

Impacts Model output with *k* = 0.35

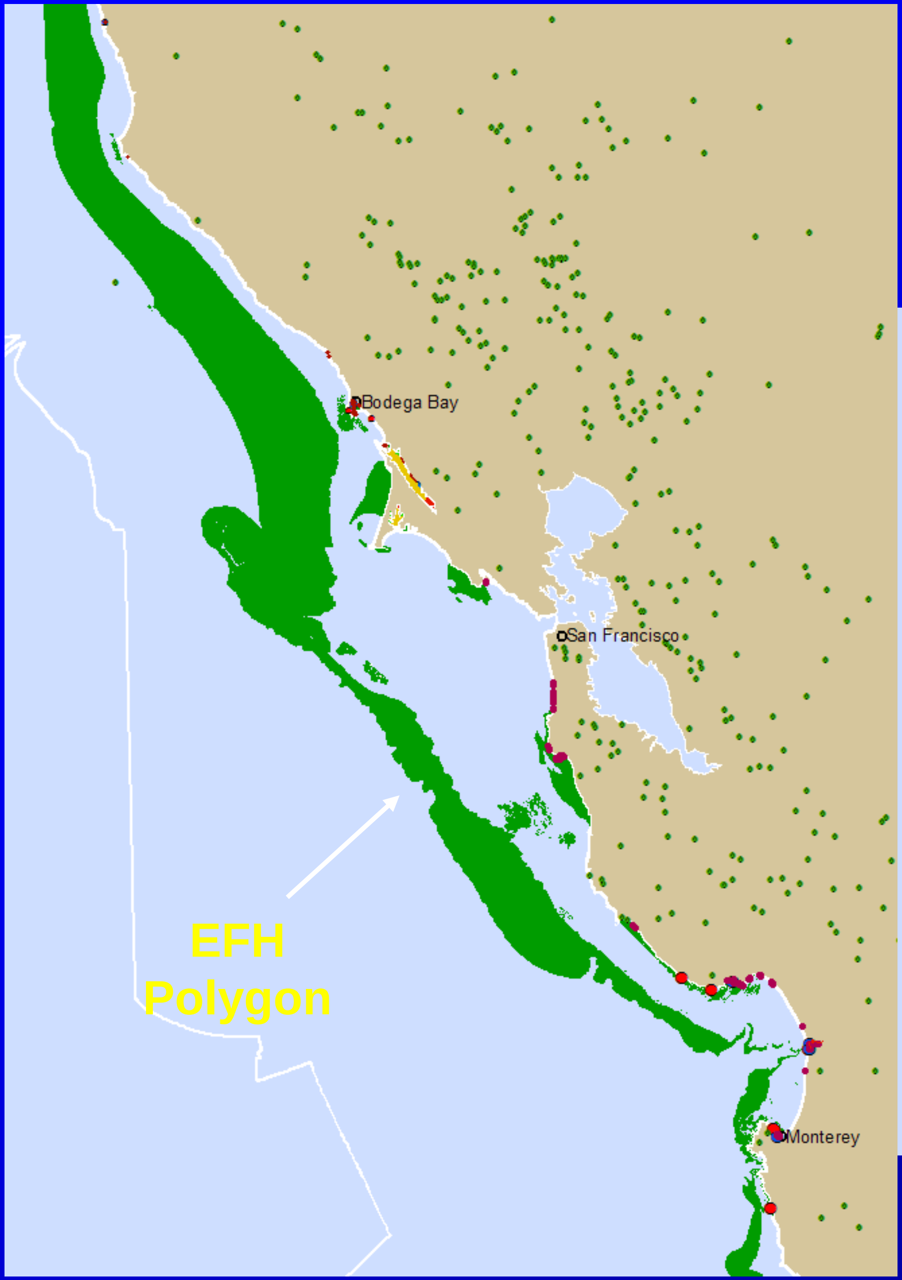




Marine Managed Areas and Example EFH

Agency	% EFH Area
	73.0%
NOAA - NMS	26.1%
NOAA - NMFS	0.7%
DOI - NPS	0.1%
DOI - NWR	0.0%

Non-fishing Impacts and Example EFH

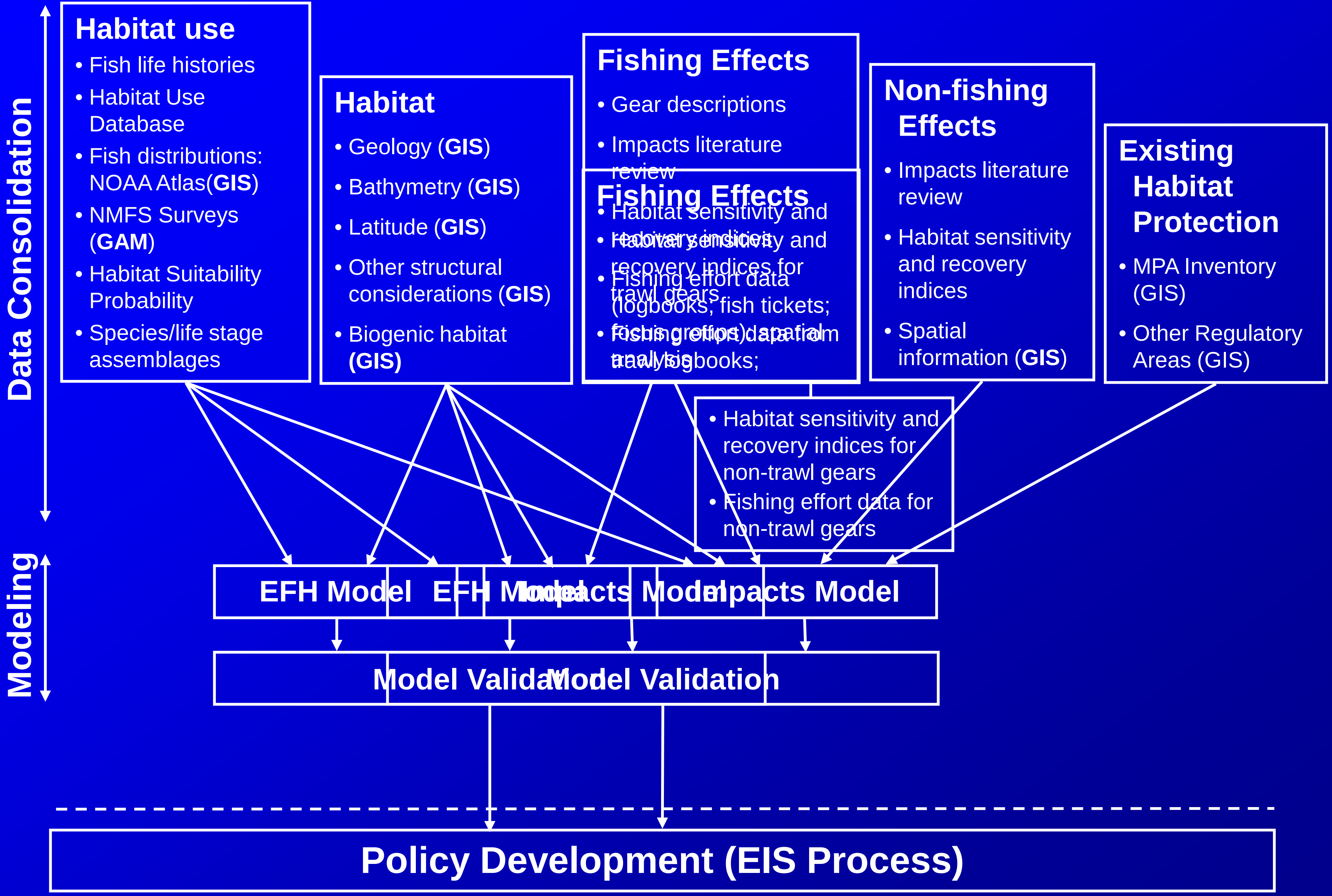


- ～ central california shoreline hardening
- • california dams
- 🔵 central califorina marinas
- 🔴 central califorina water intake

shellfish class

- 🟪 Approved
- 🟨 Conditionally Approved
- 🟥 Prohibited
- 🟦 Restricted
- 🟩 Unclassified

Decision-making Framework for EFH



Habitat use

- Fish life histories
- Habitat Use Database
- Fish distributions: NOAA Atlas(**GIS**)
- NMFS Surveys (**GAM**)
- Habitat Suitability Probability
- Species/life stage assemblages

Habitat

- Geology (**GIS**)
- Bathymetry (**GIS**)
- Latitude (**GIS**)
- Other structural considerations (**GIS**)
- Biogenic habitat (**GIS**)

Fishing Effects

- Gear descriptions
- Impacts literature review
- Habitat sensitivity and recovery indices
- Fishing effort data (logbooks; fish tickets; observer); spatial analysis

Fishing Effects

- Habitat sensitivity and recovery indices for trawl gears
- Fishing effort data from trawl logbooks;

- Habitat sensitivity and recovery indices for non-trawl gears
- Fishing effort data for non-trawl gears

Non-fishing Effects

- Impacts literature review
- Habitat sensitivity and recovery indices
- Spatial information (**GIS**)

Existing Habitat Protection

- MPA Inventory (GIS)
- Other Regulatory Areas (GIS)

EFH Model

EFH Model

Impacts Model

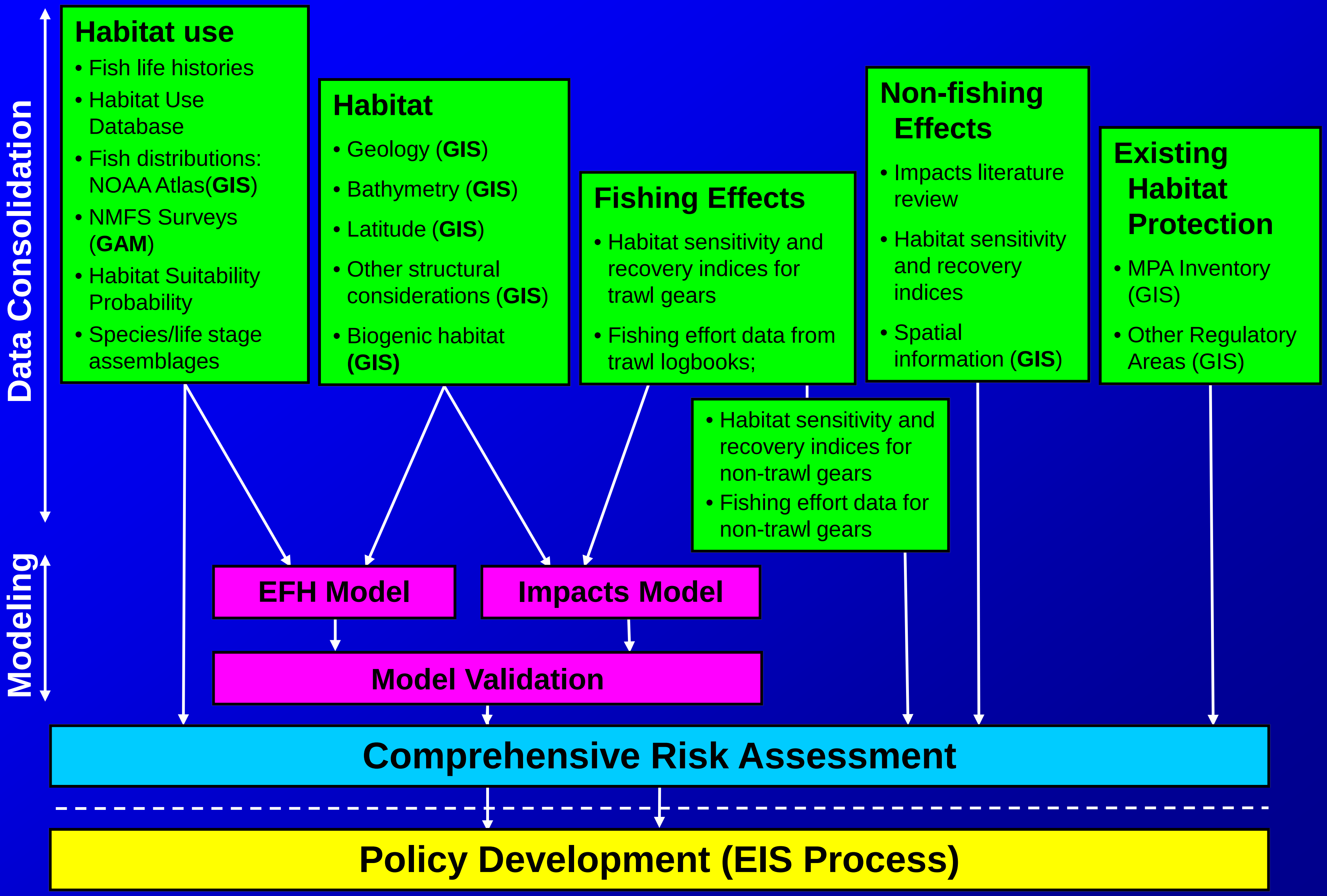
Impacts Model

Model Validation

Model Validation

Policy Development (EIS Process)

Decision-making Framework for EFH



Data Consolidation

Modeling

Habitat use

- Fish life histories
- Habitat Use Database
- Fish distributions: NOAA Atlas(**GIS**)
- NMFS Surveys (**GAM**)
- Habitat Suitability Probability
- Species/life stage assemblages

Habitat

- Geology (**GIS**)
- Bathymetry (**GIS**)
- Latitude (**GIS**)
- Other structural considerations (**GIS**)
- Biogenic habitat (**GIS**)

Fishing Effects

- Habitat sensitivity and recovery indices for trawl gears
- Fishing effort data from trawl logbooks;
- Habitat sensitivity and recovery indices for non-trawl gears
- Fishing effort data for non-trawl gears

Non-fishing Effects

- Impacts literature review
- Habitat sensitivity and recovery indices
- Spatial information (**GIS**)

Existing Habitat Protection

- MPA Inventory (GIS)
- Other Regulatory Areas (GIS)

EFH Model

Impacts Model

Model Validation

Comprehensive Risk Assessment

Policy Development (EIS Process)

Risk Assessment Document

- Major Data Sources
  - West Coast Fish Habitat
  - Effects of Fishing on Groundfish Habitat
  - Effects of Non-fishing Activities on Groundfish Habitat
- Modeling the Status of Fish Habitat (the Impacts Model)
  - Effects of Data on Model Specification
  - Impact Function
  - BN Model
- Results
  - Comprehensive Risk Assessment
  - Using the Impacts Model
- Potential Fishing Impacts Alternatives

Risk Assessment Appendices

1. DESCRIPTION OF FISHING GEARS
2. GEAR TYPES IN THE PACFIN DATABASE
3. THE EFFECTS OF FISHING GEARS ON HABITAT: WEST COAST PERSPECTIVE
4. REPORT OF FOCUS GROUPS TO COLLECT FISHINIG EFFORT DATA
5. FISHING EFFORT GIS DATA ASSESSMENT FOR GROUNDFISH ESSENTIAL FISH HABITAT
6. NON-FISHING IMPACTS TO ESSENTIAL FISH HABITAT AND RECOMMENDED CONSERVATION MEASURES
7. ORGANIZATIONS CONTACTED FOR INFORMATION ON NON-FISHING IMPACTS TO EFH
8. EVALUATION OF A US WEST COAST GROUNDFISH HABITAT CONSERVATION REGULATION VIA ANALYSIS OF SPATIAL AND TEMPORAL PATTERNS OF TRAWL FISHING EFFORT
9. MARINE PROTECTED AREAS AND FISHING ACTIVITIES ON THE U.S. WEST COAS

Exhibit C.4.c
Supplemental SSC Report
June 2004

SCIENTIFIC AND STATISTICAL COMMITTEE REPORT ON GROUNDFISH ESSENTIAL FISH HABITAT ENVIRONMENTAL IMPACT STATEMENT ANALYTICAL FRAMEWORK - FISHING GEAR IMPACT MODEL COMPONENT

Scientific and Statistical Committee (SSC) Groundfish and Economics Subcommittees met May 24-25 to review the fishing gear impact model component of the analytical framework for the essential fish habitat (EFH) environmental impact statement (EIS). Dr. Michael Dalton (Chair, SSC Economics Subcommittee) presented a report of this meeting to the SSC. Strengths and weaknesses of the current version of the fishing impacts model and data were described, recommendations were made concerning appropriate use of the fishing impacts model for EFH analyses, and data needs were considered in view of the ongoing requirements to evaluate impacts on EFH. A final version of the report will be available in time for the Ad Hoc Groundfish Fishery Management Plan EIS Oversight Committee's consideration of preliminary alternatives.

The SSC considered the utility of the fishing impacts model at its current state of development. The SSC concluded that further development of the model and additional data on fishing effort will be necessary before it can endorse use of the fishing impacts model for the purpose of identifying where adverse fishing impacts occur. The SSC does not recommend use of the current EFH fishing impacts model in the development and evaluation of management alternatives.

The report today is to inform the Council's consideration of approving the fishing impacts model. The SSC highlighted the following critical issues about the fishing impacts model:

1. Data from trawl logbooks are the only coast wide source of spatial data on fishing effort.
2. Values for a key tuning parameter in the model are arbitrary.
3. Spatial inconsistencies with the resolution of the fishing impacts model and impacts on habitat.

The SSC acknowledges the complexity of these issues and, specifically, the importance of data gaps. However, each of these issues severely limits the ability of the model to address impacts on EFH.

The Geographic Information System (GIS) package developed by the EFH analytical team contains a wide range of tools for habitat mapping and evaluation of potential fishing impacts. Data used with the fishing impacts model (trawl effort data, gear sensitivity, and habitat recovery matrices) are informative on their own. A useful set of maps based on these data could be developed to aid formulation and evaluation of EFH management alternatives. For example, polygons of the most sensitive habitat types could be overlaid with the trawl start coordinates to provide an index of potential trawl impacts. In addition, maps that associate habitat type to sensitivity and recovery for different gears could be used to develop and evaluate mitigation options.

The SSC examined some of the habitat suitability maps produced by the EFH identification model that are posted on the Council’s website. Although the EFH identification model was previously endorsed by the SSC, detailed results were not available at the time of the SSC review. The SSC has concerns about the habitat suitability maps for several species (e.g., cowcod, California scorpionfish, lingcod) which show unexpected patterns that need to be explored further. The SSC recommends that maps for individual species be reviewed before use, and that a formal review process be developed for this purpose, possibly by the EFH Technical Review Committee.

PFMC
06/16/04

Exhibit C.4.d
Supplemental HC Report
June 2004

HABITAT COMMITTEE COMMENTS ON GROUNDFISH ESSENTIAL FISH HABITAT (EFH) ENVIRONMENTAL IMPACT STATEMENT (EIS) ANALYTICAL FRAMEWORK - FISHING GEAR IMPACT MODEL COMPONENT

The Habitat Committee (HC) received a presentation from Graeme Parkes (MRAG Americas) and Steve Copps (NMFS) on the fishing gear impact model to the essential fish habitat EIS. The presentation complements information provided at the April Council meeting on the EFH model. The fishing gear impacts model represents a significant advance in efforts to understand the distribution and impacts of fishing activities on habitat. We appreciate the effort and work that went into producing this document. The compilation of habitat and fishing effort databases, and investigations into habitat sensitivity and recovery rates after impacts from mobile fishing gear, identify significant information gaps that need to be filled in future data collection efforts.

There are a number of data and analytical limitations that will constrain how this model can be used (at present) by the Council:

1. It is not possible, with the data available, to establish a quantitative relationship between fishing activities and the functional value of habitat types. However, the model does attempt to portray information in a quantitative, mathematical algorithm. While absolute estimates of habitat impact and recovery cannot be derived from the available information, relative impacts will be useful for management decisions.

2. The available modeling information is limited to bottom-trawling, as this is the only gear type with a comprehensive data set that can be put into a GIS format. It is not possible to make comparisons of fishing impacts to habitat across gear types that could guide the Council in addressing habitat impacts through allocation or gear regulations.

3. There was a limited consideration of non-fishing impacts in relation to fishing impacts on EFH; therefore it will not be possible at this time to place fishing and non-fishing impacts to EFH into perspective. The HC recognizes that with limited funds and limited time this was not a primary goal of the EFH EIS team. This points out the need for future data collection and analytical efforts to address non-fishing impacts.

4. One of the Council's charges through EFH is to minimize impacts on habitat from fishing to the extent practicable. While this modeling effort is valuable in identifying areas where relative impacts are more or less severe, it is not possible to use these model results to determine where the Council needs to take action to protect habitat. In other words, the modeling effort will be helpful to the Council in addressing spatial questions related to trawl fishing; there is not sufficient information to help the Council determine how subtle changes in gear attributes will translate into habitat sensitivity and recovery.

Despite these limitations, the EFH fishing gear impacts modeling effort allows is to identify relative impacts to EFH for single species as well as ecological assemblages due to trawling. By itself, this is a significant advance in our understanding.

The HC is concerned that while a great deal of effort has been put into modeling and data collection, there is very little time before the September Council meeting for development of alternatives.

PFMC
06/14/04

Exhibit C.5
Situation Summary
June 2004

PRELIMINARY CONSIDERATION OF EXEMPTED FISHING PERMIT APPLICATIONS FOR 2005-2006

Situation: Exempted fishing permits (EFPs) provide a process for testing novel fishing gears and strategies to substantiate methods for prosecuting sustainable and risk-averse fishing opportunities. The cost of conducting EFPs is the loss of some available harvest for directed full fleet fisheries.

This agendum provides the opportunity for Council, state, and agency representatives to review draft applications for EFPs in 2005. Draft EFP applications approved by the Council under this agendum will likely require harvest set asides for overfished species. The costs and benefits of allocating available harvest to EFPs and directed fisheries needs to be considered coincidentally. Therefore, harvest set asides for Council approved EFPs in 2005 and anticipated EFPs in 2006 will be adopted along with tentative 2005-2006 management measures under agendum C.6 and final 2005-2006 management measures under agendum C.10. Final approval of 2005 EFP applications will occur at the November Council meeting. Only those draft EFP applications approved at the June Council meeting may be considered in November; EFP applications received after the June Council meeting for 2005 will not be considered.

Council Action:

1. Review and provide preliminary approval of draft EFP applications for 2005-2006.

Reference Materials:

1. Exhibit C.5.b, CDFG Report: Application for Issuance of an Exempted Fishing Permit to Test a Selective Flatfish Trawl (including Scottish Seine) in and area otherwise closed to fishing, 2005.
2. Exhibit C.5.b, ODFW Report: Application for Exempted Fishing Permit to Examine Groundfish Behavior During Capture in Bottom Trawls.
3. Exhibit C.5.b, WDFW Report: Exempted Fishing Permit Applications for 2005-2006.
4. Exhibit C.5.b, WDFW Report Attachment 1: Application for Issuance of an Exempted (Experimental) Fishing Permit for Arrowtooth Flounder.
5. Exhibit C.5.b, WDFW Report Attachment 2: Application for Issuance of an Exempted (Experimental) Fishing Permit for Spiny Dogfish.

Agenda Order:

a.	Agendum Overview	Mike Burner
b.	Recommendations of the States, Tribes, and Federal Agencies	
c.	Reports and Comments of Advisory Bodies	
d.	Public Comment	
e.	**Council Action:** Preliminary Approval of EFP Applications for 2005-2006.	

PFMC
05/27/04

Exhibit C.5.b
CDFG Report
June 2004

Application for Issuance of an Exempted Fishing Permit to Test a Selective Flatfish Trawl (including Scottish Seine) in an area otherwise closed to fishing in 2005

A. **Date of application:** Draft: May 26, 2004

B. **Applicant Contact**
California Department of Fish and Game
350 Harbor Blvd.
Belmont, CA 94002

Contact: Primary: Steve Wertz (562-342-7184)
Secondary: Susan Ashcraft (650) 631-6786

C. **Statement of purpose and goals of the experiment, for which an EFP is needed, including a general description of the arrangements for the disposition of all species harvested under the EFP:**
The purpose of the experiment is to determine whether a shelf flatfish fishery can be prosecuted in an otherwise closed area of California waters using modified small footrope trawl gear including Scottish seine designed to minimize the bycatch of overfished groundfish. Testing of this modified trawl in California was first conducted in 2003 in the area South of 40°10' N. lat; however, only one vessel participated, and the area tested was in a narrow geographic range. In order to draw conclusive results for management consideration over a broader range in California, this experiment requires additional years of data to be collected. A second year of study engaging six vessels is scheduled for August through November 2004. A continuation of the study in 2005 may be required to collect necessary data to determine the effectiveness of modified small footrope trawl gear in minimizing impacts on overfished shelf rockfish species when accessing healthy flatfish stocks on the shelf.

Pacific Coast groundfish are managed by the Pacific Fishery Management Council (PFMC) under a federal fishery management plan (FMP) for the west coast. The management goals of the FMP are to:

- Prevent overfishing by managing for appropriate harvest levels and prevent any net loss of the habitat of living marine resources.
- Maximize the value of the groundfish resource as a whole.
- Achieve the maximum biological yield of the overall groundfish fishery, promote year-round availability of quality seafood to the consumer, and promote recreational fishing opportunities.

The experiment conducted through an EFP will assist the PFMC in achieving the goals set forth in the FMP while collecting bycatch data on overfished stocks and evaluating the effectiveness of specific trawl gear modifications in reducing bycatch of overfished stocks. In particular, this EFP expands the applicability of equivalent gear tested off the coasts of Oregon and Washington in EFPs during the past two years, which are being developed into regulations to be implemented in 2005 for the area north of 40˚10' N. lat. Further evaluation in the area south of 40˚10' N. lat is needed before results may be applied coastwide.

- **The specific goals of the experiment are:** To evaluate the effectiveness of modified trawl gear (see Section I below for modified trawl gear specifications) to catch shelf flatfish while minimizing take of overfished rockfish species in all depths.

- To measure bycatch rates of overfished groundfish and rockfish species that may be associated with the small footrope trawl shelf flatfish fishery using the modified trawl gear with no depth restrictions through an at-sea observer program.

- To provide fishermen with an incentive to modify their gear by giving them the opportunity to take shelf flatfish in areas that are otherwise closed.

Disposition of the species harvested under the EFP will be as follows:

- Species caught within the normal current trip limits may be retained and sold by the vessel.

- All rockfish caught while targeting shelf flatfish during the EFP must be retained and offloaded. Overages of rockfish must be surrendered, and proceeds from these species in excess of trip limits will be forfeited to the State of California.

D. **Valid justification explaining why issuance of an EFP is warranted:**

Since 1998, the PFMC has initiated rebuilding plans for several species, including bocaccio and canary rockfish. Conservation areas have since been established and closed to groundfish fishing in order to prevent harvest of the overfished stocks in multi-species fisheries. Critical to these rebuilding plans and to the overall improvement of groundfish management, is the need for more and better scientific data. There are 82 species covered under the FMP, and at present, there is little or no data on a large number of these species. There is a need for comprehensive, timely, and credible data for priority species to aid in the conservation and rebuilding efforts for these stocks.

The shelf flatfish are an extremely important group of groundfish in the California groundfish fisheries. These stocks are believed to be healthy, and California fishermen and processors have worked aggressively to develop strong markets for these species. A component of the California trawl fleet and processors are heavily dependent upon these flatfish.

A depth closure was enacted from July 1 to December 31, 2002 to reduce the take of overfished shelf rockfish in the primary depths of their range, which applied to all trawlers, including vessels targeting shelf flatfish using small footrope trawl. An EFP was approved for use inside the closed area to observe rockfish bycatch rates of unmodified shelf flatfish trawl gear targeting shelf flatfish. Results from the 2002 EFP indicated that the incidental take of bocaccio and other sensitive rockfish species was minimal in depths to 70 fathoms (fm) using conventional flatfish trawl gear. Access to depths below 70 fm was not granted due to the increased likelihood of incidental take of bocaccio rockfish, canary rockfish, and other sensitive species in deeper waters. Although results of the experiment to 70 fm were promising, the question remained if a shelf flatfish fishery could be successfully prosecuted in deeper waters where shelf rockfish abundance increases.

In 2003 and 2004, EFPs were issued to California to conduct a follow-up fishery experiment in deeper waters, out to 100 fm (in 2003) and to unrestricted depths (in 2004), where the likelihood of incidental take of bocaccio and other shelf rockfish is higher. An important condition added under these EFPs was a requirement to use modified shelf flatfish trawl gear. The design follows the net configuration used in an Oregon research and EFP project to evaluate the bycatch rates of overfished shelf rockfish species while targeting flatfish with the modified trawl. Results from the Oregon experiment were promising and reflected a reduced bycatch rate of canary rockfish. The application of a similar trawl design was applied in the California EFP to test the effectiveness of the modified trawl in minimizing the bycatch of not only canary, but also of bocaccio, which is an overfished stock in coastal California. The 2003 EFP results are inconclusive at this time because only one vessel in a narrow geographic range participated in the experiment. To draw sound conclusive results, this experiment requires additional data to be collected from a larger pool of vessels. A continuation of the study has been approved to commence in August 2004, and is due to be completed November 2004. The results of the 2004 study are not available at the time of this application, and it is therefore not possible to evaluate whether 2004 EFP results will be sufficient for purposes of considering management applications. Therefore, this application proposes the continuation of the study for a third and final year in 2005 should it be necessary.

E. **A statement of whether the proposed experimental fishing has broader significance than the applicant's individual goals**.

The applicant of this EFP believes that the information collected during this experiment will have significance, broader than the applicant's individual goals, applicable to fisheries throughout California and the West Coast.

- The experiment will produce data on the amount and location of overfished groundfish bycatch in the shelf flatfish fishery using this trawl, and provides samples of these species from areas otherwise closed to groundfish fishing.

- Results indicating that overfished groundfish bycatch rates are minimized while using this modified trawl could lead to a management tool that allows the Council to maximize sustainable access to healthy shelf flatfish stocks while overfished groundfish stocks are rebuilt.

- This EFP complements a series of EFP experiments conducted off the west coast to evaluated the effectiveness of modified trawl gear to avoid overfished groundfish. Since 2002, both Oregon and Washington have tested the effectiveness of modified trawl gear to avoid overfished groundfish while fishing for healthy groundfish stocks. In California, comparable testing of the same modified trawl gear over shelf waters in California is in progress, commencing with a single participant in the 2003 study, and continuation of the study with six participants in 2004. Regulations based on the successful EFP results in Oregon are being crafted for implementation north of 40˚10' N. lat. during the 2005-06 Council management cycle. The thorough evaluation of the modified trawl gear in California, where there are differences in the composition of shelf species relative to the northern area, may result in the opportunity to extend this regulatory provision to flatfish trawl fishermen off the entire coast of California.

F. **Vessels covered under the EFP:**

Vessels covered under the EFP will include those which have historically participated in the targeted shelf flatfish fishery off California according to criteria used in the 2002, 2003, and 2004 flatfish EFPs:

- Vessels must have landed into California ports at least 10,000 pounds of shelf flatfish (California halibut, Pacific sanddab, English sole, sand and rock sole, starry flounder, and unspecified flatfishes) taken with trawl gear in two of three years from 1998 to 2000.

- Vessels must have a valid California delivery permit.

Vessels identified as qualifiers in the 2004 EFP process will qualify for this pool of applicants.

A letter of inquiry will be sent to the owners of each of the qualifying vessels requesting a statement of interest to be returned by a specified closing date.

A maximum of **six** vessels will be selected to participate throughout the EFP fishing period, with a goal of issuing permits to two vessels per California port group between Pt. Conception and Pt. Mendocino. Potential port complexes are Morro Bay/Avila, Monterey/Moss Landing, and Half Moon Bay/San Francisco/Bodega Bay.

Applications received will be selected at random following the closing date if more vessels apply than can be accommodated by observers.

Any EFP may be canceled and made available to another vessel if the permitted vessel: 1) does not follow the terms and conditions of the permit; 2) fails to follow federal or State fishing regulations; 3) does not prosecute shelf flatfish using a modified small footrope trawl gear as specified in the EFP; or 4) does not reasonable accommodate the observer or cooperate with the applicant.

A permitted vessel may withdraw once from the EFP program and resume participation the following month.

G. **A description of the species (target and incidental) to be harvested under the EFP and the amount(s) of such harvest necessary to conduct the experiment:** The target species are collectively referred to as *shelf flatfish* and include California halibut, Pacific sanddab, English sole, rock and sand sole, and unspecified flatfish. The maximum expected catch per vessel for all species will be the normal trip limits in place in Period 4. That allowable trip limit for other flatfish is anticipated to be 120,000 pounds per two months of which no more than 20,000 pounds may be Petrale sole. EFP participants will be exempted from any closures or reductions in allowable trip limits during the EFP study period. Trip limits for EFP participants will be increased to match any increases in federal trip limits resulting from in-season adjustments. Note that California halibut is not included in the trip limit and is estimated later in this section. Total harvest of target species for the EFP fishery is anticipated to be the same as in the 2004 EFP and will therefore be:

Species/Species Group	Vessels * no. periods in EFP[1]	Cumulative limit per two months (lbs)	Maximum allowable catch (lbs)	Maximum allowable catch (mt)
Other flatfish	6*2=12	120,000; no more than 20,000 pounds may be Petrale sole	1,440,000; no more than 120,000 may be Petrale sole	653 mt; no more than 54.4 mt may be Petrale sole

[1] A maximum of 6 vessels will be operating for the entire EFP period, encompassing 2 periods of cumulative trip limits.

The program requires full retention of rockfish. All rockfish species will be landed to enhance biological sampling and to document the actual rockfish mortality and discard rates, with catch thresholds in place for overfished rockfish species to ensure that take remains below allocated bycatch caps. The EFP thresholds for incidental take of bocaccio, cowcod, canary, and yelloweye rockfish will be applied as follows:

- Monthly per species threshold: An individual vessel will be constrained to a maximum of 1,000 pounds of bocaccio, and 50 pounds each of canary, yelloweye and cowcod rockfish per fishing month. If these amounts are exceeded for any of the four species, then all fishing by that vessel will be terminated for the balance of the month, but may resume for the following month.

- Monthly cumulative threshold: The cumulative amount of bocaccio harvested by all vessels fishing under the EFP must not exceed 6,000 pounds in a fishing month. The cumulative amount of canary, cowcod, or yelloweye rockfish harvested by all vessels fishing under the EFP must not exceed 300 pounds in a fishing month. If that amount is exceeded for any of the four species by all vessels combined, then all EFP fishing will be terminated for the remainder of the month, but may resume for the following month.

- EFP threshold: The cumulative amount of bocaccio, canary, or yelloweye rockfish harvested by all vessels fishing under the EFP must not exceed 22,000 pounds (10 mt) at any time. Additionally, the cumulative amount of cowcod rockfish must not exceed 1,000 pounds (0.5 mt) at any time. If the cumulative EFP threshold amount is exceeded for any of the four species, then all EFP fishing will be terminated for the remainder of the year.

- EFP threshold for lingcod: The maximum amount of total lingcod that may be taken by all participating vessels fishing under this EFP is 20 mt. If the limit for this species is reached, the EFP will be terminated for the remainder of the year.

Expected fishing mortality of overfished groundfish for this EFP are based on bycatch estimates derived from the 2002 EFP study. Data collected under the 2003 EPF was not used to estimate mortality rates for overfished groundfish because only one vessel participated in the program over a narrow geographic range. Bycatch rates for overfished groundfish and rockfish species during the 2002 EFP were well below these thresholds, with bycatch rates of 0.01% for bocaccio, 0.02% for cowcod rockfish, and 0% for canary and yelloweye rockfish. Although 2002 NMFS observer data indicates that in waters deeper than 100 fm proposed for access in this study, the probability of bocaccio catch increases significantly when using unmodified conventional flatfish trawl gear, it is anticipated that the use of the selective flatfish trawl during this EFP period will significantly reduce the probable take of any overfished rockfish species, including bocaccio. However, some bycatch is likely to occur. Therefore, the total estimated fish mortality in metric tons for overfished species (including overfished rockfish and lingcod) for this EFP is as follows:

Species/Species Group	EFP Threshold (mt)	Total Estimated Catch (mt)
Bocaccio Rockfish	10.0	10.0
Canary Rockfish	0.5	0.5
Cowcod Rockfish	0.5	0.2
Yelloweye Rockfish	0.5	0.5
Lingcod	20.0	20.0

Based on bycatch information from our EFP program in 2002, the following catches would be expected in addition to target flatfish and overfished rockfish species, if the bycatch rates were the same as in 2002:

Species/Species Group	Bycatch Rate[1] (2002)	Expected Bycatch[2] (lbs)	Expected Bycatch[2] (mt)
Other Flatfish	2.67	3,844,800	1,744
California Halibut	8.02	11,548,800	5,239
Nearshore Rockfish	0.14	201,600	91
Shelf Rockfish	2.86	4,118,400	1,868
Lingcod	0.56	806,400	366
Sablefish	0.44	633,600	287
Sharks	1.23	1,771,200	803
Skates	5.87	8,452,800	3,834
Crab, Dungeness and misc.	7.02	10,108,800	4,585
King Salmon	0.09	129,600	59
Green Sturgeon	0.06	86,400	39
Misc. Fish[3]	4.74	6,825,600	3,096
Nominal Bycatch Species[4]	0.16	230,400	105

[1] Bycatch is defined as the total landed and discarded pounds of a species relative to the total landed target species group (i.e., the trip limit). An estimate of discarded 'other flatfish' is included in this table as discards of target species may occur due to size, market, etc.

[2] There are six vessels that will be operating for the entire 4 months of the EFP, encompassing 2 periods of cumulative trip limits. Expected bycatch is bycatch rate*120,000 lbs (flatfish 2-month trip limit)*6*2.

[3] Miscellaneous fish includes white croaker, squid, hake, ratfish, scorpionfish, and shad, and other misc. fish.

[4] Nominal bycatch includes species with *individual bycatch rates* of <0.05% in 2002, and includes the following species: slope rockfish, white seabass, striped bass, cabezon, surfperch, greenlings, midshipman, and surfperch.

H. For each vessel covered by the EFP, the approximate time(s) and place(s) fishing will take place:

- The test fishery will be conducted from August through November 2005.

- The EFP will be valid in those Pacific Ocean waters adjacent to California coastwide in all depths outside state waters (3 miles). While the allowable depth exceeds the shoreward boundary for the trawl RCA (up to 100 fm during the proposed study period), the removal of a depth restriction is necessary to test the modified trawl gear in areas with a history of bocaccio catches, and to allow for fishing at depths where target flatfish species may be distributed.

I. All participating vessels under the authority of the EFP:

- Must exclusively employ legal small footrope trawl as defined in current federal regulation, except that modification is required to create a severely cut-back top section, which allows roundfishes to "rise" out of the trawl while flatfish, which remain near the bottom, are captured.

- Must apply and submit a net plan for approval. Net plans must meet specifications utilized by the 2003 Oregon Flatfish EFP, and by the 2003 and 2004 California Flatfish EFPs, which specified that:

    - *"The trawl must have a headrope to footrope ratio of at least 1.30 (i.e., 30% longer footrope).*

    - *The trawl must have a maximum rise of 5 ft at the center of the headrope.*

    - *There must be no floats along the middle 33% of the headrope",* except for Scottish seine, for which there must be no floats along the middle 25% of the headrope.

    - *The headrope must be wide in the center, not a narrow V-shape that creates shoulders that would trap ascending fish.*

- Must carry a National Marine Fisheries Service-trained observer onboard all trips using the selective flatfish net in the NTZ. A total of three observers are necessary to execute the EFP. Vessels participating in the program must share observer time.

- Must land all fish caught under the authority of the EFP into the State of California.

- Must sign a contract with the State of California detailing the vessel's responsibility for the EFP fishery. Failure to abide by the conditions in the contract or to follow provisions in the EFP will result in revocation of the contract and of the EFP for the year.

J. Signature of the applicant:

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California Department of Fish and Game

Exhibit C.5.b
ODFW Report
June 2004

Application for Exempted Fishing Permit to Examine Groundfish Behavior During Capture in Bottom Trawls

A. Application Date

June 1, 2004

B. Applicant Contact

Oregon Department of Fish and Wildlife
2040 SE Marine Science Drive
Newport, OR 97365

Phone: 541 867-4741
FAX: 541 867-0311
Contacts: Dr. Patricia Burke

C. Statement of Purpose and Goal

The purpose of this EFP is to identify potential species- and group-specific behaviors to develop trawl modifications for bycatch reduction in west coast bottom trawls.

D. Justification

Selective flatfish trawls incorporating very low rise and a cutback headrope have been developed for the U.S. west coast bottom trawl fishery (King et al. 2004). These trawls reduce the bycatch of some critical rockfish species, but don't decrease catch rates for some other species, such as darkblotched rockfish, lingcod or skates (ODFW, unpublished data). However, it's possible that sorting grids, or footrope or wing modifications could improve the selectivity of these trawls and decrease bycatch of some species that do not escape well from selective flatfish trawls. However, the development of these modifications depends on knowledge of behavior and vertical distribution as individuals are approached by and interact with the trawl. This research proposes to study and categorize behaviors of exploited groundfish species with the ultimate goal of developing trawl modifications that may reduce bycatch of other rockfish, lingcod or skates.

E. Significance of Results

The information collected will have a broad and timely significance for fishery management on the West Coast, and potentially in other regions because it will provide information on the efficacy of various bycatch reduction methods. Identification of potential bycatch reduction techniques will assist the PFMC in reducing bycatch of overfished species, and maintain harvest in other fisheries that cannot significantly reduce bycatch levels.

F. EFP Structure

Experiments will be designed by ODFW staff and will generally follow the methods outlined in King et al. 2004. A vessel will be chartered for personal services by the State of Oregon and will be under the direct supervison of ODFW biologists at all times while conducting experimental tows. The EFP will authorize the State of Oregon to land and sell groundfish up to the limits of overfished species listed in section H. The EFP will be valid for charter work between May 1st and October 1st in 2005 and 2006. Charters will be scheduled depending on vessel availability, research coordination, and weather. Vessels to be used are not yet known but necessary information will be forwarded to NOAA fisheries during the charter bidding process to allow violations checks to occur.

Experiments will last approximately three weeks each year and will be conducted off the coasts of Oregon or Washington to target concentrations of the appropriate target species. Fishing will occur within the Rockfish Conservation Area as several species found at depths between 75 and 150 fm will be targeted for study. The trawl gear used will be the selective flatfish trawl developed by ODFW.

G. Vessel Obligations

Vessels will be identified through ODFW's normal contract procurement process and will be under charter contract to the State of Oregon for these projects. The vessel captain will provide the knowledge, skills and experience necessary to conduct groundfishing operations in the Pacific Ocean. All fish captured under these projects are the property of the state of Oregon, but will be sold by the vessel to offset charter costs. Vessels remain able to catch and land their normal trip limits outside of this EFP project. All prohibited species will be released.

H. Catch Limits

We estimate that the research conducted will require 20 days of tows with a maximum of 10, one hour tows per day, or 200 h of trawling each year. To maintain statistical rigor but minimize catch and bycatch, we will attempt to conduct short (~1 h) tows. Using catch rates from the shelf experiments with the selective flatfish trawl, we estimate bycatch of overfished species according to the following table in 2005 and again in 2006. Note that all Pacific halibut and lingcod will be released to take advantage of their high survival rates and to minimize mortality associated with this research. We expect zero salmon catch therefore no 4d permit was required for this project.

Species	Estimated catch (mt)
Dover sole	36.25
Slender sole	1.21
Flathead sole	1.98
Petrale sole	4.23
English sole	0.83
Rex sole	9.00
Pacific halibut	17.5
Arrowtooth flounder	50.34

Pacific whiting	0.71
Sablefish	45.97
Bocaccio	trace
Cowcod	trace
Canary rockfish	0.30
Redstripe rockfish	0.20
Shortspine thornyhead	16.75
Rosethorn rockfish	1.93
Splitnose rockfish	4.12
Greenstriped rockfish	5.69
Darkblotched rockfish	8.70
Sharpchin rockfish	1.76
Stripetail rockfish	0.94
Redbanded rockfish	0.94
Pacific ocean perch	1.00
Widow rockfish	0.10
Yelloweye rockfish	0.10
Lingcod	22.15
Pacific cod	0.28
Rougheye	0.645
Yellowmouth	0.18
Longnose skate	28.54
Sandpaper skate	1.67
Spotted ratfish	3.37
Threadfin sculpin	1.00
Spiny dogfish	1.50

I. Signature of Applicant

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Oregon Department of Fish and Wildlife
Dr. Patricia M. Burke, Manager

Exhibit C.5.b
Supplemental CDFG Report 2
June 2004

Application for Issuance of an Exempted Fishing Permit to Test a Selective Flatfish Trawl (including Scottish Seine) in an area otherwise closed to fishing South of 40°10' N. lat. in 2005

A. **Application Date:**
Draft: May 26, 2004
Revision date: June 14, 2004

B. **Applicant Contact**
California Department of Fish and Game
350 Harbor Blvd.
Belmont, CA 94002

Contacts:
Primary: Steve Wertz (562-342-7184)
Secondary: Susan Ashcraft (650) 631-6786

C. **Statement of purpose and goals of the experiment, for which an EFP is needed, including a general description of the arrangements for the disposition of all species harvested under the EFP:**
The purpose of the experiment is to determine whether a shelf flatfish fishery can be prosecuted in an otherwise closed area of California waters between 40°10' N. lat. and Pt. Conception (34°27' N. lat.) using modified small footrope trawl gear including Scottish seine designed to minimize the bycatch of overfished groundfish. Testing of this modified trawl in California was first conducted in 2003 in the area south of 40°10' N. lat; however, only one vessel participated, and the area tested was in a narrow geographic range. In order to draw conclusive results for management consideration over a broader range in California, this experiment requires additional years of data to be collected. A second year of study engaging six vessels is scheduled for August through November 2004. A continuation of the study in 2005 may be required to collect necessary data to determine the effectiveness of modified small footrope trawl gear in minimizing impacts on overfished shelf rockfish species when accessing healthy flatfish stocks on the shelf.

Pacific Coast groundfish are managed by the Pacific Fishery Management Council (PFMC) under a federal fishery management plan (FMP) for the west coast. The management goals of the FMP are to:

- Prevent overfishing by managing for appropriate harvest levels and prevent any net loss of the habitat of living marine resources.

- Maximize the value of the groundfish resource as a whole.

- Achieve the maximum biological yield of the overall groundfish fishery, promote year-round availability of quality seafood to the consumer, and promote recreational fishing opportunities.

The experiment conducted through an EFP will assist the PFMC in achieving the goals set forth in the FMP while collecting bycatch data on overfished stocks and evaluating the effectiveness of specific trawl gear modifications in reducing bycatch of overfished stocks. In particular, this EFP expands the applicability of equivalent gear tested off the coasts of Oregon and Washington in EFPs during the past two years, which are being developed into regulations to be implemented in 2005 for the area north of 40°10' N. lat. Further evaluation in the area south of 40°10' N. lat is needed before results may be applied coastwide.

- **The specific goals of the experiment are:** To evaluate the effectiveness of modified trawl gear (see Section I below for modified trawl gear specifications) to catch shelf flatfish while minimizing take of overfished rockfish species in all depths.

- To measure bycatch rates of overfished groundfish and rockfish species that may be associated with the small footrope trawl shelf flatfish fishery using the modified trawl gear with no depth restrictions through an at-sea observer program.

- To provide fishermen with an incentive to modify their gear by giving them the opportunity to take shelf flatfish in areas that are otherwise closed.

Disposition of the species harvested under the EFP will be as follows:

- Species caught within the normal current trip limits may be retained and sold by the vessel.

- All rockfish caught while targeting shelf flatfish during the EFP must be retained and offloaded. Overages of rockfish must be surrendered, and proceeds from these species in excess of trip limits will be forfeited to the State of California.

C. Valid justification explaining why issuance of an EFP is warranted:

Since 1998, the PFMC has initiated rebuilding plans for several species, including bocaccio and canary rockfish. Conservation areas have since been established and closed to groundfish fishing in order to prevent harvest of the overfished stocks in multi-species fisheries. Critical to these rebuilding plans and to the overall improvement of groundfish management, is the need for more and better scientific data. There are 82 species covered under the FMP, and at present, there is little or no data on a large number of these species. There is a need for comprehensive, timely, and credible data for priority species to aid in the conservation and rebuilding efforts for these stocks.

The shelf flatfish are an extremely important group of groundfish in the California groundfish fisheries. These stocks are believed to be healthy, and California fishermen and processors have worked aggressively to develop strong markets for these species. A component of the California trawl fleet and processors are heavily dependent upon these flatfish.

A depth closure was enacted from July 1 to December 31, 2002 to reduce the take of overfished shelf rockfish in the primary depths of their range, which applied to all trawlers, including vessels targeting shelf flatfish using small footrope trawl. An EFP was approved for use inside the closed area to observe rockfish bycatch rates of unmodified shelf flatfish trawl gear targeting shelf flatfish. Results from the 2002 EFP indicated that the incidental take of bocaccio and other sensitive rockfish species was minimal in depths to 70 fathoms (fm) using conventional flatfish trawl gear. Access to depths below 70 fm was not granted due to the increased likelihood of incidental take of bocaccio rockfish, canary rockfish, and other sensitive species in deeper waters. Although results of the experiment to 70 fm were promising, the question remained if a shelf flatfish fishery could be successfully prosecuted in deeper waters where shelf rockfish abundance increases.

In 2003 and 2004, EFPs were issued to California to conduct a follow-up fishery experiment in deeper waters, out to 100 fm (in 2003) and to unrestricted depths (in 2004), where the likelihood of incidental take of bocaccio and other shelf rockfish is higher. An important condition added under these EFPs was a requirement to use modified shelf flatfish trawl gear. The design follows the net configuration used in an Oregon research and EFP project to evaluate the bycatch rates of overfished shelf rockfish species while targeting flatfish with the modified trawl. Results from the Oregon experiment with the modified gear reflected a reduction in the bycatch rate of canary rockfish. The application of a similar trawl design was applied in the 2003 California EFP to test the effectiveness of the modified trawl in minimizing the bycatch of not only canary, but also of bocaccio, which is an overfished stock in coastal California. While the Oregon results were significant enough to lead to a proposal to move the EFP into regulations north of 40°10' N. lat. in 2005, the 2003 California EFP results are inconclusive at this time because only one vessel in a narrow geographic range participated in the experiment. To draw sound conclusive results, this experiment requires additional data to be collected from a larger pool of vessels. A continuation of the study has been approved to commence in August 2004, and is due to be completed November 2004. The results of the 2004 study are not available at the time of this application, and it is therefore not possible to evaluate whether 2004 EFP results will be sufficient for purposes of considering management applications. Therefore, this application proposes the continuation of the study for a third and final year in 2005 should it be necessary.

D. A statement of whether the proposed experimental fishing has broader significance than the applicant's individual goals.

The applicant of this EFP believes that the information collected during this experiment will have significance, broader than the applicant's individual goals, applicable to fisheries throughout California and the West Coast.

- The experiment will produce data on the amount and location of overfished groundfish bycatch in the shelf flatfish fishery using this trawl, and provides samples of these species from areas otherwise closed to groundfish fishing.

- Results indicating that overfished groundfish bycatch rates are minimized while using this modified trawl could lead to a management tool that allows the Council to maximize sustainable access to healthy shelf flatfish stocks while overfished groundfish stocks are rebuilt.

- This EFP complements a series of EFP experiments conducted off the west coast to evaluated the effectiveness of modified trawl gear to avoid overfished groundfish. Since 2002, both Oregon and Washington have tested the effectiveness of modified trawl gear to avoid overfished groundfish while fishing for healthy groundfish stocks. In California, comparable testing of the same modified trawl gear over shelf waters in California is in progress, commencing with a single participant in the 2003 study, and continuation of the study with six participants in 2004. Regulations based on the successful EFP results in Oregon are being crafted for implementation north of 40°10' N. lat. during the 2005-06 Council management cycle. The thorough evaluation of the modified trawl gear in California, where there are differences in the composition of shelf species relative to the northern area, may result in the opportunity to extend this regulatory provision to flatfish trawl fishermen off the entire coast of California.

E. Vessels covered under the EFP:

Vessels covered under the EFP will include those which have historically participated in the targeted shelf flatfish fishery off California according to criteria used in the 2002, 2003, and 2004 flatfish EFPs:

- Vessels must have landed into California ports at least 10,000 pounds of shelf flatfish (California halibut, Pacific sanddab, English sole, sand and rock sole, starry flounder, and unspecified flatfishes) taken with trawl gear in two of three years from 1998 to 2000.

- Vessels must have a valid California delivery permit.

Vessels identified as qualifiers in the 2004 EFP process will qualify for this pool of applicants.

A letter of inquiry will be sent to the owners of each of the qualifying vessels requesting a statement of interest to be returned by a specified closing date.

A maximum of **six** vessels will be selected to participate throughout the EFP fishing period, with a goal of issuing permits to two vessels per California port group between Pt. Conception and Pt. Mendocino. Potential port complexes are Morro Bay/Avila, Monterey/Moss Landing, and Half Moon Bay/San Francisco/Bodega Bay.

Applications received will be selected at random following the closing date if more vessels apply than can be accommodated by observers.

Any EFP may be canceled and made available to another vessel if the permitted vessel: 1) does not follow the terms and conditions of the permit; 2) fails to follow federal or State fishing regulations; 3) does not prosecute shelf flatfish using a modified small footrope trawl gear as specified in the EFP; or 4) does not reasonable accommodate the observer or cooperate with the applicant.

A permitted vessel may withdraw once from the EFP program and resume participation the following month.

C. **A description of the species (target and incidental) to be harvested under the EFP and the amount(s) of such harvest necessary to conduct the experiment:**

The target species are collectively referred to as *shelf flatfish* and include California halibut, Pacific sanddab, English sole, rock and sand sole, and unspecified flatfish. The maximum expected catch per vessel for all species will be the normal trip limits in place in Period 4. That allowable trip limit for other flatfish is anticipated to be 120,000 pounds per two months of which no more than 20,000 pounds may be Petrale sole. EFP participants will be exempted from any closures or reductions in allowable trip limits during the EFP study period. Trip limits for EFP participants will be increased to match any increases in federal trip limits resulting from in-season adjustments. Note that California halibut is not included in the trip limit and is estimated later in this section. Total harvest of target species for the EFP fishery is anticipated to be the same as in the 2004 EFP and will therefore be:

Species/Species Group	Vessels * no. periods in EFP[1]	Cumulative limit per two months (lbs)	Maximum allowable catch (lbs)	Maximum allowable catch (mt)
Other flatfish	6*2=12	120,000; no more than 46,000 pounds may be Petrale sole	1,440,000; no more than 552,000 may be Petrale sole	653 mt; no more than 250.4 mt may be Petrale sole

riods of cumulative trip limits.

The program requires full retention of rockfish. All rockfish species will be landed to enhance biological sampling and to document the actual rockfish mortality and discard rates, with catch thresholds in place for overfished rockfish species to ensure that take remains below allocated bycatch caps. The EFP thresholds for incidental take of bocaccio, cowcod, canary, and yelloweye rockfish will be applied as follows:

- Monthly per species threshold: An individual vessel will be constrained to a maximum of 1,000 pounds of bocaccio, and 50 pounds each of canary, yelloweye and cowcod rockfish per fishing month. If these amounts are exceeded for any of the four species, then all fishing by that vessel will be terminated for the balance of the month, but may resume for the following month.

- Monthly cumulative threshold: The cumulative amount of bocaccio harvested by all vessels fishing under the EFP must not exceed 6,000 pounds in a fishing month. The cumulative amount of canary, cowcod, or yelloweye rockfish harvested by all vessels fishing under the EFP must not exceed 300 pounds in a fishing month. If that amount is exceeded for any of the four species by all vessels combined, then all EFP fishing will be terminated for the remainder of the month, but may resume for the following month.

- EFP threshold: The cumulative amount of bocaccio rockfish harvested by all vessels fishing under the EFP must not exceed 22,000 pounds (10 mt) at any time. Additionally, the cumulative amount of canary, cowcod, or yelloweye rockfish must not exceed 1,000 pounds (0.5 mt) at any time. If the cumulative EFP threshold amount is exceeded for any of the four species, then all EFP fishing will be terminated for the remainder of the year.

- EFP threshold for lingcod: The maximum amount of total lingcod that may be taken by all participating vessels fishing under this EFP is 20 mt. If the limit for this species is reached, the EFP will be terminated for the remainder of the year.

Expected fishing mortality of overfished groundfish for this EFP are based on bycatch estimates derived from the 2002 EFP study. Data collected under the 2003 EPF was not used to estimate mortality rates for overfished groundfish because only one vessel participated in the program over a narrow geographic range. Bycatch rates for overfished groundfish and rockfish species during the 2002 EFP were well below these thresholds, with bycatch rates of 0.01% for bocaccio, 0.02% for cowcod rockfish, and 0% for canary and yelloweye rockfish. Although 2002 NMFS observer data indicates that in waters deeper than 100 fm, which are proposed for access in this study, the probability of bocaccio catch increases significantly when using unmodified conventional flatfish trawl gear, it is anticipated that the use of the selective flatfish trawl during this EFP period will significantly reduce the probable take of any overfished rockfish species, including bocaccio. However, some bycatch is likely to occur and 100% retention is required under the EFP. Therefore, the total estimated fish mortality in metric tons for overfished species (including overfished rockfish and lingcod) for this EFP is as follows:

Species/Species Group	EFP Threshold/ Estimated Total Catch (mt)
Bocaccio Rockfish	10.0
Canary Rockfish	0.5
Cowcod Rockfish	0.5
Yelloweye Rockfish	0.5
Lingcod	20.0

Based on bycatch rates calculated from our EFP program in 2002, the total 2005 EFP bycatch of species and species groups additional to target flatfish and overfished rockfish species is projected below. Note that the bycatch listed below reflects both retained and discarded species, and as such does not reflect total mortality. Based on bycatch rates calculated from our EFP program in 2002, catches would be expected in addition to target flatfish and overfished rockfish species, if the bycatch rates were the same as in 2002:

Species/Species Group	Expected Bycatch (landed and discarded)[2] (mt)
Other Flatfish	17.4
California Halibut	52.4
Nearshore Rockfish	0.9
Shelf Rockfish	18.7
Lingcod	3.7
Sablefish	2.9
Sharks	8.0
Skates	38.3
Crab, Dungeness and misc.	45.9
King Salmon	0.6
Green Sturgeon	0.4
Misc. Fish[3]	31.0
Nominal Bycatch Species[4]	1.1

[1] Bycatch is defined as the total landed and discarded pounds of a species relative to the total landed target species group (i.e., the trip limit). An estimate of discarded 'other flatfish' is included in this table as discards of target species may occur due to size, market, etc.

[2] There are six vessels that will be operating for the entire 4 months of the EFP, encompassing 2 periods of cumulative trip limits. Expected bycatch is bycatch rate*120,000 lbs (flatfish 2-month trip limit)*6*2.

[3] Miscellaneous fish includes white croaker, squid, hake, ratfish, scorpionfish, and shad, and other misc. fish.

[4] Nominal bycatch includes species with *individual bycatch rates* of <0.05% in 2002, and includes the following species: slope rockfish, white seabass, striped bass, cabezon, surfperch, greenlings, midshipman, and surfperch.

E. **For each vessel covered by the EFP, the approximate time(s) and place(s) fishing will take place:**

- The test fishery will be conducted from August through November 2005.
- The EFP will be valid in those Pacific Ocean waters adjacent to California coastwide south of 40°10' N. lat., in all depths outside state waters (3 miles). While the allowable depth exceeds the shoreward boundary for the trawl RCA (up to 100 fm during the proposed study period), the removal of a depth restriction is necessary to test the

modified trawl gear in areas with a history of bocaccio catches, and to allow for fishing at depths where target flatfish species may be distributed.

I. All participating vessels under the authority of the EFP:

- Must exclusively employ legal small footrope trawl as defined in current federal regulation, except that modification is required to create a severely cut-back top section, which allows roundfishes to "rise" out of the trawl while flatfish, which remain near the bottom, are captured.

- Must apply and submit a net plan for approval. Net plans must meet specifications utilized by the 2003 Oregon Flatfish EFP, and by the 2003 and 2004 California Flatfish EFPs, which specified that:

    - *"The trawl must have a headrope to footrope ratio of at least 1.30 (i.e., 30% longer footrope).*

    - *The trawl must have a maximum rise of 5 ft at the center of the headrope, and less than a 3 foot rise at the wings..*

    - *There must be no floats along the middle 33% of the headrope",* except for Scottish seine, for which there must be no floats along the middle 25% of the headrope.

    - *The headrope must be wide in the center, not a narrow V-shape that creates shoulders that would trap ascending fish.*

- Must carry a National Marine Fisheries Service-trained observer onboard all trips using the selective flatfish net in the NTZ. A total of three observers are necessary to execute the EFP. Vessels participating in the program must share observer time.

- Must land all fish caught under the authority of the EFP into the State of California.

- Must sign a contract with the State of California detailing the vessel's responsibility for the EFP fishery. Failure to abide by the conditions in the contract or to follow provisions in the EFP will result in revocation of the contract and of the EFP for the year.

J. Signature of the applicant:

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California Department of Fish and Game

Exhibit C.5.b
WDFW Report Attachment 1
June 2004

DRAFT
APPLICATION FOR ISSUANCE OF AN EXEMPTED (EXPERIMENTAL) FISHING PERMIT FOR ARROWTOOTH FLOUNDER

A. Date of application: May 19, 2004

B. Applicant's names, mailing addresses, and telephone numbers:

Washington Department of Fish and Wildlife
600 Capitol Way North, Olympia, WA 98501-1091
Contacts: Philip Anderson (360) 902-2720
Brian Culver (360) 249-1205
Michele Robinson (360) 249-1211

C. A statement of the purpose and goals of the experiment for which an EFP is needed, including a general description of the arrangements for the disposition of all species harvested under the EFP.

Pacific Coast groundfish are managed by the Pacific Fishery Management Council under a federal fishery management plan (FMP). The management goals of the FMP are to:

1. Prevent overfishing by managing for appropriate harvest levels and prevent any net loss of the habitat of living marine resources.
2. Maximize the value of the groundfish resource as a whole.
3. Achieve the maximum biological yield of the overall groundfish fishery, promote year-round availability of quality seafood to the consumer, and promote recreational fishing opportunities.

The purpose of the experiment is to assist the Pacific Fishery Management Council in achieving the goals of the FMP by collecting bycatch data on overfished stocks to allow for informed management decisions in setting appropriate trip limits to maximize safe harvest levels of healthy stocks.

Specifically, the goals of the experiment are to:
- Measure bycatch rates for canary and other rockfish associated with the arrowtooth flounder fishery through an at-sea observer program,
- Test specific selective flatfish gear,
- Test specific areas identified as "cold spots" for canary rockfish, and
- Collect data that could be used to augment the National Marine Fisheries Service groundfish observer program.

With regard to the disposition of the species harvested under the EFP:
- Species caught within current trip limits as published in the Federal Register, may be retained by the vessel.

  - Species caught in excess of current trip limits, but permitted within the EFP (i.e., arrowtooth flounder, petrale sole), will be retained by the vessel.
  - Rockfish caught in excess of current trip limits, but required to be retained under the EFP, will be sold at fair market value and the revenue will be forfeited to the state.

- Valid justification explaining why issuance of an EFP is warranted:

  Since 1998, the Pacific Council has initiated rebuilding plans for several species, including canary rockfish and widow rockfish. Critical to these rebuilding plans and to the overall improvement of groundfish management is the need for more and better scientific data. Fishery dependent data that is needed includes amount of total catch and catch location, as well as biological data (e.g., age and sex). There are 82 species covered under the Pacific coast groundfish FMP, and at present, there is little or no biological data on a large number of these species. There is a need for comprehensive, timely and credible data for priority species to aid in the conservation and rebuilding efforts for these stocks. The data collected under this EFP will include total catch (amount and species composition) data, catch location, bycatch data on associated species, and biological data.

  Arrowtooth flounder are an extremely important species in Washington groundfish fisheries. The stock is healthy and Washington fishers and processors have worked aggressively to develop strong markets for this species. A large component of the Washington trawl fleet, and at least two major processors, are heavily dependent upon arrowtooth flounder. Fishers targeting arrowtooth are currently constrained by their limit of canary rockfish. The current flatfish trip limit is based upon the assumed bycatch rate of canary rockfish. Fishers who have historically targeted arrowtooth have indicated that under this monthly trip limit, targeting arrowtooth will not be economically feasible. Further, these fishers believe that they can prosecute an arrowtooth fishery with a much lower canary bycatch rate, thereby allowing a higher arrowtooth catch.

  This EFP is expected to provide much needed information that can be used to assess bycatch rates in the directed arrowtooth fishery which in turn may be used to establish trip limits in the future that maximize fishing opportunities on healthy stocks while meeting conservation goals for depleted stocks.

  Without this EFP vessels would not be allowed to fish for arrowtooth flounder and petrale sole the Trawl Rockfish Conservation Area. According to some Washington fishermen, the majority of the arrowtooth flounder catch occurs inside this closed area.

- The applicant of this EFP believes that the information collected during this experiment will have broader significance than the applicant's individual goals by:
  - Producing data on the amount and location of canary rockfish bycatch in the arrowtooth flounder fishery, which can be used to set appropriate management measures in the future (e.g., trip limits, area closures)
  - Providing valuable and accurate data on the catch composition by species of the trawl flatfish fishery off the Washington coast,
  - Providing a pilot program for assessing the feasibility of the retention of rockfish overages, and

- Providing a pilot program for experimenting with gear modifications to selectively fish for flatfish.
- Age and sex data may also be collected to aid in future groundfish stock assessments.

These data could allow the Council to establish trip limits in the future that maximize fishing opportunities on healthy stocks while meeting conservation goals for depleted stocks.

F. Vessels covered under the EFP must:

- Have completed and mailed the Washington Department of Fish and Wildlife Arrowtooth EFP application form by March 1, 2005, and
- Be a Washington resident and have a valid Washington delivery permit

It is anticipated that there would be 6-8 fishers who may apply. A list of the participating fishers (and their designated vessels) will be provided to NMFS.

G. The targeted species is arrowtooth flounder which would not be subject to a monthly trip limit, but which would be constrained by the measured bycatch allowance of canary rockfish for the flatfish fishery. Fishers are currently allowed 300 lbs per month of canary rockfish with an assumed 16% discard rate (when applied, this equals 348 lbs total).

Under the EFP, the bycatch allowance for canary rockfish would be divided as follows:

- Individual vessels would be limited to 170-225 lbs/month (depending on the number of participants) of canary rockfish for tows that are identified as directed arrowtooth tows by the skipper of the vessel (in advance) and all tows within the federal groundfish conservation area (GCA) for trawl. Once the individual vessel cap of canary rockfish is caught, and if the vessel has already reached the current <u>small</u> footrope trip limits for arrowtooth and petrale sole published in the Federal Register, then the vessel cannot have any directed arrowtooth tows for the rest of the month and cannot retain any more arrowtooth or petrale.

- Once the individual vessel cap of canary rockfish is caught, and if the vessel has **not** reached the current <u>small</u> footrope trip limits for arrowtooth and petrale sole published in the Federal Register, then the vessel can continue to conduct directed arrowtooth tows until the current monthly trip limits for arrowtooth and petrale have been reached. Once those trip limits have been reached, the vessel cannot have any directed arrowtooth tows for the rest of the month and cannot retain any more arrowtooth or petrale.

- The balance of the canary rockfish would be used to accommodate the bycatch of canary while targeting other groundfish species.

- An individual bycatch cap of 680-900 lbs. (depending on the number of participants) of canary rockfish will also apply to each vessel. Once this cap has been reached by an individual vessel in directed tows, the vessel will not be allowed to continue to fish under the EFP.

- All tows conducted within the federal rockfish conservation area (RCA) for trawl will be considered "directed" tows.

- For all fishing under the EFP overall bycatch amounts would be as follows:
  Canary rockfish - 2.5 mt
  Darkblotched rockfish - 3.0 mt
  Lingcod* - 4.5 mt (*Note: Cap would accommodate current trip limit)
  Widow rockfish - 5.5 mt
  POP - 18.0 mt
  Yelloweye rockfish - 0.5 mt

  Once one or more of these bycatch caps has been reached, the EFP will be terminated.

- Petrale sole caught in a directed arrowtooth tow would not be subject to a monthly trip limit.

- Other species could be landed under current trip limit levels and fishers could land up to the current limit of other flatfish in addition to their arrowtooth flounder landings. There is not expected to be any interactions with protected species (e.g., seabirds), ESA-listed species, nor marine mammals.

- Based upon the EFP programs conducted in 2001 and 2002, expected amounts of targeted species taken above trip limits in the arrowtooth EFP are:

Arrowtooth Flounder	- 455 mt
Petrale sole	- 36 mt

In addition, rockfish species taken in directed EFP tows and forfeited to the state as required (above trip limit or non-market size) are anticipated as follows:

Slope rockfish	- 2.3 mt
Shelf rockfish	- 2.7 mt
Yellowtail rockfish	- 3.6 mt
S.spine thornyhead	- 1.8 mt

Fish above trip limits taken in non-EFP tows would be consistent with fishing activities of the fleet at large and will be estimated separately.

General

- Incidental catches of rockfish in excess of the trip limit must be retained.

H. For each vessel covered by the EFP, the approximate time(s) and place(s) fishing will take place, and the type, size, and amount of gear to be used:

The EFP will be valid in Pacific Ocean waters adjacent to Washington, outside three miles. Vessels must fish north of Destruction Island for all of their fishing strategies during the months of the EFP. There may be specific areas within the RCA that would be closed to EFP fishing; these areas will be specified in the Washington Department of Fish and Wildlife contracts with the individual vessel owners participating in the EFP.

Approximate time for the experimental fishery is May 1-August 31, 2005.
Total estimated duration of the EFP: This is the final year.

Vessels covered by the EFP can use large footrope for directed arrowtooth tows on the slope only. Slope tows must be conducted entirely in depths greater than 120 fathoms. If a vessel uses small footrope while fishing in the RCA, the vessel may still retain and sell up to the higher trip limits for sablefish, Dover sole, arrowtooth, petrale, and other flatfish (large footrope only limits) until the individual monthly or total bycatch cap is reached, or the EFP is terminated, whichever is sooner.

Vessels are allowed to have more than one type of gear onboard (large footrope, small footrope, and midwater gear).

All vessels fishing under the authority of the EFP must:

- Carry a Washington Department of Fish and Wildlife-provided observer or a federal observer onboard all fishing trips. State-sponsored observers must successfully complete an observer training course that prepares them for collecting data with sampling protocols as defined in the NMFS West Coast Groundfish Observer Program manual. In addition, NMFS observer coverage requirements at 50 CFR 660.360 are independent of EFP observer requirements, so vessels that carry state-sponsored observers may also be required to carry a NMFS observer.

- Employ legal trawl gear as defined in current federal regulations. Vessels fishing under the EFP must adhere to gear specifications, including the use of one of the prescribed excluder mechanisms for all directed EFP tows and all tows within the RCA. Specific excluder definitions will be described in the Washington Department of Fish and Wildlife contracts with the individual vessel owners participating in the EFP.

- Land all fish caught under the authority of the EFP into the State of Washington to a processor designated to participate in this program by the Washington Department of Fish and Wildlife. In order for a processor to be able to participate in this program, it must hold a contract with the Washington Department of Fish and Wildlife and abide by the conditions listed in the contract. Failure to abide by the conditions in the contract will result in revocation of the contract by the Director of the Washington Department of Fish and Wildlife.

- Hold a contract with the Washington Department of Fish and Wildlife and abide by the conditions listed in the contract. Failure to abide by the conditions in the contract and/or to follow the provisions in the EFP will result in revocation of the contract by the Director of the Department of Fish and Wildlife. The Director of the Department of Fish and Wildlife may modify the terms of the contract based on the status of the stocks which are caught incidentally in the experimental fishery.

I. The signature of the applicant:

____
Washington Department of Fish and Wildlife

Exhibit C.5.b
WDFW Report Attachment 2
June 2004

DRAFT
APPLICATION FOR ISSUANCE OF AN EXEMPTED (EXPERIMENTAL) FISHING PERMIT FOR SPINY DOGFISH

A. Date of application: May 19, 2004

B. Applicant's names, mailing addresses, and telephone numbers:

Washington Department of Fish and Wildlife
600 Capitol Way North, Olympia, WA 98501-1091
Contacts: Philip Anderson (360) 902-2720
Brian Culver (360) 249-1205
Michele Robinson (360) 249-1211

C. A statement of the purpose and goals of the experiment for which an EFP is needed, including a general description of the arrangements for the disposition of all species harvested under the EFP.

Pacific Coast groundfish are managed by the Pacific Fishery Management Council under a federal fishery management plan (FMP). The management goals of the FMP are to:

1. Prevent overfishing by managing for appropriate harvest levels and prevent any net loss of the habitat of living marine resources.
2. Maximize the value of the groundfish resource as a whole.
3. Achieve the maximum biological yield of the overall groundfish fishery, promote year-round availability of quality seafood to the consumer, and promote recreational fishing opportunities.

The purpose of the experiment is to assist the Pacific Fishery Management Council in achieving the goals of the FMP by collecting bycatch data on overfished stocks to allow for informed management decisions in setting appropriate trip limits to maximize safe harvest levels of healthy stocks.

Specifically, the goals of the experiment are to:

- Measure bycatch rates for canary, yelloweye and other rockfish associated with the longline dogfish fishery through an at-sea observer program,
- Test specific areas identified as "cold spots" for canary and yelloweye, and
- Collect data that could be used to augment the National Marine Fisheries Service groundfish observer program.

With regard to the disposition of the species harvested under the EFP:

- Species caught within current trip limits, as published in the Federal Register, may be retained by the vessel.
- Groundfish caught in excess of current trip limits, but required to be retained under the EFP, will be sold at fair market value and the revenue will be forfeited to the state

D. Valid justification explaining why issuance of an EFP is warranted:

Since 1998, the PFMC has initiated rebuilding plans for several species including canary and yelloweye rockfish. Critical to these rebuilding plans and to the overall improvement of the ground fish management, is the need for more and better scientific data. Fishery dependent data that is needed includes amount of total catch and catch location, as well as biological data (e.g., age and sex). There are 82 species covered under the Pacific Coast groundfish FMP, and at present, there is little or no biological data on a large number of these species. There is a need for comprehensive, timely and credible data for priority species to aid in the conservation and rebuilding efforts for these stocks. The data collected under this EFP will include total catch (amount and species composition) data, catch location, bycatch data on associated species, and biological data.

Spiny dogfish is an extremely important species in Washington groundfish fisheries. The stock is healthy, and Washington fishermen and processors have worked aggressively to develop and maintain strong markets for this species. A number of Washington groundfish longline fishers and at least one major processor are heavily dependent upon spiny dogfish. Fishermen targeting dogfish are currently constrained by their limit of yelloweye and canary rockfish. In 2002, dogfish were prohibited for fixed gear due to the associated bycatch of yelloweye rockfish. Fishermen who have historically targeted dogfish have indicated that under without a bycatch allowance of yelloweye and canary rockfish, the dogfish fishery cannot be pursued. Further, these fishermen believe that they can pursue a dogfish fishery with a much lower yelloweye and canary bycatch rate than data indicates, thereby allowing a dogfish fishery to continue. This EFP is expected to provide much needed information that can be used to assess bycatch rates in the directed dogfish fishery which in turn may be used to establish trip limits in the future that maximize fishing opportunities on healthy stocks while meeting conservation goals for depleted stocks.

Without this EFP vessels would not be allowed to fish for dogfish and other groundfish within the Non-Trawl Groundfish Conservation Area (< 100 fms north of 40°10'N latitude). According to some Washington longline dogfish fishermen, the majority of the dogfish catch occurs inside this closed area.

E. A statement of whether the proposed experimental fishing has broader significance than the applicant’s individual goals.

The applicant of this EFP believes that the information collected during this experiment will have broader significance than the applicant’s individual goals by:

- Producing data on the amount and location of rockfish bycatch in the longline dogfish fishery; which can be used to set appropriate management measures in the future (e.g., area closures)
- Providing valuable and accurate data on the catch composition by species in the longline dogfish fishery off the Washington coast, and
- Providing a pilot program for assessing the feasibility of the retention of groundfish overages.

- Age and sex data may also be collected to aid in future groundfish stock assessments.

These data could allow the Council to establish trip limits in the future that maximize fishing opportunities on healthy stocks while meeting conservation goals for depleted stocks.

F. Vessels covered under the EFP must:

- Have completed and mailed the Washington Department of Fish and Wildlife Arrowtooth EFP application form by January 1, 2005, and
- Be a Washington resident and have a valid Washington delivery permit

It is anticipated that there would be 3-4 fishers who may apply. A list of the participating fishers (and their designated vessels) will be provided to NMFS.

G. The targeted species is spiny dogfish which would not be subject to a monthly trip limit, but which would be constrained by the measured bycatch allowance of canary and yelloweye rockfish. Under the EFP, the bycatch allowances for canary and yelloweye rockfish would be divided as follows:

- Individual vessels would be limited to 55-73 lbs (depending on the number of participants) of canary rockfish and 137-240 lbs/month (depending on the number of participants) of yelloweye rockfish for sets within the federal rockfish conservation area (RCA) for longline (< 100 fms north of 40°10'). Once the monthly vessel cap of yelloweye rockfish is caught, the vessel cannot fish in the RCA for the rest of the month. Once the individual vessel cap of canary rockfish is caught, the vessel can no longer participate in the EFP.

- For all fishing under the EFP overall bycatch amounts would be as follows:
  Canary rockfish - 0.1 mt
  Yelloweye rockfish - 1.0 mt
  Widow rockfish - 0.5 mt
  Darkblotched rockfish - 0.5 mt
  Pacific ocean perch - 8.5 mt
  Lingcod* - 2.0 mt (*Note: Cap would accommodate current trip limit)

  Once one or more of these bycatch caps has been reached, the EFP will be terminated.

- Other species could be landed under current trip limit levels, however, it is not anticipated that the participating vessels will fish for groundfish other than dogfish for the duration of the EFP. There is not expected to be any interactions with protected species (e.g., seabirds), ESA-listed species, nor marine mammals.

- Expected amounts of targeted species taken in the dogfish EFP are:
  Spiny dogfish - 300 mt

Fish above trip limits taken in non-EFP sets would be consistent with fishing activities of the fleet at large and will be estimated separately.

General

- Incidental catches of all groundfish in excess of the trip limit must be retained.

H. For each vessel covered by the EFP, the approximate time(s) and place(s) fishing will take place, and the type, size, and amount of gear to be used:

The EFP will be valid in Pacific Ocean waters adjacent to Washington, outside three miles. Vessels must fish north of 46°16'00" north latitude for all of their fishing strategies during the months of the EFP. There may be specific areas within the RCA that would be closed to EFP fishing; these areas will be specified in the Washington Department of Fish and Wildlife contract with the individual vessel owner participating in the EFP.

Approximate time for the experimental fishery is March 1-May 31, 2005.
Total estimated duration of the EFP: This is the final year.

All vessels fishing under the authority of the EFP must:

- Carry a Washington Department of Fish and Wildlife-provided observer or a federal observer onboard all fishing trips. State-sponsored observers must successfully complete an observer training course that prepares them for collecting data with sampling protocols as defined in the NMFS West Coast Groundfish Observer Program manual. In addition, NMFS observer coverage requirements at 50 CFR 660.360 are independent of EFP observer requirements, so vessels that carry state-sponsored observers may also be required to carry a NMFS observer.

- Employ legal longline gear as defined in current federal regulations.

- Land all fish caught under the authority of the EFP into the State of Washington to a processor designated to participate in this program by the Washington Department of Fish and Wildlife. In order for a processor to be able to participate in this program, it must hold a contract with the Washington Department of Fish and Wildlife and abide by the conditions listed in the contract. Failure to abide by the conditions in the contract will result in revocation of the contract by the Director of the Washington Department of Fish and Wildlife.

- Hold a contract with the Washington Department of Fish and Wildlife and abide by the conditions listed in the contract. Failure to abide by the conditions in the contract and/or to follow the provisions in the EFP will result in revocation of the contract by the Director of the Department of Fish and Wildlife. The Director of the Department of Fish and Wildlife may modify the terms of the contract based on the status of the stocks which are caught incidentally in the experimental fishery.

I. The signature of the applicant:

____
Washington Department of Fish and Wildlife

Exhibit C.5.b
WDFW Report
June 2004

WASHINGTON DEPARTMENT OF FISH AND WILDLIFE
REPORT ON PROPOSED EXEMPTED FISHING PERMITS (EFPs) FOR 2005 AND 2006

The Washington Department of Fish and Wildlife (WDFW) is proposing to include the provisions of our Arrowtooth Flounder Trawl EFP into the federal regulations for 2005 and 2006. However, as a result of discussions with National Marine Fisheries Service (NMFS), it is our understanding that these provisions may need additional analysis beyond what can be accommodated in the 2005-06 specifications EIS. As such, if the Council approves the WDFW proposal, then NMFS would have to file a regulatory amendment to move the proposed arrowtooth trawl fishery into federal regulations through a separate process. It is clear that the regulatory amendment process would not be finalized in time for the arrowtooth trawl fishery to begin in May 2005. Recognizing that the arrowtooth flounder fishery is extremely important to Washington trawl fishers and local processors, WDFW received guidance from NMFS to prosecute the arrowtooth trawl fishery as an EFP for another year in 2005.

Based on this guidance, WDFW is proposing the following EFPs for 2005, in priority order, with the associated bycatch caps (in mt):

	Canary	Darkbl	Lingcod*	POP	Widow	Yelloweye
Arrowtooth Trawl	2.5	3.0	4.5	18.0	5.5	0.5
Longline Dogfish	0.1	0.5	2.0	8.5	0.5	1.0

(* Cap would accommodate current trip limits)

The longline dogfish EFP has been conducted in 2003 and 2004. The EFP requirements include qualifying criteria that would have allowed three vessels to participate each year, however, only one vessel has indicated an interest. It is our intention to continue this EFP for one more year (2005) and remove the qualifying criteria to provide an opportunity for additional participation. If the results of the experiment continue to be positive, we would like to explore allowing this fishery in 2006 through the use of "hotspot" management.

Attached are the draft EFP applications for 2005 for the arrowtooth trawl and longline dogfish EFPs. WDFW is not proposing any EFPs for the 2006 fishing year.

Exhibit C.5.c
Revised Supplemental GAP Report
June 2004

GROUNDFISH ADVISORY SUBPANEL STATEMENT ON PRELIMINARY CONSIDERATION OF EXEMPTED FISHING PERMIT APPLICATIONS FOR 2005/2006

The Groundfish Advisory Subpanel (GAP) reviewed four exempted fishing permit (EFP) proposals - one each from California and Oregon, and two from Washington. The GAP provides the following comments and recommendations on these proposals.

California Selective Flatfish Trawl

The California proposal reviewed by the GAP contained several typographical errors that showed exceedingly high levels of bycatch. After further discussion with California Department of Fish and Game (CDFG) representatives, the errors were corrected, and the GAP withdrew its initial objection to the proposal.

The GAP notes that, even with the correction, large amounts of Dungeness crab are projected to be incidentally taken in this exempted fishery. The GAP recommends that interim and final reports on the fishery specifically include a break-out of crab incidental catch.

Oregon Selective Flatfish Trawl

The Oregon proposal is an attempt to refine the selective trawl work that has already been done by finding ways to further reduce incidental take of some rockfish species. The GAP supports the proposal.

Washington Arrowtooth Flounder

This EFP is a continuation of a permit that has been in effect for several years. The GAP is concerned that, while it provides a fishing opportunity for some vessels and some data on canary rockfish concentration, the fishery has not yet been converted into a regular, non-exempt fishery. The GAP also expressed reservations about the 2.5 mt cap of canary rockfish, since the fishery is currently capped at 1.5 mt.

The GAP recommends the fishing opportunity be continued for one more year, with the goal of converting it into a regular fishery in 2006. Further, given the current problems with distributing canary rockfish bycatch impacts, the GAP recommends that the proposal be capped at 1.5 mt of canary, even if this means reducing the number of boats that might be eligible to participate.

Washington Spiny Dogfish

This is also a continuation of an existing permitted fishery, which at present involves only one vessel. Similar to the concern about canary impacts in the arrowtooth trawl fishery, the GAP is concerned about the amount of yelloweye rockfish assigned to a fishery with low participation. A majority of the GAP recommends that the permit be approved, but that the amount of yelloweye be capped at .5 mt. A minority of the GAP believes that the permit should be approved as requested.

Finally, the GAP is aware that all states receiving EFPs have complied with reporting and documentation requirements. Unfortunately, the GAP seems to have been left off the distribution list for most of these reports. We respectfully request that future reports on exempted fishing permit fisheries be provided to the GAP.

PFMC
06/15/04

Exhibit C.5.d
Supplemental Public Comment
June 2004

Application for an experimental permit for shallow water species of Rock Cod at Cordell Banks.

I feel that I can fish Cordell Banks with 100 ft of line and stay inside 300 ft of water and target Yellow Tail Rock Fish, Blue Rock Fish and Olive Rock Fish. I believe this method will work as you will not come close to the bottom where the protected species live.

The benefit to fishing the Banks is that we would relieve some of the pressures on the near shore fish, which you seem to think are endangered. I own a six-pack charter vessel and have fished these waters for more than 20 yrs. Before we were closed to Cordell Banks, I specialized in shallow water fishing at the Banks. We would use a light tackle like spinning rods and one 3oz scampi. We would catch them one at a time and most of the time no deeper than 50 ft. Our business has suffered enough! If we could fish Cordell Banks, we could recoup some of our business and make a decent living like we used to.

I do know that there is a Commercial experimental hook and line permit for Cordell on the Chillies and if you can trust the Commercial Fisherman to fish the Banks, then you should also trust the Sport Fisherman to fish the Banks too.

I am willing to take spotters out. I have all the life saving equipment and insurance on my vessel that is required.

Respectfully

Captain Dave French of the PAYBACK
PO Box 791
Bodega Bay CA 94923
707-795-1402

1. 30 inch ling cod -------------------- slot limit 22-30 inches

2. Regions ---------at least 4 and every region has its share of the quota. We are getting ripped off because we do not fish as many days as most of the rest of the state.

3. Seasons should be set in Dec and not changed until the next year as we did spend a lot money for gear and upgrades based on the season set by the DFG and latter changed by the PFMC

4. The lbs they say on the average near shore rock fish is way off that is why they think we are hitting our quota so fast average sack is about 15 lbs average capizon 4lbs and lings are about 7lbs

5. Where did they get there stats for the rock fish to say we hit our quota by the end of oct last year they had no stats for the previous year. 2003 was the first year they had spotters on the docks and this is the first year they are using the charter boat logs to gather data.

6. Why are we spending money on two agencies to gather the same data and that data does not match nore is it used they take the worst and use that. What a waste of money and man power that could have been used in another way.

Exhibit C.6
Situation Summary
June 2004

TENTATIVE ADOPTION OF GROUNDFISH MANAGEMENT MEASURES FOR 2005-2006 FISHERIES

Situation: Management measures adopted during the Council process are designed to implement new and existing rebuilding programs, achieve bycatch reduction mandates, keep total catch within the proposed harvest levels, and achieve optimum benefits to the various user groups and fishing communities.

In the last five years, the Council has implemented a substantial restructuring of the groundfish fishery that includes gear restrictions, seasons, dramatically lower harvest levels consistent with previously-approved rebuilding programs for overfished species, and depth-based restrictions that shift the fishery out of the areas where the most depleted groundfish species reside. The management implications of new groundfish stock assessments and rebuilding analyses, as well as the overharvest of some species in recent years may require consideration of different management measures than implemented in 2004.

The Council adopted a range of specific management options in April to help focus public attention on the extent of changes that may be necessary and to provide the basis for adopting final 2005-2006 management measures at this meeting. A preliminary draft 2005-2006 Management Specifications Environmental Impact Statement (EIS) was prepared by the GMT and Council staff with analysis of effects of the alternative management measures adopted in April (Exhibit C.6.a, Attachment 1). The appendices to the preliminary draft EIS are available as electronic copies on CD-ROM and include Appendix A, Affected Environment (Exhibit C.6.a, Attachment 2); Appendix B, Proposed Arrowtooth Flounder - Rockfish Conservation Area (AT-RCA) Trawl Fishing Program Scoping Document (Exhibit C.6.a, Attachment 3); Appendix C, Widow Area Management (Exhibit C.6.a, Attachment 4); and Appendix D, Council Fisheries Income Impact Modeling (Exhibit C.6.a, Attachment 5). (It is noted that the appendices to the preliminary draft EIS are incorrectly referenced in some parts of the document.) Additionally, the Ad Hoc Allocation Committee is scheduled to meet on May 27 to refine recommended management and allocation alternatives for 2005 and 2006. The Groundfish Management Team (GMT), Groundfish Advisory Subpanel (GAP), and interested public are expected to provide recommendations, additional analyses, and perspectives on 2005-2006 management issues at the June Council meeting.

The Council is scheduled to deliberate 2005-2006 management measure alternatives in three steps this week. Initial refinement of management measure alternatives occurs under this agendum, followed by a GMT and GAP check-in on Thursday under agendum C.8, and a final decision on 2005-2006 management measures on Friday under agendum C.10. Further, optimum yield levels for other flatfish and canary rockfish are scheduled for final decision-making during agendums C.6 and C.10, respectively.

<u>Council Action</u>:

Adopt tentative management measures for 2005-2006 Fisheries for GMT analysis (including proposed EFP set-asides) and adopt final acceptable biological catches and optimum yields for other flatfish.

<u>References</u>:

1. Exhibit C.6.a, Attachment 1: Proposed Acceptable Biological Catch and Optimum Yield Specifications and Management Measures for the 2005 and 2006 Pacific Coast Groundfish Fishery; Preliminary Draft Environmental Impact Statement.
2. Exhibit C.6.a, Attachment 2: Appendix A, Affected Environment (electronic copy on CD-ROM).
3. Exhibit C.6.a, Attachment 3: Appendix B, Proposed Arrowtooth Flounder - Rockfish Conservation Area (AT-RCA) Trawl Fishing Program Scoping Document (electronic copy on CD-ROM).
4. Exhibit C.6.a, Attachment 4: Appendix C, Widow Rockfish Area Management (electronic copy on CD-ROM).
5. Exhibit C.6.a, Attachment 5: Appendix D, Council Fisheries Income Impact Modeling (electronic copy on CD-ROM).
6. Exhibit C.6.a, WDFW Report: Washington Department of Fish and Wildlife Summary of Groundfish Public Meetings.
7. Exhibit C.6.e, Written Public Comments.
8. Exhibit C.6.b, Supplemental Attachment 1: Ad Hoc Allocation Committee Report.

<u>Agenda Order</u>:

a. Agendum Overview	John DeVore
b. Ad Hoc Allocation Committee Report	Committee Members
c. Reports and Comments of Advisory Bodies	
e. Public Comment	
f. **Council Action**: Adopt Tentative Management Measures for 2005-2006 Fisheries for GMT Analysis (Including Proposed EFP Set-Asides) and Adopt Final Acceptable Biological Catches and Optimum Yields for Other Flatfish	

PFMC
06/01/04

Exhibit C.6.a
Attachment 1
June 2004

PROPOSED ACCEPTABLE BIOLOGICAL CATCH AND OPTIMUM YIELD SPECIFICATIONS AND MANAGEMENT MEASURES

FOR THE

2005-2006 PACIFIC COAST GROUNDFISH FISHERY

[PRELIMINARY DRAFT]

DRAFT ENVIRONMENTAL IMPACT STATEMENT,

INCLUDING
REGULATORY IMPACT REVIEW AND INITIAL REGULATORY FLEXIBILITY ANALYSIS

PREPARED BY
THE PACIFIC FISHERY MANAGEMENT COUNCIL
7700 NE AMBASSADOR PLACE, SUITE 200
PORTLAND, OR 97220
(503) 820-2280
WWW.PCOUNCIL.ORG

IN COOPERATION WITH THE

NATIONAL MARINE FISHERIES SERVICE
7600 SAND POINT WAY NE, BIN C15700
SEATTLE, WA 98115-0070
(206) 526-6150

MAY 2004

This document may be cited in the following manner:

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This document is published by the Pacific Fishery Management Council pursuant to National Oceanic and Atmospheric Administration Award Number NA03NMF4410067.

COVER SHEET
2005-2006 Groundfish Specifications and Management Measures
ENVIRONMENTAL IMPACT STATEMENT

Proposed Action:	Specify harvest levels (acceptable biological catch [ABC] and optimum yield [OY] values) for species and species complexes in the fishery management unit and establish management measures to constrain total fishing mortality to these specifications for the calendar years 2005-2006.
Type of Statement:	Draft Environmental Impact Statement (Preliminary)

For Further Information Contact:

Mr. Robert Lohn Regional Administrator Telephone: (206) 526-6150 Fax: (206) 230-5435	National Marine Fisheries Service Northwest Region 7600 Sand Point Way Seattle, WA 98115-0070
Dr. Donald O. McIsaac Executive Director Telephone: (503) 820-2280 Fax: (503) 820-2299	Pacific Fishery Management Council 7700 NE Ambassador Place, Suite 200 Portland, OR 97220

Abstract:

The *Pacific Coast Groundfish Fishery Management Plan* (FMP) establishes a framework authorizing the range and type of measures that may be used to manage groundfish fisheries, enumerates 18 objectives that management measures must satisfy (organized under three broad goals), and describes more specific criteria for determining the level of harvest that will provide the greatest overall benefit to the Nation, or OY. Fisheries subject to management measures include limited entry trawl fisheries, limited entry fixed gear (pot and longline) fisheries, and a variety of other fisheries catching groundfish, either as target species or incidentally, but not license limited under the management framework established in the groundfish FMP. Allocations to tribal fisheries in Washington State are also identified. To date, nine groundfish species have been declared overfished by the Secretary of Commerce (Secretary), and measures to prevent overfishing and rebuild these overfished stocks are a central element of this action. The proposed action establishes harvest guidelines for groundfish species, species groups, and geographic subunits. In order to constrain fisheries to these harvest guidelines, management measures for commercial and recreational fisheries are identified. Management measures considered for commercial fisheries include two-month cumulative landing limits for species, species groups, and geographic subunits for limited entry trawl and fixed gear sectors, and fisheries not license limited under the Pacific Coast Groundfish Fishery Management Plan, and gear restrictions to reduce bycatch of overfished species and reduce habitat impacts. Management measures considered for recreational fisheries include bag limits, size limits, and fishing seasons; which vary by state. In addition, area closures based on depth and intended to reduce bycatch of species apply to both commercial and recreational fisheries that are likely to catch these species. These closures vary by geographic area and time of year.

Comments due by: .

EXECUTIVE SUMMARY

TABLE OF CONTENTS

LIST OF TABLES

Page

LIST OF FIGURES

Page

1.0 INTRODUCTION

1.1 How This Document is Organized

This document provides background information about, and analysis of, harvest specifications and management measures for fisheries covered by the *Pacific Coast Groundfish Fishery Management Plan* (FMP) and developed by the Pacific Fishery Management Council (hereafter, the Council) in collaboration with the National Marine Fisheries Service (NMFS). These measures must conform to the Magnuson-Stevens Fishery Conservation and Management Act (MSA), the principal legal basis for fishery management within the Exclusive Economic Zone (EEZ), which extends from the outer boundary of the territorial sea to a distance of 200 nautical miles from shore. In addition to addressing MSA mandates, this document is an Environmental Impact Statement (EIS), pursuant to the National Environmental Policy Act (NEPA) of 1969, as amended. According to NEPA (Sec. 102(2)(C)), any "major federal action significantly affecting the quality of the human environment" must be evaluated in an EIS. Based on a preliminary determination by Council and NMFS staff, implementing harvest specifications and management measures for the 2005-2006 biennial period may have significant impacts. Therefore, rather than preparing an environmental assessment (EA), which provides "sufficient evidence and analysis for determining whether to prepare an environmental impact statement," NMFS and the Council have decided to proceed directly to preparation of an EIS. This document is organized so that it contains the analyses required under NEPA, the Regulatory Flexibility Act (RFA), and Executive Order (EO) 12866, which mandates an analysis similar to the RFA. For the sake of brevity, this document is referred to as an EIS, although it contains required elements of an Initial Regulatory Flexibility Analysis (IRFA) pursuant to the RFA and a Regulatory Impact Review (RIR) pursuant to EO 12866.

Federal regulations (40 CFR 1502.9) require agencies to prepare and circulate a draft EIS (DEIS), which "must fulfill and satisfy to the fullest extent possible the requirements established for final statements in Section 102(2)(C) of the Act" (i.e., NEPA). Agency guidelines (NOAA Administrative Order 216-6. 5.01.b.1(i)) stipulate a minimum 45-day public comment period on the DEIS. At the end of this period a final EIS (FEIS) is prepared, responding to comments and revising the document accordingly. After the EIS is completed, a 30-day "cooling off" period ensues before the responsible official may sign a record of decision (ROD) and implement the proposed action.

Environmental impact analyses have four essential components: a description of the purpose and need for the proposed action, a set of alternatives that represent different ways of accomplishing the proposed action, a description of the human environment affected by the proposed action, and an evaluation of the predicted direct, indirect, and cumulative impacts of the alternatives.[1/] (The human environment is interpreted comprehensively to include the natural and physical environment and the relationship of people with that environment, 40 CFR 1508.14.) These elements allow the decision maker to look at different approaches to accomplishing a stated goal and understand the likely consequences of each choice or alternative. EISs are commonly organized around four chapters covering each of these topics. This EIS is organized differently; Chapters 1 and 2 cover the purpose and need and describe the alternatives, but the next six chapters focus on parts of the human environment potentially affected by the proposed action. Each of these chapters describes both the baseline environment potentially affected by the proposed action and the predicted impacts of each of the alternatives. Based on this structure, the document is organized in 14 chapters:

1/ Federal regulations at 40 CFR 1502 detail the required contents of an EIS. Although there are several additional components, this list is of the core elements.

- The rest of this chapter, Chapter 1, discusses the reasons for Federal regulation of West Coast groundfish fisheries in 2005-2006. This description of purpose and need defines the scope of the subsequent analysis.

- Chapter 2 outlines different alternatives that have been considered to address the purpose and need. The Council will choose among these alternatives as their preferred alternative, which is recommended to NMFS for adoption as a plan amendment.

- Chapter 3 describes **West Coast marine ecosystems and essential fish habitat (EFH)** potentially affected by the proposed action and discloses the predicted impacts of the alternatives on that segment of the physical and biological environment.

- Chapter 4 describes the **groundfish fishery management unit species** affected by the proposed action and discloses the predicted impacts of the alternatives on that segment of the biological environment.

- Chapter 5 describes **other, nongroundfish species** affected by the proposed action and discloses the predicted impacts of the alternatives on that segment of the biological environment.

- Chapter 6 describes **protected species** potentially affected by the proposed action and discloses the predicted impacts of the alternatives on that segment of the biological environment.

- Chapter 7 describes the **public sector and fisheries management regime** and how the different alternatives would affect these institutions.

- Chapter 8 describes the **socioeconomic environment**, which includes commercial and recreational fisheries and coastal communities in the action area, and how they would be affected by the different alternatives.

- Chapter 9 addresses additional requirements of NEPA and implementing regulations, including the identification of any measures that will be implemented to mitigate significant impacts of the proposed action.

- Chapter 10 details how this amendment meets 10 National Standards set forth in the MSA (§301(a)) and groundfish FMP goals and objectives.

- Chapter 11 provides information on those laws and EOs, in addition to the MSA and NEPA, that an amendment must be consistent with, and how this action has satisfied those mandates.

- Chapters 12 through 15 include required supporting information: the list of preparers, who received copies of the document, a glossary and acronym list, and the bibliography.

- Appendix A is a comprehensive description of the affected environment and supports the descriptions included in Chapters 3 through 8

1.2 Purpose and Need for the Proposed Action

The proposed action falls within the management framework described in the groundfish FMP, which enumerates 18 objectives that management measures must satisfy (organized under three broad goals), describes more specific criteria for determining the level of harvest that will provide the greatest overall benefit to the Nation (defined as optimum yield), and authorizes the range and type of measures that may be used to achieve optimum yield. The management regime described in the groundfish FMP is itself consistent with 10 National Standards described in the MSA. Harvest specifications (OYs) and management measures must be consistent with the goals, objectives, and management framework described in the groundfish FMP.

1.2.1 The Proposed Action

The Council's/NMFS' *proposed action*, evaluated in this document, is to specify acceptable biological catch (ABC) and OY values for species and species complexes in the fishery management unit and establish management measures to constrain total fishing mortality to these specifications. These specifications and management measures will be established for calendar years 2005 and 2006, although they are considered within the context of past management and long-term sustainability of managed fish stocks. Separate harvest specifications are established for 2005 and 2006; management measures are intended to keep total fishing mortality during each year within the OY established for that year. Specifications include new harvest levels for species with the new stock assessments and projected harvest levels for species with stock assessments completed in prior years. Long-term management programs, such as capacity reduction programs, are not developed as part of the annual management process, but in separate Council deliberations which are outside the scope of this EIS. Management measures may be modified during the biennial period, so total fishing mortality is constrained to the OYs identified in the preferred alternative. The environmental impact of any such changes in management measures is expected to fall within the range of impacts evaluated in this EIS. Federally-managed Pacific groundfish fisheries occurring off the coasts of Washington, Oregon, and California (WOC) establish the geographic context for the proposed action.

1.2.2 Need (Problems for Resolution)

The proposed action is needed to constrain commercial and recreational harvests in 2005 and 2006 to levels that will ensure groundfish stocks are maintained at, or restored to, sizes and structures that will produce the highest net benefit to the nation, while balancing environmental and social values.

1.2.3 Purpose of the Proposed Action

The purpose of this action is to ensure Pacific Coast groundfish subject to federal management are harvested at OY during 2005 and 2006 and in a manner consistent with the aforementioned groundfish FMP and National Standards Guidelines (50 CFR 600 Subpart D), using routine management tools available to the specifications and management measures process (FMP at 6.2.1, 50 CFR 660.323(b)). Chapter 10 of this EIS describes how the proposed action (preferred alternative) is consistent with the FMP and MSA.

1.3 Background

1.3.1 Background to Purpose and Need

Marine fish are "common pool" resources with access and use stemming from the public trust doctrine. It is difficult to exclude people from using a common pool resource, because of the physical characteristics of these resources (Ostrom 1990). (Fish are a relatively mobile, "fugitive" resource, making it impossible for any one individual to precisely know their location or control their distribution.) A fish stock is also "subtractable," meaning that exploitation by any one person diminishes the total amount available to others. Under the common law public trust doctrine, resources in ocean areas under U.S. jurisdiction are believed to be held in trust by government to satisfy a broadly-defined public interest (Committee to Review Individual Fishing Quotas 1999). This doctrine also makes a legally defensible exclusive property right to fishery resources difficult or impossible (at least before fish are harvested). The MSA, originally enacted in 1976 as part of the extension of jurisdiction to the 200-mile EEZ (and most recently amended in 1996), establishes the goals, standards, responsibilities, and processes needed to address the characteristics of the fishery resource. A paramount purpose is to "conserve and manage the fishery resources found off the coasts of the United States" (§2(b)(1)). This Act delegates management responsibility to the U.S. Secretary of Commerce (Secretary) who, with the aid of eight regional fishery management councils and through the National Marine Fisheries Service (NMFS), implements measures to ensure the conservation and management goals of the MSA and fulfills the trust responsibility. Councils develop FMPs describing how particular species and fisheries will be managed. The Pacific Fishery Management Council was assigned stewardship responsibilities for the fish resources in the EEZ off the Pacific Coast (see Figure 1-6 in Appendix A) and first approved the groundfish FMP in 1982.[2/]

Chapter 6 in the groundfish FMP describes the management measures the Council may recommend NMFS use and the process of establishing and adjusting such measures. Various biological reference points and information on fishery performance are used to determine, on an annual basis, the OY for particular species or species groups (see Section 3.2. for a description of these reference points). The groundfish FMP also describes "points of concern" and socioeconomic frameworks, which help managers determine whether and what types of management measures are needed. Section 6.2 of the groundfish FMP describes the deliberative process the Council must follow and the parallel process NMFS uses to translate Council recommendations into regulations. NEPA-mandated environmental impact assessment is a central component of this process. (Due to recent litigation, *Natural Resources Defense Council* v. *Evans* discussed in Section 1.3.3, the current process differs somewhat from what is described in the groundfish FMP. The NEPA analysis has gained greater prominence, and there is more opportunity for public notice and comment during rulemaking.)

1.3.2 Background to Groundfish Management and the Specifications Process

The groundfish FMP lists three overall goals to guide the management process:

1. Conservation - prevent overfishing by managing for appropriate harvest levels and prevent any net loss of habitat of living marine resources.
2. Economics - maximize the value of the groundfish resource as a whole.
3. Utilization - achieve the maximum biological yield of the overall groundfish fishery, promote year-round availability of quality seafood to the consumer, and promote recreational fishing opportunities.

A variety of management measures have been employed to achieve these goals, including gear restrictions, a license limitation program, time/area closures, the specification of OYs or other harvest limitations for some species, seasons, and trip/cumulative landing limits, which are limitations on the amount of certain species that may be caught, retained, and landed by any vessel. The groundfish FMP allows harvest guidelines and quotas to be re-specified on a periodic basis. Harvest guidelines are specified numerical harvest objectives which are treated as targets but not absolute limitations. Therefore, a fishery does not have to be closed if its harvest guideline is reached, although the Council and NMFS may choose to do so. All recent numerical harvest specifications, including OY values, have been harvest guidelines. A quota is defined as a specified numerical harvest objective, the attainment (or expected attainment) of which causes closure of the fishery for that species or species group. The main use of harvest guidelines and quotas recently has been to designate allocations and sub-components of a specified OY.

[2/] The groundfish FMP has been amended 17 times to date (counting Amendments 16-1 and 16-2 as separate amendments).

In accordance with the groundfish FMP, since 1990 the Council has annually set Pacific Coast groundfish harvest specifications (acceptable and sustainable harvest amounts) and management measures designed to achieve those harvest specifications, with harvest specifications and management measures in effect for the calendar year, January 1 to December 31 The current action reflects a notable change in this management cycle, with a shift to a biennial management cycle, as implemented by Amendment 17 to the groundfish FMP, which was approved on August 20, 2003. Thus 2004 is the last year under the annual process and 2005–2006 begins biennial management. Under the biennial management cycle, harvest specifications and management measures are established for the two-year period in advance of the biennium. Separate ABCs and OYs are established for each calendar year in the two-year cycle. Council decision-making for this action occurs over three meetings, culminating in June of the year preceding the biennium. For the 2005-2006 biennium the Council identified a preliminary range of ABCs and OYs at their November 2003 meeting; at their April 2004 meeting they selected a preferred set of ABCs and OYs and a preliminary range of management measures; and at their June 2004 meeting they finalize the full package of harvest specifications and management measures, choosing preferred management measure alternatives. In addition to allowing more careful consideration of management proposals, this process addresses an issue raised by the court ruling in *Natural Resources Defense Council* v. *Evans*, 2001 168 F. Supp. 2d 1149 (N.D. Cal. 2001). The court found that NMFS was not allowing sufficient time for public notice and comment on the regulations before they were implemented at the beginning of the new year. The biennial process allows more time to complete full notice-and-comment rulemaking before the January 1 start date.

Of the more than 80 groundfish species managed under the FMP, only about 20 are assessed for stock size and status on a regular basis.[3/] As a general principal, assessments are scheduled for stocks on a three-year rotating basis, although the actual schedule can vary due to the availability of scientists to conduct the assessments and the role a stock plays in structuring management measures. Thus, when the Council recommends a new set of harvest specifications in a given year, normally only specifications for those species with new assessments, or past assessments containing an OY projection for the coming year, are changed from the previous year's value. In addition, eight groundfish species are currently declared overfished by the Secretary, pursuant to provisions in the MSA.[4/] Based on stock assessments, scientists have conducted rebuilding analyses for these species in order to determine suitable harvest levels consistent with the rebuilding framework established by the MSA and the groundfish FMP, as amended by Amendment 16-1, and rebuilding plans adopted by Amendments 16-2 and 16-3. These amendments are described in the next section. For overfished species, the rebuilding analysis represents an additional analytical step used to

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[3/] Target species, and in recent years overfished species, are given the highest priority for full stock assessment. Incidentally-caught species, species only identifiable as part of a stock complex, and species caught in small numbers, typically fall in assessment Category 2 or 3, as defined in the groundfish FMP. These species are managed based on historical landings.

[4/] Tables 2-2 and 2-3 in Appendix A list the overfished species and associated rebuilding parameters. Currently overfished species are: bocaccio (*Sebastes levis*), cowcod (*S. levis*), canary rockfish (*S. pinninger*), darkblotched rockfish (*S. crameri*), Pacific ocean perch (*S. alutus*), widow rockfish (*S. entomalas*), yelloweye rockfish (*S. ruberimus*), lingcod (*Ophidon elongates*). NMFS declared Pacific whiting (*Merluccius productus*) overfished on April 15, 2002 (67 FR 18117). However, the most recent whiting stock assessment (Helser, *et al.* 2004), incorporating new data from the 2003 hydro-acoustic survey, estimates current biomass between 47% and 51% of unfished biomass; the stock is, therefore, not currently overfished. Furthermore, because the 1999 year class was larger than previously estimated, estimates of the 2001 biomass in the current stock assessment range from 27% to 33% of unfished biomass, indicating the stock approached, but never fell below, the $B_{25\%}$ minimum stock size threshold (Whiting STAR Panel 2004). On April 30, 2004, NMFS announced that Pacific whiting is no longer considered an overfished stock (69 FR 23667).

determine an OY. OYs for unassessed stocks are based on more limited data, such as catch history, and for this reason are not usually changed year to year.

Various factors contribute to differences in OYs for 2005 and 2006 in comparison to 2004. Information from new stock assessments on stock structure and productivity can lead to significant changes in proposed harvest levels. In the absence of a new assessment, a species' OY is set using the most recent assessment along with any adjustments based on expected stock performance. Only lingcod and cabezon have been newly assessed since 2004 harvest specifications were set (Cope, *et al.* 2004; Jagielo, *et al.* 2004). Previous assessments, including six conducted in 2003, are used for other species. OYs for overfished species must be consistent with adopted rebuilding plans. As noted above, the Council has adopted rebuilding plans for all currently overfished species, which determine the range of OYs that may be considered for these stocks. Since lingcod is an overfished species, the new stock assessment is accompanied by an updated rebuilding analysis, which computes the OY based on targets adopted by the Council. Separate harvest control rules (F rates) are identified in the groundfish FMP for the northern and southern lingcod stocks. Cabezon has been assessed for the first time; previously it was managed as part of the Other Fish stock complex but will now be managed according to its own ABC/OY. Finally, adjustments have been made to the OYs for Pacific cod and the Other Flatfish and Other Fish complexes. Because these are unassessed stocks, their ABCs and OYs are set based on past landings; the harvest specifications have been adjusted downward, consistent with guidance (Restrepo, *et al.* 1998). A Council-preferred ABC/OY is not identified for Pacific whiting in this EIS because of the nature of the fishery and related assessment schedule. This stock is assessed annually and the next assessment will be completed by March 2005, in time for the April 1 start of this fishery. Since this seasonal fishery is managed by quota, crafting of complex management measures is unnecessary. However, bycatch of widow rockfish, an overfished species with a relatively low OY, is a management issue in this fishery, influencing the choice of OY for the target species. The range of whiting OYs evaluated in this EIS captures the range of potential values expected from that assessment. Section 2.1 describes the basis for 2005-2006 harvest specifications in detail.

In contrast to the EISs prepared for the 2003 and 2004 seasons, this EIS treats the choice of ABCs and OYs as a separate decisional step from the development of management alternatives. The OYs for 15 stocks or stock complexes differ among the three harvest specification action alternatives. OYs for the remaining stocks are the same across all the action alternatives. (The No Action Alternative represents the status quo, or re-application of 2004 harvest specifications, OYs for additional stocks are different under No Action in comparison to the action alternatives.) The differences among the harvest specification action alternatives reflect policy decisions based on various factors, such as scientific uncertainty in stock assessments (e.g., lingcod, cabezon, sablefish), the recent adoption of rebuilding plans (bocaccio, cowcod, widow rockfish, yelloweye rockfish), and whether to apply a precautionary reduction for unassessed stocks (Pacific cod, Other Flatfish, and Other Fish), among other factors. In the 2003 and 2004 harvest specification EISs a single set of alternatives was analyzed; each alternative included both the ABCs/OYs and the management measures projected to constrain total fishing mortality to these different harvest specifications. The biennial process highlights the procedural separation between choosing a preferred set of harvest specifications and developing management measures. Therefore, the choice of harvest specifications and the development of management measures are separated into two sets of alternatives, which form the basis of the impact analysis. The second set of alternatives contain different combinations of management measures, and each one of these management measure alternatives (except for No Action) is intended to constrain fishing mortality at or below the Council-preferred OY levels determined by the choice among the first set of alternatives. (The action alternatives were crafted before performing the detailed analysis necessary to determine total fishing mortality for each stock. Therefore, one or more of the action alternatives may be projected to exceed the Council-preferred OY for one or more stocks. However, the Council-preferred alternative, chosen at the June Council meeting, must be projected to keep total fishing mortality for all stocks within their respective OYs.) This approach also makes it easier to compare alternative management measures to one standard: the Council-preferred ABC/OY levels chosen from the first set of alternatives.

In order to rebuild overfished groundfish species while satisfying the groundfish FMP's resource utilization goal, Council policy is to use management measures that discourage or prevent targeting of these species. The Council has also recommended management policies to reduce the incidental catch of overfished species taken in fisheries targeting healthier stocks. In 2002 the Council began using an analysis of the incidental catch rates of particular overfished species taken in trawl fisheries targeting healthy stocks.[5/] Then, in setting management measures for the year, the Council recommended trip limit combinations that allowed higher landings of healthy stocks in months and seasons when those healthy stocks co-occur less frequently with overfished stocks. Since that time a "trawl bycatch model" has been developed by NMFS (Hastie 2001; Hastie [2003]), which is used to project total fishing mortality in the limited entry groundfish trawl fishery for key species, based on a given set of management measures.[6/] In late 2002 the Council also implemented large closed areas for commercial groundfish fisheries, which are intended to prohibit fishing in depth ranges where certain overfished species are most abundant. These "Rockfish Conservation Areas" (RCAs) were a key feature of 2003 management, and continue to be so today. Observer data from the first year of the West Coast Groundfish Observer Program (August 2001 through August 2002) also became available in early 2003. Although still relatively limited, the Council directed that these data should be used to estimate total fishing mortality beginning in mid-2003. The trawl bycatch model has been continually updated, both to evaluate the effect of different closed area configurations on total fishing mortality and to incorporate updated bycatch rates based on observer data (Hastie 2003). A second year of trawl sector observer data became available in early 2004 (September 2002 through August 2003). The first two years of observer data and bycatch modeling for the primary sablefish fishery were also available in early 2004; this fishery is prosecuted by limited entry fixed gear vessels (Hastie 2004).

An important mandate that the proposed action must meet is to base management on "the best available science," the second National Standard specified in the MSA. Regular stock assessments for target species in groundfish fisheries, whenever possible, are an example of the application of this requirement. Managers are improving the quality of data and analysis; this supports assessment and catch accounting.

1.3.3 Key Management Issues in 2005 and 2006

Although the main issues considered in 2003 and 2004 again play a role in the development of management measures for 2005-2006, several new issues are relevant to the proposed action. Foremost, the use of a biennial management cycle for the first time requires changes in Council/NMFS decision-making procedures and the sequencing of management information. It could also affect the frequency and magnitude of inseason changes to management measures in unforseen ways.

Certain overfished species will continue to constrain harvest opportunities for healthier stocks. In response, various combinations of sector-specific trip limits and closed area configurations will be a central management feature. The availability of a second year's worth of observer data, available in early 2004, requires both adjustments in the bycatch rates used in modeling projected total fishing mortality and refinement of the models used to project bycatch. Although preventing overfishing and rebuilding overfished stocks is a paramount concern, management measures are intended to allow fishers to access healthy stocks

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5/ Incidental catch includes retained catch of non-target species and discards. The MSA defines bycatch as "fish which are harvested in a fishery, but which are not sold or kept for personal use . . ." Bycatch, under the MSA definition, accords with discards, as the term is used here.

6/ The number of trawl vessels targeting Pacific Coast groundfish is limited by a licensing program established in the groundfish FMP. Although only one of several fishery sectors catching groundfish, a large proportion of total groundfish landings is attributable to this sector. Accurately predicting total catch mortality in this sector is, therefore, crucial in determining how well a given set of management measures will constrain fishing to OYs.

by reducing bycatch rates. This addresses a competing goal in the groundfish FMP to maximize the value of the groundfish resource. Striking this balance between conservation of and direct social benefit from groundfish is another way to understand the purpose of this action.

Inseason management of California recreational fisheries to constrain mortality of overfished groundfish occupied the Council in 2004 and plays an important role in the formulation of management measures for the 2005-2006 period. To date, the information on California recreational fishing has been primarily derived from the NMFS Marine Recreational Fisheries Statistical Survey (MRFSS). These data were not intended and are not well-suited for use in management decision-making. A new system, the California Recreational Fisheries Survey (CRFS), intended to provide more accurate and reliable information, has been put in place. Data from this survey is becoming available during the biennial cycle and could affect pre-season or inseason recreational harvest projections.

Regionalizing recreational fisheries management is a related issue. Although differing state regulations and the geographic distribution of groundfish stocks caught by recreational fishers signaled some degree of regionalization in the past, the Council, along with the states, is now considering more explicit regional allocations in the form of harvest guidelines or targets. The concern that a given sector or region could harvest a disproportionate share of the very low coastwide OY for certain overfished groundfish, such as canary rockfish, has sparked this discussion.

Exempted Fishing Permits (EFP) have been used successfully to test new gear and fishing strategies outside of the normal regulatory framework for groundfish management. Fishers in all three states, under the auspices of state management agencies, have been testing modified bottom trawl gear that reduces bycatch of overfished rockfish species while maintaining or increasing catch efficiency for target flatfish species. (The modified trawl nets use a cutback headrope, which allow species—such as some rockfish species—which swim upward when disturbed, to evade the net entrance. Bottom-hugging species like flatfish are still caught.) Sufficient testing has occurred in Oregon waters to transition this modified gear configuration into the regulatory regime for fisheries north of the management line at 40º 10' N. lat. (near Cape Mendocino, California). The regime under discussion would require the use of this gear shoreward of the RCA while likely permitting higher landing limits for target species because of the lower bycatch rates. Fishers in California are currently testing this gear under an EFP submitted by that state; given similar results this regime may be extended south of 40º 10' N. lat. NMFS has authorized several other EFPs, which at a future date could be brought under the normal regulatory regime in a similar fashion.

1.3.4 Changes to the FMP Affecting Annual Management

Although the groundfish FMP was first implemented 20 years ago, changes in the fishery and the MSA have resulted in substantial modification through plan amendments. Three recent amendments (numbered 11 through 13), which in part respond to new requirements imposed by the 1996 Sustainable Fisheries Act (SFA) reauthorizing and amending the MSA, have affected the framework for specifying harvest levels and management measures. Amendments 11 and 12 were adopted in order to make the groundfish FMP consistent with MSA National Standard 1: *Conservation and management measures shall prevent overfishing while achieving on a continuing basis, the optimum yield from each fishery for the United States fishing industry*.

Approved in 1999, Amendment 11 establishes a default OY policy that reduces the numerical OY of any stock believed to be below its precautionary threshold, which is defined as smaller than 40% of its pristine (unfished) abundance (denoted B_0) unless better information is available.[7/] A groundfish stock is defined as overfished if its abundance is less than 25% of its unfished abundance ($B_{25\%}$). The procedures and criteria for determining OYs for Pacific groundfish are detailed in Section 4.x.

Amendment 12, although subsequently remanded in part by court order, established procedures to rebuild overfished stocks. In response to the remand, the Council developed Amendment 16, which has been adopted in several different parts. Amendment 16-1 to the groundfish FMP established the framework for rebuilding overfished stocks, including the adoption and reviewing of rebuilding plans. It was approved by NMFS in November 2003 and the final rule establishing rebuilding parameters in Federal regulations was published on February 26, 2004. Under this framework key targets that will guide the rebuilding process are specified in the FMP and Federal regulations. If these target values need to be changed, new values are published in regulations and are thus subject to notice-and-comment rulemaking. (As envisioned, the rulemaking process associated with harvest specifications, along with supporting NEPA documentation, is the normal mechanism used to implement changes to rebuilding parameters. This was the case in the 2004 harvest specifications, which implemented changes to the harvest control rules for darkblotched rockfish and Pacific ocean perch in response to information from new stock assessments. The impacts of these changes were evaluated in the supporting EIS (PFMC 2004b). Amendment 16-2 adopted rebuilding plans consistent with the Amendment 16-1 framework for canary rockfish, darkblotched rockfish, lingcod, and Pacific ocean perch. It was approved by NMFS in January 2004 and the final rule was published on April 13, 2004 (69 FR 19347 with an effective date of May 13, 2004. By court order the ROD for Amendment 16-3, adopting rebuilding plans for bocaccio, cowcod, widow rockfish, and yelloweye rockfish, must be signed by September 15, 2004. The DEIS for this action was published on April 2, 2004. The FEIS will be distributed in July 2004. Harvest specifications established for 2005 and 2006 are consistent with the rebuilding targets established by these amendments. Based on the new stock assessment mentioned above, the lingcod harvest control rule (harvest rate) described in Amendment 16-2 will be modified as part of 2005-2006 biennial specifications process. This change is described and evaluated in this EIS.

Amendment 13 was developed in response to SFA requirements to address bycatch and bycatch accounting. (It also added to the list of routine management measures that are part of the groundfish FMP framework. This allows more effective management of overfished species and bycatch.) This amendment addresses MSA National Standard 9: *Conservation and management measures shall, to the extent practicable (A) minimize bycatch and (B) to the extent bycatch cannot be avoided, minimize mortality of such bycatch*. Bycatch (fish discarded at sea for regulatory or economic reasons) has emerged as a difficult problem in groundfish management. In order to manage for overfished stocks, it is necessary to estimate total catch, rather than only the catch landed at the dock. At the same time, reductions in cumulative landing limits can increase the amount of fish discarded, since these limits are based on landed catch rather than total catch. (Until the recent development of an observer program, it has been difficult to effectively monitor discards, confounding the ability to accurately estimate total catch.) NMFS published a Bycatch Mitigation Program Draft Programmatic EIS on February 20, 2004 (NMFS 2004b). The Council identified a preferred alternative at their April 2004 meeting, which will be included in the Final Programmatic EIS (FPEIS). Once the FPEIS is finalized, the Council will undertake an FMP amendment to implement the goals, program direction, and bycatch reduction measures recommended by the FPEIS.

Amendment 17 implemented biennial management, and was described in the preceding section.

[7/] Sometimes spawning stock biomass is used instead of total stock biomass, and sometimes spawning potential is used. Where there is insufficient information to develop a numerical OY, the groundfish FMP still allows establishment of a non-numerical OY.

1.4 Scoping Summary

1.4.1 Background to Scoping

According to the NEPA, the public and other agencies must be involved in the decision-making process. “Scoping” is an important part of this process. Scoping is designed to provide interested citizens, government officials, and tribes an opportunity to help define the range of issues and alternatives that should be evaluated in the EIS. NEPA regulations stress that agencies should provide public notice of NEPA-related proceedings and hold public hearings whenever appropriate during EIS development (40 CFR 1506.6).

The scoping process is designed to ensure all significant issues are properly identified and fully addressed during the course of the EIS process. The main objectives of the scoping process are to provide stakeholders with a basic understanding of the proposed action; explain where to find additional information about the project; provide a framework for the public to ask questions, raise concerns, identify issues, and recommend options other than those being considered by the agency conducting the scoping; and ensure those concerns are included within the scope of the EIS.

1.4.2 Council and Agency NEPA Scoping

On October 15, 2003 (68 FR 59358), NMFS and the Council published a Notice of Intent (NOI) in the *Federal Register* announcing their intent to prepare an EIS in accordance with NEPA for the 2005-2006 ABC and OY specifications and management measures for the Pacific Coast groundfish fishery. The NOI described the proposed action and the way in which alternatives to be analyzed in the EIS would be formulated; it also enumerated a preliminary list of potentially significant impacts that could result from implementing the proposed action. A public scoping period, ending on November 14, 2003, was announced in the NOI. A public scoping meeting was held on November 2 in Del Mar, California, to gather oral comments on the scope of the EIS. In addition, written comments were accepted through the end of the scoping period.

In addition to the formally-announced public scoping period, the Council process, which is based on stakeholder involvement, allows for public participation and public comment on fishery management proposals during Council, subcommittee, and advisory body meetings. The advisory bodies involved in groundfish management include the Groundfish Management Team (GMT), with representation from state, federal, and tribal fishery scientists; and the Groundfish Advisory Subpanel (GAP), whose members are drawn from the commercial tribal, and recreational fisheries, fish processors, and environmental advocacy organizations. The Ad Hoc Allocation Committee, a subpanel of the whole Council, provides advice on allocating harvest opportunity among the various fishery sectors. These opportunities all constitute the broadly-defined Council scoping process, not all of which focuses on the scope and content of NEPA analysis.

The Council and its advisory bodies considered 2005-2006 specifications and management measures at several meetings. As noted above, the Council took action at four meetings in November 2003, March 2004, April 2004, and June 2004. The Ad Hoc Allocation Committee of the Council met on March 24 and 25 and May 27, 2004, to review the range of harvest specifications and provide guidance on allocation of harvest opportunity among different fishery sectors for 2005-2006. When the Council considers groundfish management at their meetings, the GMT and GAP provide advice and guidance on the development of harvest specifications and management measures. The GMT also meets outside of Council meetings to develop management recommendations. For the 2005-2006 harvest specifications process they met in October 2003, and February, May, and June 2004. All these meetings are open to the public and are duly noticed.

In addition, although not part of the formal scoping process, both the Oregon and California state fish and game departments hold public hearings to solicit input on the formulation of management measures. Comments made at these hearings were summarized and made available to the Council in advance of their June 2004 meeting.

1.4.3 Summary of Comments Received

The Council received emails, letters, and oral comments from 17 people. Based on their affiliation these commenters can be categorized as follows:

Affiliation	Number of Commenters
Commercial fishing	2
Recreational fishing	4
Government agency	5
Environmental advocacy group	3
Other affiliation	3
Total	17

The number of times an issue is raised during the scoping process provides an indication of the issues that commentors are most concerned about. Scoping also helps agencies eliminate from detailed study issues that are not significant (40 CFR 1501.4(g)).

Table 1-1 summarizes and categorizes the scoping comments. Sixty-six individual comments were extracted from the written and oral statements received. These comments are listed under six broad categories relating to the analysis in this EIS. They are then further sub-categorized according to more specific issues. The comments and how they are addressed in this EIS are summarized as follows:

1. **Harvest level comments** are sub-categorized according to **allocation**, **OYs**, and **rebuilding overfished species**. Many of the comments under the OY and rebuilding categories recommend setting harvest levels conservatively for overfished species, evaluating different rebuilding strategies in the EIS, and implementing mechanisms to deal with over-harvest (exceeding the OY). It should be noted that the Council has adopted rebuilding plans for all currently overfished groundfish species. The strategic rebuilding parameters in these plans dictate the OYs for these species. The Council has changed the harvest control rule for selected stocks, based on information in new stock assessments. However, this has been done to achieve rebuilding with probabilities equal to or greater than those identified in the rebuilding plans. As noted above, the Council is changing the harvest control rule for lingcod in response to the new stock assessment. This change will be discussed and evaluated in this EIS; however, rebuilding strategies for the other overfished species are not revisited and evaluated here. Comments on over-harvest refer to the effects of harvests in one sector on fishing opportunity for other sectors (as an allocation issue) and how to respond to overages in one year by adjusting future harvest levels. Chapter 2, describing harvest level alternatives, and Chapter 4, evaluating impacts to fish stocks, discuss these issues.

2. **Management measure comments** are sub-categorized under **rebuilding overfished species, closed areas**, and **trip limits**, along with three more general comments. Rebuilding comments emphasize the need to implement management measures that ensure rebuilding of overfished species. Closed area comments discuss the use and configuration of RCAs and the effect of these closures on smaller vessels.

The other comments recommend evaluating the efficacy of management measures for controlling total fishing mortality and propose a range of management measures to reduce bycatch, habitat, and ecosystem impacts. Chapter 2 describes the range of management measures considered in the alternatives. Their effects on different components of the human environment are discussed in Chapters 3 through 8, as appropriate.

3. **Monitoring and enforcement comments** are sub-categorized under **bycatch**, **enforcement**, and **observers and monitoring**. The bycatch comments emphasize the need to accurately account for this source of fishing mortality. As noted earlier in this chapter, accounting for total fishing mortality is an important component of the groundfish fishery management regime. Some of the bycatch-related comments are outside the scope of this action. For example, updating or amending the groundfish FMP, to specify gathering bycatch-related information, is not part of the harvest specifications process. By the same token, a comprehensive treatment of bycatch and bycatch reduction is the subject of the bycatch mitigation PEIS referenced in Section 1.3.4. The bycatch PEIS also evaluates a range of bycatch reduction measures that are beyond the scope of the harvest specifications process, because, for example, they would require an FMP amendment to implement. This harvest specifications EIS discusses bycatch reduction within the context of management measures proposed for 2005-2006. Commentors also recommended evaluating various monitoring techniques, including observer coverage, and logbook and electronic data collection. Bycatch estimation is currently based on combining information from the West Coast Groundfish Observer Program, logbook information, and landings data to model total projected fishing mortality. This EIS discusses and evaluates these methods. Comments on enforcement stress its importance as a complement to monitoring in preventing harvest limits from being exceeded. These issues are discussed and evaluated in Chapter 7 of this EIS.

4. **Ecosystem and habitat impacts comments** are sub-categorized under **ecosystems**, **gears and other techniques**, and **habitat**. One comment recommends evaluating a wide range of measures for reducing habitat impacts. Management measures considered under the harvest specifications process are primarily designed to constrain total fishing mortality with other effects considered secondarily. In addition, some measures, such a further reducing fishing capacity (e.g., retiring fishing vessels participating in the groundfish fishery) and developing a network of no-take marine protected areas (MPAs) are outside the scope of the proposed action. NMFS is currently preparing an EIS to comprehensively evaluate designation and protection of essential fish habitat (EFH) as mandated by the MSA; this EIS will take up many of the broader habitat protection measures proposed in these comments. In addition, the bycatch mitigation PEIS also considers some of these measures in the bycatch reduction context. These analyses may result in the implementation of more comprehensive habitat protection measures over a longer period than that for the development of management measures for the harvest specifications process. Chapter 3 in this EIS describes and evaluates impacts of biennial management measures on habitat and ecosystems.

5. **Socioeconomic impacts comments** are sub-categorized under **communities**, **small vessels**, **processors**, **recreational fishing**, and **year-round fishery**. These comments address different aspects of the socioeconomic environment, including fishery sectors and fishing communities. Several comments emphasize the economic problems caused by the need to restrict groundfish fishing, by implementing the RCAs for example. One commentor recommends evaluating the objective of sustaining a year-round fishery. Recreational fishing-related comments recommend evaluating the value of that sector in comparison to the commercial sector. Socioeconomic impacts are described and evaluated in Chapter 8 of this EIS.

6. Comments on other **analytical issues** are sub-categorized under **communication**, and **cumulative effects**. There are also three more general comments in this category. In preparing this EIS, Council and

NMFS staff address the analytical requirements identified in NEPA regulations and guidance while striving to present the information in a clear, readable format.

1.4.4 Criteria Used to Evaluate the Impacts of the Proposed Action

The proposed action will be evaluated based on projected impacts to the components of the human environment listed below. For each of these components the criteria used for measuring direct, indirect, and cumulative impacts are described. These criteria were developed by Council and NMFS staff, based on scoping comments and Council and advisory body discussions.

Habitat and Ecosystem (Chapter 3)

The combined and cumulative effects of proposed management measures are considered. Impacts to habitat and ecosystem would correlate with the level and type of fishing activity. Increased fishing activity, particularly bottom trawling, would result in greater impacts to habitat in comparison to a decrease in fishing. However, data on the distribution and intensity of fishing effort is currently unavailable. In addition, the correlation between fishing and impacts to habitat is not sufficiently detailed to specify the effects on habitats and ecosystems. For these reasons the alternatives are evaluated qualitatively in terms of relative impacts.

Groundfish, Including Overfished Species (Chapter 4)

The fishery management unit (stocks managed under the FMP) may be subdivided into three categories for the purposes of evaluating impacts: overfished species, species subject to precautionary management, and species believed to be at or above B_{MSY}. A goal of the management framework is to maintain stocks at B_{MSY}; for stocks below that abundance threshold, harvests must be limited in order to allow the stock, over time, to reach that size. The management framework takes a precautionary approach by requiring increasing reductions in harvest levels the more stock size falls below B_{MSY}. If a stock falls below the minimum stock size threshold (MSST) defining an overfished stock (which for groundfish is 25% of unfished biomass) a different framework applies: for a given harvest rate managers identify a time frame for recovery and assess the likelihood of recovery during that time period. Fishing mortality, or the removal of stock biomass, in 2005-2006 is the direct effect of the proposed action. From the standpoint of impact assessment, this has relatively little utility; fishery management depends on the cumulative effects of past management (which partly determines current biomass) and focuses on the future effect of current fishing mortality. One criterion for evaluating alternatives, therefore, is their likelihood of satisfying the B_{MSY} management goal. Rebuilding plans for overfished species—which dictate the OYs that can be established for these stocks—provide a quantification of this likelihood, the probability of stock recovery within a given time period. For stocks above MSST the evaluation must rely on a more qualitative discussion of the types of risk associated with a given harvest level. Any harvest level that constitutes overfishing, a rate that exceeds F_{MSY} or its proxy, represents a clear threshold for significance. (F_{MSY} is shorthand for the fishing mortality rate that will maintain the stock at maximum sustainable yield [MSY] biomass. The true value for this rate is not known for groundfish species. Instead, proxy values are used.) The MSA does not allow the Council to knowingly authorize overfishing (that is, a harvest rate that keeps stock size below B_{MSY}). Therefore, the alternatives must be assessed for overfishing risk—failing to maintain stocks at B_{MSY} over the long term and on a continuing basis—which would represent a significant impact.

As discussed earlier in this chapter, once the Council identifies a preferred set of OYs, management measure alternatives are formulated and the resulting projected catch (or total fishing mortality, including bycatch) is estimated. The management measures are evaluated in terms of their projected success in constraining total fishing mortality of each stock or stock complex to a level at or below the OYs; if they don't, further adjustments need to be made until projected catch of each stock or stock complex falls below the OYs. Thus, the impact of management measures represents another level of the same analytical question: what is the likelihood that *actual* harvests (as opposed to the potential harvest levels represented by OYs) will satisfy the goal of maintaining stocks at B_{MSY}? Because the intent is to manage within OYs, the degree to which management measures sufficiently constrain fishing mortality, including any further precautionary reductions from the OY for a given species, represents the impact to be evaluated. The level of bycatch resulting from a given suite of management measures is an important aspect of this evaluation. From a biological perspective, the amount of bycatch is immaterial as long as total fishing mortality is sufficiently constrained (assuming that discarding fish into the marine environment does not by itself result in significant impacts).[8/] However, bycatch mortality is much more difficult to monitor and assess than landed catch mortality. Thus, as bycatch increases, there is a greater risk that total fishing mortality will be under-estimated. As harvest limits for certain species are reduced, there is greater incentive for fishermen to discard fish, so they may continue fishing for other species with higher limits. Alternatives, therefore, must be evaluated for their bycatch-producing effect.

Non-groundfish Species (Chapter 5)

Vessels fishing for groundfish may also catch non-groundfish species. Many of these species come under other state or Federal management regulations. Harvest limits and separate entry requirements for vessels targeting those species may be established. Incidental catch by groundfish vessels contributes toward total fishing mortality for these species. Impacts may be evaluated in terms of this incidental harvest in relation to any harvest limit established for the incidentally-caught species under other state or Federal management regimes.

Protected Species (Chapter 6)

A range of species other than federally-managed fish are protected under the Endangered Species Act (ESA), Marine Mammal Protection Act (MMPA), and the Migratory Bird Treaty Act (MBTA). Groundfish fisheries may interact with these species, causing mortality or otherwise harming them. Different protected species are affected by a variety of gear types. For example, ESA-listed salmon stocks are caught in midwater trawl fisheries targeting Pacific whiting, and longline fisheries may hook seabirds during gear deployment. As with habitat, alternatives that allow more fishing effort may result in greater impacts to protected species in comparison to alternatives that result in less fishing effort. Significant impacts would occur if standards established pursuant to the relevant laws were exceeded. Current estimates of protected species takes suggest that these standards are not being exceeded.

The Management Regime (Chapter 7)

As noted above, management measures will be implemented to ensure total fishing mortality remains at levels necessary to achieve OYs. The impacts of the alternatives are evaluated in terms of the types of management measures that may be used. More complicated, controversial, and difficult-to-enforce management measures would impose greater costs in comparison to less complex measures. Impacts to the management regime can also be evaluated in terms of the data needed to both support and evaluate potential management measures. Management measures that are more dependent on precise total catch monitoring will require a higher level of direct observation than is currently in place. Increasing observer coverage would entail more costs.

8/ It is important to recognize that bycatch may represent a social cost. Marketable fish may be discarded due to regulatory restrictions, decreasing potential revenue. Even if fish are discarded because there is no market for them, or because production costs exceed potential revenues, a social cost may be incurred. This cost represents foregone opportunities, environmental services provided by the living fish, the value society attaches to the mere existence of the fish, and other values not adequately captured in prices.

Socioeconomic Impacts (Chapter 8)

Socioeconomic impacts are evaluated across a range of sectors as follows:

Commercial fishery impacts are compared in terms of changes in expected landings, and where possible, exvessel revenue. These socioeconomic impacts are inversely related to biological impacts. Alternatives that limit harvest more, and thereby reduce landings, also reduce exvessel revenue; alternatives that allow higher harvest levels result in comparatively higher exvessel revenue.

Recreational fishery impacts are evaluated based on the change in fishing opportunity as measured by the number of fishing trips that might occur under each alternative.

Tribal fishery impacts are qualitatively evaluated based on the degree of change in groundfish landings compared to historical landings. As with all socioeconomic impacts, alternatives with a lower harvest limit are more likely to negatively affect tribal allocations than those that allow a higher harvest limit.

Impacts on buyers and processors correlate closely with changes in landings and associated exvessel revenue. (Exvessel revenue is derived from purchases by this sector.) Alternatives can, thereby, be qualitatively evaluated in a similar fashion. Lower harvest limits would reduce the amount of fish that could be purchased relative to higher harvest limits.

Impacts of the alternatives on markets, such as retail outlets and restaurants, can be qualitatively evaluated in terms of the substitutability of other fish products for those that might become unavailable (or become too expensive) as a result of harvest limits. Some groundfish products might be easily substituted, while others—such as live fish sales—may not be.

Fishing community impacts represent the aggregate of the socioeconomic impacts described above. Alternatives can be evaluated by comparing the alternatives in terms of changes in personal income resulting from changes in groundfish landings. Given the range of these species and how vessels targeting them are distributed by port, there will be geographic differences in community impacts. This evaluation compares these differences, based on the different harvest levels expected under the management measure alternatives. Consistent with EO 12898, Environmental Justice, disproportionate adverse impacts to low income and minority populations are also evaluated.

2.0 ALTERNATIVES INCLUDING THE PROPOSED ACTION

The Council adopted preferred alternatives for 2005-2006 groundfish harvest levels and a range of management measure alternatives for analysis in this preliminary DEIS for managing the 2005-2006 West Coast groundfish fishery at its April 2004 meeting in Sacramento, California. In general, alternative management specifications address measures designed to reduce total mortality of overfished groundfish stocks and are analyzed for their potential effect on groundfish habitats, groundfish stocks and other marine resources, and the socioeconomic infrastructure of the West Coast fishery and fishing-dependent coastal communities. The proposed action will be decided by the Council at its June meeting in Foster City, California.

2.1 Alternative Harvest Levels

New harvest levels for 2005-2006 are being considered for some groundfish stocks and stock complexes (Tables 2.1-1a and 2.1-1b). Alternative groundfish harvest levels contemplated for a change from status quo (2004 specifications) are based on new stock assessments (i.e., cabezon and lingcod), based on projections from the most recent assessment (i.e., Dover sole and shortspine thornyheads), based on the potential application of precautionary harvest reductions for stocks and stock complexes that have not been formally assessed (i.e., Pacific cod and Other Flatfish), or based on the need to analyze a range of potential bycatch effects prior to the next formal assessment (i.e., Pacific whiting). The rationale for ranging alternative harvest levels are described in this section for those stocks with harvest levels different than status quo.

Alternative harvest levels are quantitatively analyzed in Chapter 4 where effects of this action on groundfish species are addressed. However, a more qualitative treatment of alternative harvest levels is provided in the other chapters where habitat and socioeconomic effects are analyzed. All the analytical chapters will quantitatively analyze effects of alternative management measures for their effectiveness in staying within the Council-preferred harvest levels (Council OY specifications).

2.1.1 Stocks With New Assessments

2.1.1.1 Cabezon (in Waters off California)

The first assessment of cabezon (*Scorpaenichthys marmoratus*) on the West Coast was done last year (Cope *et al.* 2004) and formally approved by the Council for use in 2005-2006 management decision-making in March 2004. While cabezon are distributed coastwide along the West Coast, this assessment concentrated on the southern portion of the stock in waters off California because it was determined that the available data for the northern portion of the stock was insufficient for population evaluation. The predicted spawning output of the southern cabezon stock was 34.7% of the stocks initial, unfished biomass ($B_{35\%}$). While this is above the minimum stock size threshold (MSST) of $B_{25\%}$, it is below the target level of spawning output that is predicted to support maximum sustainable yield (MSY) of $B_{40\%}$ (or B_{MSY}). Therefore, according to the groundfish harvest policies in California and in Federal regulations, a precautionary reduction of the ABC is appropriate to achieve B_{MSY}. Two precautionary harvest policies are considered in this EIS: the Council's 40-10 rule and the 60-20 rule as specified in California's Nearshore FMP (see section 4.X). Dr. Andre Punt, one of the contributing assessment authors, provided cabezon harvest projections for the southern portion of the stock under these two precautionary harvest policies, the ABC rule, and two harvest control rules ($F_{45\%}$ and $F_{50\%}$) (Table 2.1-2). The range of alternative harvest levels analyzed covers the broadest range of projected harvest levels given these varying harvest rates and policies.

The California Fish and Game Commission (CFGC) recommended using the proxy F_{MSY} harvest rate of $F_{45\%}$ (i.e., the harvest rate predicted to build the stock's biomass to B_{MSY}) to set the ABC and the 60-20 precautionary harvest policy to set the OY. Additionally, the CFGC recommended using the 2005-2007 average OY projected using these harvest policies and control rules to establish the 2005 and 2006 cabezon OY. The Council agreed to these recommendations and set a cabezon OY of 69 mt for 2005-2006 as their preferred harvest level (Council OY in Tables 2.1a and 2.1b).

2.1.1.2 Lingcod

A new lingcod (*Ophiodon elongatus*) assessment was done last year (Jagielo *et al.* 2004) and formally approved by the Council for use in 2005-2006 management decision-making in March 2004. This assessment updated the previous coastwide lingcod assessment (Jagielo, *et al.* 2000). As in the last assessment, separate age-structured assessment models were constructed for northern areas (Columbia and U.S.-Vancouver INPFC areas) and southern areas (Conception, Monterey, and Eureka INPFC areas). Results from these two models were combined to obtain coastwide estimates of spawning biomass, the depletion level, and other relevant assessment outputs.

This assessment indicates that the lingcod stock has achieved its rebuilding objective of $B_{40\%}$ in the north (actually 28% above $B_{40\%}$), but was at $B_{31\%}$ in the south. However, the adopted lingcod rebuilding plan specifies a coastwide rebuilding objective. The Council's SSC, working in concert with the lead assessment author recalculated the coastwide lingcod stock status in March 2004 using actual 2003 harvests (the assessment, which was completed during 2003, assumed harvest would be equal to the specified OY in 2003). Their calculations indicated that the spawning biomass at the start of 2004 was within 99.3% of B_{MSY} (or $B_{40\%}$) on a coastwide basis (Table 2.1-3). Therefore, the Council could not recommend to NMFS that the stock should be declared rebuilt.

The range of alternative lingcod harvest levels analyzed for 2005-2006 is based on the new assessment. The Low OY alternative applies the harvest control rule specified in the lingcod rebuilding plan ($F = 0.0531$ in the north and $F = 0.0610$ in the south) that was adopted as part of FMP Amendment 16-2 (PFMC 2003b) to the new north and south estimates of spawning biomass. The Medium OY alternative applies the new estimated harvest control rules to new biomass estimates and assumes a rebuilding probability (P_{MAX} or the probability of rebuilding in the maximum allowable time according to the National Standard Guidelines) of 70%. The High OY alternative assumes new biomass and harvest control rule estimates with a P_{MAX} of 60%. The preferred Council OY alternative is to use the Medium OY alternative ABC projected for 2005 and 2006, but the OY projected for 2006 (2,414 mt, which is projected to be lower than 2005; Tables 2.1-1a and 2.1-1b) for both years. Implicit in this action is a regulatory amendment of the harvest control rule adopted in the rebuilding plan which comports with the process and standards criteria for rebuilding plans adopted under FMP Amendment 16-1 (PFMC 2003a).

2.1.2 Stocks With New Harvest Levels Projected From Recent Assessments

2.1.2.1 Bocaccio (in Waters off California South of 40°10' N. Lat.)

The range of 2005-2006 harvest specifications for bocaccio is based on the most recent stock assessment (MacCall 2003b) and rebuilding analysis (MacCall 2003a). The range of harvest specifications attempts to analyze varying rebuilding probabilities and model uncertainties in the assessment and rebuilding analysis. Model uncertainties compelled the STAR Panel (Helser, *et al.* 2003) and the SSC to recommend consideration of the STATc base model and the competing STARb1 and STARb2 models. The Council also limited the range of rebuilding probabilities considered for detailed analysis of rebuilding plans under FMP Amendment 16-3 (PFMC 2004a) to comply with P_{MAX} values ranging from 60% to 90%. Therefore, the range of bocaccio harvest specifications analyzed in this EIS represents the full range of plausible assessment model outputs and the P_{MAX} range of 60% to 90%. The Low OY specifications comport to the STARb2 model with a rebuilding probability of 90%. The Medium OY specifications are derived using the STATc base model with a rebuilding probability of 70% and the High OY specifications are structured using the STARb1 model with a rebuilding probability of 60%.

The Council adopted a bocaccio rebuilding plan during their final action on FMP Amendment 16-3 in April 2004. The adopted rebuilding plan parameters were determined using the STATc base model since the assessment author recommended this model as the most plausible. The adopted rebuilding plan has a 70% rebuilding probability, a target rebuilding year of 2023, and a harvest control rule specifying a constant harvest rate (F) of 0.0498. The harvest specifications in accord with the bocaccio rebuilding plan are ABCs of 566 mt and 549 mt for 2005 and 2006, respectively and OYs of 307 mt and 309 mt for 2005 and 2006, respectively (Tables 2.1-1a and 2.1-1b).

2.1.2.2 Black Rockfish (in Waters off Oregon and California)

A new black rockfish assessment was done for the portion of the coastwide stock occurring off the coasts of Oregon and California (Ralston and Dick 2003). Previous assessments were done for the portion of the stock occurring off the coasts of Oregon north of Cape Falcon and Washington. Alternative harvest levels in the assessment for the portion of the black rockfish stock occurring off Oregon and California were ranged to capture the major uncertainty of historical landings prior to 1978. Black rockfish catches prior to 1945 were assumed to be zero in the assessment. Many gaps in historical landings of black rockfish since 1945 were evident, and these landings were reconstructed using a variety of data sources. The base model assumed cumulative landings of black rockfish from all fisheries was 17,100 mt from 1945 to 1977. The projected 2005-2006 harvest specifications for black rockfish in the waters off Oregon and California used this base case catch scenario. The OY equals the ABC since the stock is predicted to be above B_{MSY}. The projected 2005 and 2006 ABCs/OYs for black rockfish are 753 mt and 736 mt, respectively.

2.1.2.3 Canary Rockfish

Alternative canary rockfish harvest levels are based on projections from the 2002 rebuilding analysis (Methot and Piner 2002a) and the Council's adoption of a canary rockfish rebuilding plan as part of FMP Amendment 16-2, which specifies rebuilding targets consistent with a P_{MAX} of 60% (the target rebuilding year [T_{TARGET}] specified in FMP Amendment 16-2 is 2074 and the harvest control rule (F) is 0.0220). Although canary rockfish were not assessed in 2003 or 2004, alternative harvest levels are analyzed because OY values depend on recreational and commercial catch sharing. This is because the recreational fishery tends to take smaller canary rockfish than the commercial fishery, and therefore, has a greater “per ton” impact on canary rockfish rebuilding than the commercial fishery. That is, as the recreational share of the available canary rockfish harvest increases, the OY decreases. The Low OY canary rockfish harvest level is based on 50% recreational and 50% commercial catch shares. The Medium OY and High OY alternatives are based on 39% recreational and 61% commercial catch shares, which represent the status quo catch shares adopted as harvest guidelines in 2004. All OY alternatives have the same rebuilding impact on canary rockfish and do not require re-specification of the target rebuilding year or harvest control rule adopted under FMP Amendment 16-2.

2.1.2.4 Cowcod

Alternative cowcod harvest specifications are derived from the rebuilding analysis conducted in 2000 (Butler and Barnes 2000). The Council limited the range of cowcod rebuilding probabilities considered for detailed analysis under FMP Amendment 16-3 (PFMC 2004a) to comply with P_{MAX} values ranging from 55% to 60%. Higher rebuilding probabilities could not be derived using the assessment and rebuilding analysis due to the limited input data and the model limitations in the cowcod assessment (Butler, *et al.* 1999) and the rebuilding analysis. The Council adopted a cowcod rebuilding plan during their final action on FMP Amendment 16-3 in April 2004. The adopted rebuilding plan has a 60% rebuilding probability, a target rebuilding year of 2090, and a harvest control rule specifying a harvest rate (F) of 0.009. The harvest specifications in accord with the cowcod rebuilding plan are 2005 and 2006 ABCs of 5 mt and 19 mt for the Conception and Monterey INPFC areas, respectively, and OYs of 2.1 mt in each INPFC area for 2005 and 2006 (Tables 2.1-1a and 2.1-1b).

2.1.2.5 Darkblotched Rockfish

Darkblotched rockfish alternative harvest levels are based on projections from the most recent stock assessment and rebuilding analysis (Rogers 2003a). Harvest projections are influenced by recent strong recruitment (the 2000 and 2001 year classes), which has not been completely validated in the data used to assess the stock. The Scientific and Statistical Committee (SSC) STAR Lite Panel requested progressive inclusion of 1997-1999, 2000, and 2001 recruitment estimates (Ralston, *et al.* 2003). Risk of error progressively increased from including those recruitment estimates because they were based on increasingly limited data. Rebuilding results were sensitive to the high 2000 and 2001 recruitment estimates, and including them allowed much greater OYs because those recruits are projected to enter the fishery in the future and help rebuild the stock before T_{MAX}. The ABCs, on the other hand, were not as affected because the 2000 and 2001 recruits were too small to have fully recruited to the fishery in 2004-2006. This led to OY estimates which were higher than the ABC, even given a 90% probability of rebuilding by the maximum allowable year (T_{MAX}). Since the Magnuson-Stevens Act does not allow harvest greater than the ABC, these ABC values are the harvest limits for these 2005 and 2006 specifications. The ABC projections for 2005 and 2006 are 269 mt and 294 mt, respectively. These projected harvest specifications are compliant with the darkblotched rockfish rebuilding plan adopted under FMP Amendment 16-2 (PFMC 2003b). The target rebuilding year remains unchanged from the rebuilding plan specification. The harvest control rule, which was amended during the 2004 specifications process (PFMC 2004b)[1/] also remains unchanged with this action.

2.1.2.6 Dover Sole

The 2005 and 2006 Dover sole ABC and OY are projected from the 2001 assessment (Sampson and Wood 2001). The 40-10 adjustment was applied to the ABC to derive the OY, since the stock's spawning biomass is estimated to be below 40% of its initial, unfished level.

2.1.2.7 Sablefish

The GMT recommended updating the sablefish ABC and OY ranges analyzed in last year's EIS for 2004 management. Therefore, updated harvest level alternatives are presented as derived in the 2002 assessment update (Schirripa 2002). The Low OY harvest level of 6,500 mt is based on the adopted OY for north of Pt. Conception in 2003. The Medium OY harvest level assumes a density-dependence recruitment hypothesis, but is derived using the stock's default F_{MSY} harvest rate of $F_{45\%}$. The High OY harvest level is based on the default $F_{45\%}$ harvest rate, but assumes recruitment variability is driven more by environmental regime shifts (regime shift hypothesis) than parental stock density. The 40-10 adjustment is applied to all the alternative

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[1/] Regulatory amendment of adopted strategic rebuilding parameters, such as the harvest control rule, is compliant with the process and standards for groundfish rebuilding plans as adopted under FMP Amendment 16-1. The harvest control rule is expected to change with every new, formally-adopted assessment.

OYs since the stock's spawning biomass is predicted to be less than 40% of its initial, unfished level (in 2002, $B_{32\%}$ under a density-dependence hypothesis and $B_{39\%}$ under a regime shift hypothesis).

The Council chose the Medium OY sablefish harvest specification as its preferred alternative for 2005-2006. Therefore, a coastwide OY of 7,761 mt of sablefish (7,486 mt for north of the Conception INPFC area; and 275 mt for the Conception INPFC area) is proposed under the Council-Preferred OY alternative for 2005. The 2002 assessment update projects a slight decrease in sablefish exploitable biomass in 2006. Therefore, under the Council-Preferred OY, the 2006 OY is 7,634 mt (7,363 mt for north of the Conception INPFC area; and 271 mt for the Conception INPFC area).

2.1.2.8 Shortspine Thornyhead

The 2005 and 2006 shortspine thornyhead ABC and OY are projected from the 2001 assessment (Piner and Methot 2001). The 40-10 adjustment was applied to the ABC to derive the OY, since the stock's spawning biomass is estimated to be below $B_{40\%}$.

2.1.2.9 Widow Rockfish

The range of 2005-2006 harvest specifications for widow rockfish is based on the most recent stock assessment (He, *et al.* 2003b) and rebuilding analysis (He, *et al.* 2003a). The range of harvest specifications attempts to analyze varying rebuilding probabilities and model uncertainties in the assessment and rebuilding analysis. Model uncertainties compelled the SSC to recommend consideration of the base model 8 and the competing models 7 and 9 in the He et al. (2003a) rebuilding analysis. The Council also limited the range of rebuilding probabilities considered for detailed analysis of rebuilding plans under FMP Amendment 16-3 (PFMC 2004a) to comply with P_{MAX} values ranging from 60% to 90%. Therefore, the range of widow rockfish harvest specifications analyzed in this EIS represents the full range of plausible assessment model outputs and the P_{MAX} range of 60% to 90%. The Low OY specifications comport to the model 7 results with a rebuilding probability of 90%. The Medium OY specifications are derived using the base model 8 with a rebuilding probability of 60% and the High OY specifications are structured using model 9 with a rebuilding probability of 60%.

The Council adopted a widow rockfish rebuilding plan during their final action on FMP Amendment 16-3 in April 2004. The adopted rebuilding plan parameters were determined using the base model 8 since the assessment author recommended this model as the most plausible. The adopted rebuilding plan has a 60% rebuilding probability, a target rebuilding year of 2038, and a harvest control rule specifying a constant harvest rate (F) of 0.0093. The harvest specifications in accord with the widow rockfish rebuilding plan are ABCs of 3,218 mt and 3,059 mt for 2005 and 2006, respectively and OYs of 285 mt and 289 mt for 2005 and 2006, respectively (Tables 2.1-1a and 2.1-1b).

2.1.2.10 Yelloweye Rockfish

The 2005 and 2006 yelloweye rockfish ABCs and OYs were projected from the 2002 rebuilding analysis (Methot and Piner 2002b). The Council adopted a yelloweye rockfish rebuilding plan during their final action on FMP Amendment 16-3 in April 2004. The adopted rebuilding plan has an 80% rebuilding probability, a target rebuilding year of 2058, and a harvest control rule specifying a constant harvest rate (F) of 0.0153. The harvest specifications in accord with the yelloweye rockfish rebuilding plan are 2005 and 2006 ABCs of 54 mt and 55 mt, respectively, and OYs of 26 mt and 27 mt in 2005 and 2006, respectively (Tables 2.1-1a and 2.1-1b).

2.1.2.11 Yellowtail Rockfish

The 2005 and 2006 yellowtail rockfish ABC and OY are projected from the 2003 assessment (Lai, *et al.* 2003). Projected harvest specifications were derived using model YT2003N in the assessment, which updates the catch series used in the previous assessment (Tagart, *et al.* 2000) with a newly revised series from Pacific Coast Fisheries Information Network (PacFIN), revised Canadian catches in INPFC area 3C, and new estimates of 1967-1976 foreign catches (Rogers 2003b). The OY equals the ABC, since the stock is estimated to be above the abundance level that supports MSY (or 40% of initial, unfished biomass). The yellowtail rockfish stock was estimated to be at 46% of its initial, unfished biomass in 2002 (Lai *et al.* 2003).

2.1.3 Stocks and Stock Complexes That Have Not Been Formally Assessed, But Are Considered For Precautionary Harvest Reductions

2.1.3.1 Other Fish

The Other Fish stock complex contains all the unassessed groundfish FMP species that are neither rockfish (family *Scorpaenidae*) or flatfish. These species include big skate (*Raja binoculata*), California skate (*Raja inornata*), leopard shark (*Triakis semifasciata*), longnose skate (*Raja rhina*), soupfin shark (*Galeorhinus zyopterus*), spiny dogfish (*Squalus acanthias*), finescale codling (*Antimora microlepis*), Pacific rattail (*Coryphaenoides acrolepis*), ratfish (*Hydrolagus colliei*), cabezon (*Scorpaenichthys marmoratus*) (north of the California-Oregon border at 42° N. lat.), and kelp greenling (*Hexagrammos decagrammus*).

The status quo No Action ABC/OY specified in 2004 (and in many previous years) for the Other Fish complex was 14,700 mt based on historical catches for these species. The portion of this ABC/OY attributed to the available harvest of cabezon in waters off California was deducted once those 2005-2006 harvest specifications were decided by the Council in April 2004. This deduction for the recently-assessed cabezon stock off California resulted in an ABC of 14,597 mt in 2005 and 14,592 mt in 2006 for the Other Fish complex. The GMT recommended consideration of a 50% reduction of the ABC to set the OY harvest target for the Other Fish complex based on the guidance provided by Restrepo et al. (1998) for determining precautionary harvest levels for unassessed stocks. The Council heeded this advice and established an OY for the Other Fish complex of 7,299 mt for 2005 and 7,296 mt in 2006 (Tables 2.1-1a and 2.1-1b).

2.1.3.2 Other Flatfish

The Other Flatfish complex contains all the unassessed flatfish species in the groundfish FMP. These species include butter sole (*Isopsetta isolepis*), curlfin sole (*Pleuronichthys decurrens*), flathead sole (*Hippoglossoides elassodon*), Pacific sanddab (*Citharichthys sordidus*), rex sole (*Glyptocephalus zachirus*), rock sole (*Lepidopsetta bilineata*), sand sole (*Psettichthys melanostictus*), and starry flounder (*Platichthys stellatus*).

The status quo No Action ABC/OY specified in 2004 (and in many previous years) for the Other Flatfish complex was 7,700 mt based on historical landings for these species. The GMT recommended consideration of a 50% reduction of the ABC to set the OY harvest target for the Other Fish complex based on the guidance provided by Restrepo et al. (1998) for determining precautionary harvest levels for unassessed stocks. The GMT also recommended converting the landed catch harvest specifications for the Other Flatfish into a total catch specification that would include any discard mortality for species in the complex. The GMT had not analyzed historical catches of species in the Other Flatfish complex nor had the available observer data been thoroughly explored to recommend harvest specifications for this complex. The Council therefore decided a range of ABCs from 4,400 mt to 12,000 mt to encompass the possible range of outcomes from analysis with a 50% reduction of the ABC to determine an OY under the Low OY alternative and no reduction of the ABC to determine an OY under the High OY alternative (Tables 2.1-1a and 2.1-1b). The Council deferred a final decision on the 2005 and 2006 Other Flatfish ABC and OY until June when the GMT analysis would be provided. The subsequent GMT analysis and recommended harvest specifications for the Other Flatfish complex are found in section 4.3.1.15.

2.1.3.3 Pacific Cod

The status quo No Action ABC/OY specified in 2004 (and in many previous years) for Pacific cod *(Gadus macrocephalus*) was 3,200 mt based on historical landings for these species. The GMT recommended consideration of a 50% reduction of the ABC to set the OY harvest target for Pacific cod based on the guidance provided by Restrepo et al. (1998) for determining precautionary harvest levels for unassessed stocks. The Council heeded this advice and decided a Pacific cod OY of 1,600 mt for 2005 and 2006 (Tables 2.1-1a and 2.1-1b).

2.1.4 Stocks That Are Annually Assessed With Bycatch Effects That Need To Be Analyzed For The Next Management Cycle

2.1.4.1 Pacific Whiting

Pacific whiting are managed based on an annual assessment prepared jointly by U.S. and Canadian scientists. A new assessment is expected to be completed this winter and brought to the Council for approval in March 2005, prior to the April 1, 2005 start of the whiting fishery. This new analysis will form the basis for managing the 2005 whiting fishery. In lieu of a more informed range of possible 2005 (and 2006) whiting harvest levels, the Council decided to range whiting OYs for analytical purposes as follows: the Medium OY is projected from the recent assessment (Helser *et al.* 2004), the Low OY is half the Medium OY, and the High OY is double the Medium OY. It is expected this range is adequately broad to encompass the range of outcomes from the new assessment and rebuilding analysis anticipated early next year.

2.2 Alternative Management Measures

2.2.1 Catch Sharing Options

Harvest allocations for the most constraining groundfish stocks and those newly assessed stocks that have not been formally allocated (i.e., black rockfish) are based on criteria provided by the Council in April 2004. The species where alternative catch sharing options were offered for analysis and the rationale for these options are described as follows. Table 2.2-1 shows those harvest guidelines and harvest targets by fishery sector already decided by Council action or proposed by advisors to the Council.

2.2.1.1 Black Rockfish

The black rockfish ABC/OY for the portion of the stock in waters off California and Oregon is derived from the 2003 assessment (Ralston and Dick 2003). This EIS analyzes the same catch sharing option decided for 2004 California and Oregon nearshore fisheries. Recent historical catches of black rockfish in California and Oregon commercial and recreational fisheries are used as a basis for the black rockfish catch sharing option analyzed. The time period for this catch sharing option is 1985-2002, where the average shares are 42% California and 58% Oregon. In 2005, with a black rockfish OY of 753 mt, the state harvest guidelines for recreational and nearshore commercial fisheries combined would be 316 mt for California fisheries and 437 mt for Oregon fisheries. The black rockfish harvest guidelines for California and Oregon fisheries in 2006 are 309 mt and 427 mt, respectively since the OY decreases to 736 mt.

2.2.1.2 Canary Rockfish

Canary rockfish are distributed coastwide and are caught with a variety of fishing gears. Given the low available harvest of canary rockfish under the Council's adopted rebuilding plan and the wide variety of fisheries that incidentally catch canary rockfish, this stock is the most binding constraint to West Coast groundfish fisheries. Sharing the available canary rockfish harvest is perhaps the most difficult decision facing the Council and NMFS. With bocaccio constraints significantly eased in 2004-2006 relative to 2003, canary rockfish catch sharing will now be an even weightier decision, with California fisheries vying for available harvest to allow some increased shelf fishing opportunity.

Although canary rockfish were not assessed in 2003, alternative harvest levels are analyzed because OY values depend on recreational and commercial catch sharing. This is because the recreational fishery tends to take smaller canary rockfish than the commercial fishery, and therefore, has a greater "per ton" impact on canary rockfish rebuilding than the commercial fishery. That is, as the recreational share of the available canary rockfish harvest increases, the OY decreases. Alternative canary rockfish harvest levels are based on projections from the 2002 rebuilding analysis (Methot and Piner 2002a) and the Council's adoption of a canary rockfish rebuilding plan as part of FMP Amendment 16-2 (PFMC 2003b), which specifies rebuilding targets consistent with a P_{MAX} of 60% (the target rebuilding year [T_{TARGET}] specified in FMP Amendment 16-2 is 2074 and the harvest control rule (F) is 0.0220). The Council initially decided two commercial:recreational fishery canary rockfish sharing options for analysis: (1) a 50:50 share which would result in a 43 mt OY in 2005 (45 mt in 2006) under the Council's rebuilding plan, and (2) a 61:39 share which would result in a 48 mt OY in 2005 (51 mt in 2006) under the Council's rebuilding plan. All OY alternatives have the same rebuilding impact on canary rockfish and do not require re-specification of the target rebuilding year or harvest control rule adopted under FMP Amendment 16-2.

In April 2004, the GMT recommended that the Council set separate harvest guidelines for canary rockfish for the recreational fisheries, by state, which would be divided at the state borders (42° N. lat. between California and Oregon and 46°16' N. lat. between Oregon and Washington). The harvest guidelines would be:

Washington = 1.7 mt
Oregon = 6.8 mt
California = 9.3 mt

These values would remain constant across all canary rockfish OY alternatives. The understanding would be for the states to manage their respective recreational fisheries to stay within those specified harvest guidelines. The Council adopted these recreational harvest guidelines for all the 2005-2006 action alternatives. The Council also deferred adopted of a preferred canary OY until June when preferred management measures are adopted. The OY will be consistent with the adopted rebuilding plan, but is still dependent on the final commercial:recreational catch shares decided in June.

2.2.1.3 Lingcod

The GMT recommended that the Council set separate harvest guidelines for lingcod for the state recreational fisheries for 2005-06, by dividing the harvest guidelines into north (Oregon and Washington) and south (California) areas. These harvest guidelines would be divided at the California and Oregon border. The GMT notes that the stock assessment area was divided at Cape Blanco, Oregon (43° N. lat.) and the Oregon/California border is at 42° N. lat. The GMT recommended a formula based on the CPUE data from the Resource Assessment and Conservation Engineering (RACE) survey from 1995-2001 to account for the amount of lingcod that should be transferred from the southern area to the northern area to account for the line shift. Applying this calculation to the Council's preferred OY for lingcod, results in the following base harvest targets:

Council-Preferred OY (2005 and 2006) = 2,414 mt
North of 43° (1,694) + amount for 42° to 43° (107) = 1,801 mt (Oregon and Washington)
South of 42° (719) - amount for 42° to 43° (107) = 612 mt (California)

From these base values, the recreational harvest guidelines would be specified and subtracted from the respective areas and the understanding would be for the states to manage their respective recreational fisheries to stay within those specified harvest guidelines. The remaining amounts from the two areas would then be pooled. The catch projections to accommodate the limited entry trawl, fixed gear, and open access fisheries at 2004 levels, and tribal fisheries would then be removed from the combined pool and managed on a coastwide basis. The GMT notes that the trawl fishery would be constrained by canary rockfish bycatch impacts and the fixed gear and open access fisheries would be constrained by yelloweye rockfish bycatch impacts. Therefore, the amount of lingcod needed to accommodate those fisheries would be less than the amount that could be taken without those constraints. This will likely result in a substantial difference between the overall total projected catch and the Council-Preferred OY.

2.2.1.4 Sablefish

Trawl and nontrawl sablefish allocations are frameworked in the groundfish FMP and specified in federal regulations. Since all the specified allocations are based on the available harvest of sablefish north of 36° N. lat. (the Conception/Monterey INPFC area boundary), sablefish specifications require apportioning the coastwide sablefish OY to the Conception and north of Conception areas. The GMT proposed using the catch history of commercial sablefish landings north and south of 36° N. lat. during 1998-2002 to proportionally stratify the coastwide OY. The average share of total sablefish landings occurring in the Conception area during 1998-2002 is 3.5%.

Sablefish catch sharing would be based on the north of Conception OY alternatives. The allocations specified in the 2004 Federal regulations (50 CFR 660) are as follows: 10% of the north of Conception OY off the top as a tribal set-aside, the expected research catch and estimated take in nongroundfish fisheries off the top with the remaining north of Conception OY allocated to the commercial fishery. This commercial OY is then allocated 9.4% to open access fisheries north of Conception with the remainder allocated to limited entry. The trawl/nontrawl limited entry allocation is 58% trawl and 42% non-trawl with the expected take of sablefish in the at-sea whiting fishery taken off the top of the limited entry trawl allocation. Sablefish discard mortality rates of 8% of landed catch in limited entry fixed gear non-tribal fisheries and 3% of landed catch in fixed gear tribal fisheries has been assumed in the past. However, beginning in 2004, direct observations from the West Coast Groundfish Observer Program (WCGOP) are used to estimate discards in the non-tribal fixed gear fisheries. The assumed 3% discard rate used to analyze tribal fixed gear sablefish discards is updated in this analysis to a 2.3% discard rate calculated as the difference in market size category ratios in the competitive portion of the tribal fishery (approximately 1/3 of the tribal allocation) compared to the non-competitive (approximately 2/3 of the tribal allocation) tribal longline fisheries averaged over the past three years (see section 4.3.2.4). Although a 21% discard mortality rate has been assumed in the past for limited entry trawl fisheries, observed sablefish discard rates from the WCGOP will be used to analyze expected trawl impacts in this EIS.

2.2.1.5 Widow Rockfish

Directed non-tribal midwater fisheries targeting yellowtail and widow rockfish have not been considered since 2002 due to high canary rockfish bycatch. Canary and widow rockfish constraints in 2005-2006 will likely continue to exclude consideration of directed midwater fisheries. Therefore, without directed yellowtail/widow rockfish midwater fisheries, the sectors that have the highest bycatch of widow rockfish are the at-sea and shoreside whiting fisheries. The Council directed that the analysis of 2005-2006 management options presume that non-whiting fisheries be held harmless in managing widow rockfish bycatch and that all the widow rockfish impacts be managed in the tribal at-sea whiting, non-tribal at-sea whiting, and shoreside whiting sectors. The GMT recommended that the widow rockfish bycatch rate used for the at-sea whiting sectors be derived from the 1999-2003 average bycatch. Prior to this period, widow rockfish were not fully sorted in landings; they were often specified as mixed *Sebastes* in landings.

2.2.1.6 Yelloweye Rockfish

The Council directed that the range of 2005-2006 management options to be analyzed relative to state recreational yelloweye harvest guidelines include: 1) no harvest guidelines (consistent with the Allocation Committee report); and 2) dividing recreational catch shares north and south at the Oregon-California border at 42° N. lat. Additionally, the Council identified the possibility of state-specific harvest targets of yelloweye rockfish for the recreational catch shares north of the Oregon-California border.

The Council recommended that projected recreational yelloweye impacts in 2004 be used as the basis for determining regional harvest guidelines or state-specific harvest targets. The GMT updated the No Action bycatch scorecard after the April 2004 Council meeting once they settled on a recommended impact projection model for the California recreational fishery (see section 4.3.2.7). The projected yelloweye impacts in 2004 marine recreational fisheries on the West Coast are 3.7 mt in California, 3.2 mt in Oregon, and 3.5 mt in Washington (Table 2.2-2). Therefore, under the option where there are two yelloweye harvest guidelines north and south of the Oregon-California border in 2005 and 2006, there would be a 3.7 mt yelloweye harvest guideline in California and a 6.7 mt harvest guideline shared by Oregon and Washington. If the states manage to a state-specific yelloweye harvest target, Oregon and Washington would manage to targets of 3.2 mt and 3.5 mt, respectively. The Council's Ad Hoc Allocation Committee will discuss management responses to early attainment of yelloweye harvest limits at their May 27, 2004 meeting and a decision is anticipated at the June 2004 Council meeting. This issue is not explored further in this preliminary DEIS.

2.2.2 New Management Lines

In April the GMT recommended that a new depth management line be created for the area south of 42° N. lat. (Oregon-California border) at 40 fm. The GMT also recommended a new latitudinal management line be specified at Pigeon Point, California (37°11' N. lat.). The Council adopted both of these new management lines for analysis and public review.

2.2.3 Conversion of Exempted Fishing Permits Into Regulations

2.2.3.1 Selective Flatfish Trawl

From 2000 through 2003, the Oregon Department of Fish and Wildlife (ODFW), working cooperatively with Oregon State University and the National Marine Fisheries Service, developed and tested a modified flatfish trawl, comparing its performance to a typical West Coast sole trawl using an alternate haul sampling design (King, *et al*. 2004). This experiment showed reductions in bycatch for several overfished species of 34-97%, despite the selective flatfish trawl being a larger trawl and having increased catches of flatfish. In addition, an Exempted Fishing Permit (EFP) was utilized in 2003 to evaluate the effectiveness of this type of trawl on a fishery scale covering a broad geographic area. This test also provided explicit information for managers to estimate bycatch rates for fishermen using the selective flatfish trawl in the traditional shelf flatfish fishery.

Currently a large portion of the continental shelf, known as the Rockfish Conservation Area or RCA, is closed to groundfish trawling to limit the bycatch of several overfished species, notably canary rockfish, yelloweye rockfish, and widow rockfish (PFMC 2002). The depth range of the groundfish trawl RCA varies seasonally, but during the summer shelf flatfish fishery, it is approximately 75-200 fm (PFMC, 2002). Although this area contains a large amount of high relief rockfish habitat, it also contains a vast amount of highly productive flatfish habitat, and is the primary location of several exploited flatfish species during their migration onto the shelf during summer months (e.g., Petrale sole and Dover sole) (Hagerman 1952; Ketchen and Forrester 1966). Access to these flatfish stocks is therefore restricted due to the lack of selectivity of conventional bottom trawl gear. Because the selective flatfish trawl showed such significant reductions in bycatch of overfished rockfish species, its implementation as a management tool has the potential to provide access to some portion of the traditional shelf flatfish fishery and assist the Council in achieving the goals set forth in the federal fishery management plan for West Coast groundfish, such as to maximize the value of the groundfish resource while preventing overfishing (PFMC 2003e).

Given the large amount of comparative haul data presented in King et al. (2004), the performance of the selective flatfish trawl design was not in question. The EFP fishery documented the bycatch rates for species of concern with fishermen conducting normal flatfish fishing operations along different areas of the west coast both inside and outside of the RCA. Results were then compared to the research data, and the West Coast Groundfish Observer Program (WCGOP) estimates of bycatch rates as descriptors of a potential fishery The EFP therefore, was a feasibility test to determine if the idea tested in the research experiment could be scaled up to a fishery level and be useful for management.

As part of the EFP process we developed measurable net design criteria, because different vessels require nets of different sizes and other specifications. These allowed fishermen to modify or build nets for their vessels that still had the functional components of the selective flatfish trawl, yet were able to be objectively enforced by federal and state enforcement agencies both in port and at sea. The design criteria were that the net must have a headrope at least 30% longer than the footrope, that the expected rise of the net could not exceed 3 ft, that the headrope must not have any floats along the center 50% of its length, and that it must be a two-seam trawl. Otherwise, the trawl had to be a legal small-footrope trawl as defined in federal regulations.

Fishery Design

Because this trawl gear has different selectivities compared to traditional trawl gear for several important bycatch species, bycatch estimates for any fishery using this type of trawl should be specifically incorporated into the PFMC bycatch projection model. Given the research already conducted using this trawl (King et al. 2004), the number of tows involved in the EFP and their geographic range, the bycatch rates for the mixed-shelf flatfish strategy segregated by trip limit period presented here are the most appropriate rates to estimate future bycatch for fisheries using trawls with these defined characteristics. The methodology and resulting bycatch rates were presented to the Scientific and Statistical Committee of the PFMC and found to be the best available data to estimate fishery catch and bycatch. The difference in bycatch generated by using the lower rate can be viewed as a savings that could be applied to this fishery or other fisheries facing bycatch constraints, especially from canary rockfish and yelloweye rockfish.

Several alternatives for implementation of a fishery using this trawl were developed for analysis. For each alternative, several factors were evaluated. These included which types of trawl gear would be allowed in the fishery, what level of observer coverage should be required, where the fishery should occur, and if trip limits should be modified.

2.2.3.2 Arrowtooth Flounder Trawl

The Washington Department of Fish and Wildlife (WDFW) proposed consideration of implementing provisions of their sponsored arrowtooth trawl EFP in regulations for 2005-2006. The arrowtooth trawl EFP was conducted in the last few years to test gear configurations and fishing strategies for their effectiveness in selectively harvesting abundant arrowtooth flounder off Washington while minimizing the bycatch of co-occurring canary rockfish and other overfished groundfish species. Provisions of the EFP considered for regulatory implementation include some access to the existing trawl RCA with discrete canary hotspots closed to fishing, full retention of all rockfish, 100% observer coverage, and overfished species' bycatch caps for each participant in the fishery (see Appendix B, Proposed Arrowtooth Flounder- Rockfish Conservation Area (AT-RCA) Trawl Fishing Program: Scoping Document). The NMFS has subsequently informed WDFW and the Council that the action to convert this EFP into regulations is beyond the scope of the Council actions contemplated for June 2004 to decide 2005-2006 management measures (and analyzed herein), and would require additional analysis of the consequences of some of the proposed regulatory provisions. It is expected that additional analysis beyond what is provided in this EIS would be needed to convert this EFP into regulations during the 2005-2006 management period. In particular, the full rockfish retention, 100% observer coverage provisions need further analysis since such provisions are not part of the current groundfish FMP. Therefore, WDFW is proposing delaying a final decision on amending federal regulations to implement these provisions pending further analysis. This EIS will explore the effects of potentially implementing these provisions during the 2005-2006 management period on the rest of the groundfish fishery. The net effect of implementing these provisions may be consequential to the processing sector (i.e., disposition of unmarketable rockfish under a full retention program) and the management regime (mandatory 100% observer coverage may rob from the collective "pool" of trained observers), but is not likely to result in increased mortality of overfished species. This is because participants in the arrowtooth flounder strategy would not be landing groundfish under the existing trawl regulations. Their impacts on overfished species would not be different under the arrowtooth strategy since these impacts are controlled using bycatch caps.

2.2.3.3 Other Exempted Fishing Permits

Other ongoing EFPs have the potential of being implemented as regulations during the 2005-2006 management period depending on results of these efforts. It is anticipated that any decision to convert these EFPs into regulations during the 2005-2006 management period would be compliant with the National Environmental Policy Act and would therefore benefit from a formal NEPA analysis in an Environmental Assessment that would tier off this EIS. A brief description of these other ongoing EFPs follows.

California Selective Flatfish Trawl

The same selective flatfish trawl gear study conducted north of 40°10' N. lat. by ODFW will be conducted in 2004 and 2005 south of 40°10' N. lat. by CDFG. The need to conduct an EFP in the south is to determine whether the gear works as efficiently capturing abundant flatfish species on the shelf while avoiding rockfish as it does in the north. Given the different habitats and species' assemblages found south of Cape Mendocino, the SSC and GMT believed it prudent to test this gear in the south before recommending regulatory implementation of this trawl strategy in the south.

Oregon Deepwater Complex Fishery Reduced-Discard Strategy

The ODFW sponsored an EFP in 2004 to test a discard reduction strategy for the deepwater complex trawl fishery for Dover sole, shortspine thornyhead and sablefish (DTS). The strategy uses written vessel-processor, state-vessel and state-processor agreements to reduce economic incentives for discarding, mandate more complete or possibly full retention of DTS species, and create modest incentives for retention of DTS.

The incentives created promote reduced discard, fewer tows, higher economic efficiency, and may be scalable to the West Coast fishery as a whole. The GMT supports the approval of this EFP because the primary objective is bycatch reduction and it will not impact canary rockfish. Pending review of the results of the data collected, the GMT has recommended that consideration be given to the potential for converting this EFP into regulation inseason for 2006.

2.2.4 Description of the Alternatives

The alternatives analyzed in this EIS include a No Action alternative that describes the status quo regulations implemented in 2004 (as of May 2004 based on inseason actions decided by the Council at their April 2004 meeting) and a suite of alternative management measures analyzed for their effectiveness at attaining, but not exceeding the Council preferred harvest specifications (Council OY in Tables 2.1-1a and 2.1-1b). Action Alternative 1 describes the most conservative suite of management measures considered for 2005-2006, while action alternatives 2 and 3 describe more risk-prone management measures. One featured action the Council wanted to consider for 2005 and 2006 is establishing a more regionalized management approach with harvest guidelines for some of the more constraining groundfish species. Council-adopted harvest guidelines and harvest guidelines recommended by state managers or the GMT for black rockfish, canary rockfish, lingcod, and yelloweye rockfish are found in Table 2.2-1.

A Council-Preferred Action Alternative will be decided at the Council's June 14-18 meeting in Foster City, California and subsequently analyzed for the draft EIS that will be submitted later this year to NMFS and the Secretary of Commerce. All alternatives analyzed utilize the best available science for determining stock status, monitoring total catch, and understanding stock impacts. The estimated mortality of overfished groundfish species under each alternative can be found in the alternative bycatch scorecards. Only 2005 scorecards are provided for each action alternative since the minor variation in some 2005 and 2006 OYs (Tables 2.1-1a and -1b) cannot be discerned in the aggregated mortality estimates for those sectors where there are annual differences. For instance, for the limited entry fixed gear sector, we only have observer data for those participants in the primary sablefish fishery. Since the sablefish OY changes from 2005 to 2006, there are different projected impacts in the primary fishery each year. However, the impacts for the rest of the limited entry fixed gear fleet are based on assumed discard rates and these cannot be disaggregated from those estimated for the primary sablefish fishery. Therefore, the higher of status quo projected impacts under the No Action Alternative or those impacts estimated using the new limited entry fixed gear primary sablefish model are input in the alternative bycatch scorecards. Differences in estimated impacts for the limited entry fixed gear sector are treated qualitatively in this EIS. Table 2.2-2 is the No Action bycatch scorecard; Table 2.2-3 is the 2005 scorecard for Action Alternative 1; Table 2.2-4 is the 2005 scorecard for Action Alternative 2; and Table 2.2-5 is the 2005 scorecard for Action Alternative 3. A description of the alternatives by fishing sector follows.

2.2.4.1 Limited Entry Trawl

The No Action Alternative

Non-Whiting Trawl Fishery

The 2004 trawl trip limits and seasonal RCA configurations (as of May 2004) describe the No Action alternative and are shown in Tables 2.2-6 (north of 40°10' N. lat.) and 2.2-7 (south of 40°10' N. lat.). These same specifications and estimated impacts of the 2004 management measures are shown in Table 2.2-8. These measures do not include a selective flatfish trawl strategy north of Cape Mendocino. Selective flatfish trawls are considered legal small footrope gear; however, bycatch rates applied to landings of target species using this gear are no different than those calculated using conventional trawls (i.e., the decreased bycatch rates for overfished species from the ODFW research and EFP studies are not applied in the trawl impact analysis). The No Action Alternative does include differential small and large footrope trawl limits by period north of Cape Mendocino. This regulation works by imposing more conservative trip limits during any period when landings are made using small footrope gear. The effect of the differential trip limit strategy is to provide an incentive for trawl fishermen to fish seaward of the trawl RCA (shelf rockfish caught in the limited entry trawl fishery can only be landed using small footrope gear) and thereby minimize impacts on overfished shelf rockfish species, such as canary rockfish.

Under this option, the shelf flatfish fishery would continue under current regulations. Either a traditional small footrope trawl or a selective flatfish trawl could be used as both are legal fishing gears. Observer coverage would be as normally scheduled by the West Coast Groundfish Observer Program, fishing would be restricted to outside of the trawl RCA, and trip limits would be calculated for small footrope trawl as they have in the past.

This option results in lower fishery yield because desired flatfish populations occur in areas where trawl bycatch of overfished species would prevent access. The status quo alternative probably cannot meet the management objective of reducing bycatch to the extent possible, since this option would allow continued use of a higher bycatch gear in areas in which canary rockfish bycatch is constraining fisheries, even though a proven lower bycatch gear is available. Continuing to allow both the selective flatfish trawl and conventional small footrope trawls will not reduce bycatch rates as much as complete replacement with a more selective gear, and in that sense failed to optimize harvest and minimize bycatch for some species. Maintaining restricted access to the RCA will protect habitat there, though at the cost of decreased fishery yield from healthy flatfish stocks.

Whiting Trawl Fishery

The Pacific whiting OY of 250,000 mt used to manage the 2004 West Coast whiting fishery forms the basis for the No Action Alternative. The GMT recommended exploring overfished species' bycatch implications using a weighted 2000-2003 average bycatch. These rates are applied to the 2004 OY under this alternative. Management measures adopted for 2004 and analyzed under the No Action Alternative for the whiting-directed trawl fishery do not include a "penalty box" strategy for minimizing widow rockfish impacts (see section 4.X-X for a description of the "penalty box" strategy). Managing widow rockfish bycatch in the whiting fishery under the No Action Alternative also does not include the concept of closing areas where widow rockfish bycatch has been historically highest.

Action Alternative 1

Non-Whiting Trawl Fishery

Action Alternative 1 for the limited entry trawl sector apportions the least amount of canary rockfish, the most constraining stock for most of the trawl fishery, for 2005-2006. Trip limits and RCA configurations are modeled to impact about 8 mt of canary rockfish coastwide (Table 2.2-9).

A more conservative approach to implementing the selective flatfish trawl EFP in regulations is taken under Action Alternative 1. This alternative allows only selective flatfish trawl gear to be used shoreward of 100 fm and north of 40°10' N. lat. An EFP would be used south of 40°10' N. lat. to test selective flatfish trawl gear. Bycatch caps would be imposed on the fishery to ensure catch of overfished species does not exceed an allocated amount. Bycatch levels would be monitored via 100% observer coverage for all fishing shoreward of 100 fm. These aspects create the most conservative approach to utilizing selective flatfish trawl gear in the summer shelf flatfish fishery. Under these regulatory conditions, higher flatfish harvest per vessel is anticipated, depending on the total participation in the fishery.

The benefits of this approach are that the amount of catch and discard will be known through the observer program and inseason management can be utilized to constrain bycatch to within authorized amounts. In addition, access to fishing grounds out to 100 fm will allow harvest of species that are not accessible during spring and fall months due to their onshore summer migration pattern. Although all fishing shoreward of 100 fm would require fishers to build a new trawl or modify an existing trawl to meet selective flatfish trawl specifications, it would have the effect of implementing trawl gears with lower bycatch rates for several species of concern. Risks of this option are low participation in the fishery because of observer requirements and bycatch caps. These aspects may provide incentives for fishers to switch to deep water complex target species instead. The costs of providing observers, whether federally subsidized or paid for by the vessel will also tend to deter participation in the fishery. In addition, using bycatch caps through a normal federal fishery regulation process has not been tested on the west coast. A mechanism for using the data collected by the observer program to monitor catch inseason would need to be developed.

Whiting Trawl Fishery

Pacific whiting OYs of 181,287 mt for 2005 and 114,297 mt for 2006 are analyzed for their potential bycatch implications under Action Alternative 1. These harvest levels are half the projected OYs for 2005 and 2006 from the most recent Pacific whiting stock assessment (Helser *et al.* 2004) under the default $F_{40\%}$ harvest rate and the assumption that the catchability coefficient (q) equals 1. The GMT recommended exploring overfished species' bycatch implications using a weighted 2000-2003 average bycatch. These rates are applied to the 2005 and 2006 OYs under this alternative. Managing widow rockfish bycatch in the whiting fishery under Action Alternative 1 does not entail consideration of additional precautionary measures such as area closures given the analytical assumptions described above. This is because the estimated mortality of widow rockfish and the other overfished species in all fishery sectors combined does not exceed 2005 and 2006 OYs given this level of allowable Pacific whiting harvest (Tables 2.2-3a and 2.2-3b).

Action Alternative 2

Non-Whiting Trawl Fishery

Action Alternative 2 for the limited entry trawl sector apportions an intermediate amount of canary rockfish, the most constraining stock for most of the trawl fishery, for 2005-2006. Trip limits and RCA configurations are modeled to impact about 10 mt of canary rockfish coastwide (Table 2.2-10).

This option changes the regulations to require all trawl fishing north of latitude 40°10'N and shoreward of 100 fathoms to use a selective flatfish trawl to reduce bycatch of shelf rockfish, particularly canary rockfish. No special observer coverage is required; observer coverage will be at normal sampling rates as determined by the West Coast Groundfish Observer Program. Testing of the selective flatfish trawl south of latitude 40° 10' will be conducted via Exempted Fishing Permit only. All shelf trawling will be conducted shoreward of the inside boundary of the Rockfish Conservation Area (RCA). This option anticipates increased flatfish trip limits and movement of the shoreward boundary of the RCA seaward to the 100 fathom line, as bycatch impacts allow, to provide enhanced trawl access to healthy flatfish stocks.

This option provides for increased yield from healthy flatfish stocks, as a result of requiring newly developed bycatch reduction technology. It also allows for wider spatial distribution of nearshore trawling effort due to larger grounds being available. This option has lower costs for fishing vessels than Alternative 1, as 100% mandatory observer coverage is not required. The lower costs should better stimulate participation in the fishery, speeding the implementation and acceptance of lower bycatch trawls. Successful implementation of this option is more certain because it relies mostly on changes to existing rules governing legal trawl gear rather than enforcement of bycatch caps, as in Alternative 1. This alternative does increase costs for fishermen relative to the status quo, as any vessel wishing to trawl shoreward of the RCA will need to buy a new trawl or modify an existing 2-seam trawl to meet the definition of a selective flatfish trawl. These costs should be offset by increased trip limits and access to more productive fishing grounds, resulting in a net gain in income. Because 100% observer coverage is not required, this alternative is less conservative than Alternative 1 relative to meeting shelf rockfish conservation goals; however the risk level should be comparable to other fisheries monitored by the West Coast Groundfish Observer Program. However, this option is more conservative than status quo because gear with lower bycatch impacts will be required and will reduce the likelihood of high catches of canary rockfish encountered with traditional gear.

Whiting Trawl Fishery

Pacific whiting OYs of 362,573 mt for 2005 and 228,593 mt for 2006 are analyzed for their potential bycatch implications under Action Alternative 2. These are the projected OYs for 2005 and 2006 from the most recent Pacific whiting stock assessment (Helser *et al.* 2004) under the default $F_{40\%}$ harvest rate and the assumption that the catchability coefficient (q) equals 1. The GMT recommended exploring overfished species' bycatch implications using a weighted 2000-2003 average bycatch. These rates are applied to the 2005 and 2006 OYs under this alternative. Managing widow rockfish bycatch in the whiting fishery under Action Alternative 2 entails consideration of additional precautionary measures such as area closures given the analytical assumptions described above. This is because the estimated mortality of widow rockfish in all fishery sectors combined exceeds 2005 and 2006 OYs given this level of allowable Pacific whiting harvest (Tables 2.2-4a and 2.2-4b). The relative effects of establishing a widow RCA for the whiting fishery vs. discrete area closures (i.e., widow hotspots) vs. establishing a penalty box for controlling widow rockfish bycatch are explored under this alternative (see section 4.3.2.1).

Action Alternative 3

Non-Whiting Trawl Fishery

Action Alternative 3 for the limited entry trawl sector apportions the greatest amount of canary rockfish, the most constraining stock for most of the trawl fishery, for 2005-2006. Trip limits and RCA configurations are modeled to impact about 12 mt of canary rockfish coastwide (Table 2.2-11).

This option changes the regulations to require all trawl fishing north of latitude 40°10'N and shoreward of 100 fm to use a selective flatfish trawl to reduce bycatch of shelf rockfish, particularly canary rockfish. No special observer coverage is required; observer coverage will be at normal sampling rates as determined by the West Coast Groundfish Observer Program. Testing of the selective flatfish trawl south of 40°10' N. lat. will be conducted via Exempted Fishing Permit only. All shelf trawling will be conducted shoreward of the inside boundary of the Rockfish Conservation Area (RCA). This option anticipates increased flatfish trip limits and movement of the shoreward boundary of the RCA seaward to the 100 fathom line, as bycatch impacts allow, to provide enhanced trawl access to healthy flatfish stocks (Table 2.2-11).

This option provides for increased yield from healthy flatfish stocks, as a result of requiring newly developed bycatch reduction technology. It also allows for wider spatial distribution of nearshore trawling effort due to larger grounds being available. This option has lower costs for fishing vessels than Alternative 1, as 100% mandatory observer coverage is not required. The lower costs should better stimulate participation in the fishery, speeding the implementation and acceptance of lower bycatch trawls. Successful implementation of this option is more certain because it relies mostly on changes to existing rules governing legal trawl gear rather than enforcement of bycatch caps, as in Alternative 1. This alternative does increase costs for fishermen relative to the status quo, as any vessel wishing to trawl shoreward of the RCA will need to buy a new trawl or modify an existing 2-seam trawl to meet the definition of a selective flatfish trawl. These costs should be offset by increased trip limits and access to more productive fishing grounds, resulting in a net gain in income. Because 100% observer coverage is not required, this alternative is less conservative than

Alternative 1, relative to meeting shelf rockfish conservation goals; however the risk level should be comparable to other fisheries monitored by the West Coast Observer Program. However, this option is more conservative than status quo because gear with lower bycatch impacts will be required and will reduce the likelihood of high catches of canary rockfish encountered with traditional gear.

Whiting Trawl Fishery

Pacific whiting OYs of 725,146 mt for 2005 and 457,186 mt for 2006 are analyzed for their potential bycatch implications under Action Alternative 1. These harvest levels are double the projected OYs for 2005 and 2006 from the most recent Pacific whiting stock assessment (Helser *et al.* 2004) under the default $F_{40\%}$ harvest rate and the assumption that the catchability coefficient (q) equals 1. The GMT recommended exploring overfished species' bycatch implications using a weighted 2000-2003 average bycatch. These rates are applied to the 2005 and 2006 OYs under this alternative. Managing widow rockfish bycatch in the whiting fishery under Action Alternative 3 entails consideration of additional precautionary measures such as area closures given the analytical assumptions described above. This is because the estimated mortality of widow rockfish and the other overfished species in all fishery sectors combined exceeds 2005 and 2006 OYs given this level of allowable Pacific whiting harvest (Tables 2.2.5a and 2.2-5b).

2.2.4.2 Limited Entry Fixed Gear

The No Action Alternative

Limited entry fixed gear trip limits and the non-trawl RCA configuration as of May 2004 describe the No Action alternative and are shown in Tables 2.2-12 (north of 40°10' N. lat.) and 2.2-13 (south of 40°10' N. lat.). These trip limits and estimated impacts of 2004 management measures are depicted in Table 2.2-14. It is noted that Table 2.2-14 shows the tier limits and associated bycatch under the specified 2004 sablefish OY, but with correctly-specified tier limits calculated from the OY (see discussion below). Under the No Action alternative, the nontrawl RCA is defined by management lines specified with waypoints at roughly 30 fm to 100 fm in waters off northern California (north of 40°10' N. lat.) and Oregon; and zero fm to 100 fm in waters off Washington.

The nontrawl RCA south of 40°10' N. lat. and north of Pt. Conception at 34°27' N. lat. in 2004 (and under the No Action Alternative) is defined by management lines specified with waypoints at roughly 30 fm to 150 fm during periods 1, 2, 5, and 6 and 20 fm to 150 fm during periods 3 and 4. There is an additional closure between zero fm and 10 fm around the Farallon Islands to reduce impacts on shallow nearshore rockfish in that area. The nontrawl RCA south of Pt. Conception is defined by management lines specified with waypoints at roughly 60 fm to 150 fm. This more liberal RCA can be accommodated by the minimal occurrence of canary rockfish in the Southern California Bight.

Those limited entry permit holders who also have either a shallow nearshore fishery or deeper nearshore fishery permit administered by CDFG can land minor nearshore rockfish from either the shallow nearshore or deeper nearshore complexes. Trip limits for shallow nearshore rockfish, deeper nearshore rockfish, and California scorpionfish vary by period (Tables 2.2-12 and 2.2.-13). However, period 2 is closed for these species north of Pt. Conception, and period 1 is closed south of Pt. Conception. There is also a small and variable trip limit for bocaccio during the open nearshore periods to allow some incidental bycatch to be landed rather than discarded dead at sea.

One issue that surfaced at the May 2004 GMT meeting is the mis-specification of sablefish tier limits for limited entry fixed gear permit holders with sablefish endorsements who participate in the primary sablefish fishery. The GMT incorrectly recommended sablefish tier limits calculated using the 2004 ABC for the area north of 36° N. lat. (8,185 mt) instead of the OY for that area (7,510 mt). While the Council will consider remedial inseason action at their June 2004 meeting to keep from exceeding the limited entry fixed gear sablefish allocation, the "correct" tier limits are used in analytical comparisons of action alternatives to the No Action alternative in this EIS. The difference in tier limits incorrectly specified in April 2004 and the correct tier limits calculated using the OY is as follows:

Comparison of 2004 sablefish tier limits incorrectly specified using the ABC and the appropriate tier limits specified using the OY.

2004 sablefish harvest specifications for the West Coast north of 36° N. lat.		Tiers	Incorrect tier limits (lbs) calculated using the ABC	Correct tier limits (lbs) calculated using the OY
ABC (mt)	OY (mt)			
8,185	7,510	1	69,600	64,300
		2	31,600	29,200
		3	18,100	16,700

Action Alternative 1

The extent of the non-trawl RCA under Action Alternative 1 is the largest of all the alternatives analyzed in this EIS with the seaward boundary of the RCA extending out to 150 fm coastwide. While there is an estimated reduction of total estimated mortality of overfished shelf species such as canary and yelloweye rockfish, this comes at the expense of access to harvest important fixed gear target species, such as slope rockfish species in the south, and spiny dogfish and Pacific halibut in the north. Limited entry fixed gear tier limits under Action Alternative 1 are found in Table 2.2-15. Table 2.2-16 depicts tier limits calculated using the Council-Preferred OY for sablefish in 2005, but with the same status quo seaward RCA boundaries as under the No Action Alternative.

Action Alternative 2

The non-trawl RCA under Action Alternative 2 specifies the seaward boundary of the RCA extending out to 125 fm coastwide. While there is an estimated reduction of total estimated mortality of overfished shelf species such as canary and yelloweye rockfish in the north relative to the No Action alternative, this comes at the expense of access to harvest important fixed gear target species, such as spiny dogfish and Pacific halibut. The non-trawl RCA in the south is less extensive than that under the No Action alternative, which specifies a seaward boundary at 150 fm. The impacts to overfished species caught south of Cape Mendocino, such as bocaccio, canary rockfish, cowcod, and yelloweye rockfish, are therefore greater than under the No Action alternative. Limited entry fixed gear tier limits under Action Alternative 2 are found in Table 2.2-15.

Action Alternative 3

The non-trawl RCA under Action Alternative 3 specifies the seaward boundary of the RCA extending out to 100 fm coastwide. The extent of the non-trawl RCA north of Cape Mendocino is therefore the same as under the No Action alternative, with similar consequent effects on target and overfished species. However, the non-trawl RCA in the south is less extensive than that under the No Action alternative which specifies a seaward boundary at 150 fm. The impacts to overfished species caught south of Cape Mendocino, such as bocaccio, canary rockfish, cowcod, and yelloweye rockfish, are therefore greater than under the No Action or any of the other action alternatives. While these impacts are not directly quantified due to the geographic limitation of available observation data from the WCGOP, they are thought to be significant due to the depth distribution of many of these species of concern. Limited entry fixed gear tier limits under Action Alternative 3 are found in Table 2.2-15.

2.2.4.3 Open Access

The No Action Alternative

Open access trip limits and estimated impacts of 2004 management measures (as of May 2004) describe the No Action alternative and are shown in Tables 2.2-17 (north of 40°10' N. lat.) and 2.2-18 (south of 40°10' N. lat.). The same nontrawl RCA described for limited entry fixed gears under the No Action alternative (Section 2.2.4.2) would also apply for those open access fisheries not exempt from the RCA restrictions.

Action Alternative 1

The extent of the non-trawl RCA under Action Alternative 1 is the largest of all the alternatives analyzed in this EIS with the seaward boundary of the RCA extending out to 150 fm coastwide. While there is an estimated reduction of total estimated mortality of overfished shelf species such as canary and yelloweye rockfish, this comes at the expense of access to harvest important open access target species, such as slope rockfish species in the south, and spiny dogfish and Pacific halibut in the north.

The effects of open access action alternatives are discussed qualitatively since no direct observations of open access discards are available from the WCGOP. Such data will be available for the first time in April 2005 and will be used for 2005 inseason management decision-making. An updated observation data set will be available in November 2005, with annual updates provided every November thereafter. These data will provide more accurate information to manage the West Coast open access fleets.

Action Alternative 2

The non-trawl RCA under Action Alternative 2 specifies the seaward boundary of the RCA extending out to 125 fm coastwide. While there is an estimated reduction of total estimated mortality of overfished shelf species such as canary and yelloweye rockfish in the north relative to the No Action alternative, this comes at the expense of access to harvest important open access target species, such as spiny dogfish and Pacific halibut. The non-trawl RCA in the south is less extensive than that under the No Action alternative, which specifies a seaward boundary at 150 fm. The impacts to overfished species caught south of Cape Mendocino, such as bocaccio, canary rockfish, cowcod, and yelloweye rockfish, are therefore greater than under the No Action alternative.

The effects of open access action alternatives are discussed qualitatively since no direct observations of open access discards are available from the WCGOP. Such data will be available for the first time in April 2005 and will be used for 2005 inseason management decision-making. An updated observation data set will be available in November 2005, with annual updates provided every November thereafter. These data will provide more accurate information to manage the West Coast open access fleets.

Action Alternative 3

The non-trawl RCA under Action Alternative 3 specifies the seaward boundary of the RCA extending out to 100 fm coastwide. The extent of the non-trawl RCA north of Cape Mendocino is therefore the same as under the No Action alternative, with similar consequent effects on target and overfished species. However, the non-trawl RCA in the south is less extensive than that under the No Action alternative which specifies a seaward boundary at 150 fm. The impacts to overfished species caught south of Cape Mendocino, such as bocaccio, canary rockfish, cowcod, and yelloweye rockfish, are therefore greater than under the No Action or any of the other action alternatives. While these impacts are not directly quantified due to the geographic limitation of available observation data from the WCGOP, they are thought to be significant due to the depth distribution of many of these species of concern.

The effects of open access action alternatives are discussed qualitatively since no direct observations of open access discards are available from the WCGOP. Such data will be available for the first time in April 2005 and will be used for 2005 inseason management decision-making. An updated observation data set will be available in November 2005, with annual updates provided every November thereafter. These data will provide more accurate information to manage the West Coast open access fleets.

2.2.4.4 Tribal Fisheries

The No Action Alternative

The Washington coastal tribes (Makah, Quileute, Hoh, and Quinault) prosecuted their groundfish fisheries in 2004 with the following allocations and trip limits. The sablefish allocation was 10% of the total catch OY (for the portion of the stock north of 36° N. lat.) of 6,500 mt. This provided an allocation of 631 mt of sablefish after deducting an assumed 3% discard mortality. The tribal commercial harvest of black rockfish was managed with a harvest guideline of 20,000 pounds north of Cape Alava, Washington at 48°09'30" N. lat., and 10,000 pounds between Destruction Island, Washington at 47°40' N. lat. and Leadbetter Point, Washington at 46°38'10" N. lat. Thornyheads were subject to a 300-pound trip limit as were canary rockfish. Yelloweye rockfish were subject to a 100-pound trip limit. Yellowtail rockfish taken in tribal midwater trawl fisheries were subject to a 30,000-pound, two-month cumulative landing limit and widow rockfish landings were limited to 10% of the weight of yellowtail rockfish landed in any two-month period. These midwater landing limits were subject to inseason adjustments to minimize the take of canary and widow rockfish. Other rockfish, including species in the minor nearshore, minor shelf, and minor slope rockfish complexes were subject to either a 300-pound trip limit per species or complex, or to the non-tribal limited entry trip limit for those species if those limits were less restrictive. Rockfish taken during the open competitive tribal commercial fisheries for Pacific halibut were not subject to trip limits. A full rockfish retention program, as well as a tribal observer program, were instituted to provide catch accountability. Lingcod were subject to a 300-pound trip limit and a 900-pound weekly landing limit. Trip limits for Pacific cod, petrale sole, English sole, rex sole, arrowtooth flounder, and other flatfish in the tribal bottom trawl fishery were the same as for non-tribal limited entry fixed gear fishery at the start of the season (Table 2.2.-6) using the same Council-approved gear. The tribal plan was not to reduce these limits inseason because of the low expected catch unless catch statistics indicated that the tribes would attain more than half the harvest of these species in their usual and accustomed (U and A) fishing areas. The tribal allocation of Pacific whiting in 2004 was 32,500 mt based on the sliding scale allocation formula that specifies the tribal whiting OY based on the total U.S. whiting OY. The Makah tribe was the only one of the four tribes prosecuting a whiting-directed fishery in 2004.

Action Alternative 1

Tribal proposals for their groundfish fishery are the same as status quo (No Action) with the following exceptions:

- the tribes propose an increased lingcod harvest guideline of between 50-100 mt. This is increased from the 25 mt harvest guideline the tribes proposed for their 2004 fisheries; however, under this alternative the analysis includes a tribal lingcod harvest guideline of 25 mt.
- the Makah Tribe proposes an increased yellowtail rockfish cumulative landing limit of 180,000 lbs/2 months for their midwater trawl fleet. This is increased from their 2004 fleet-wide cumulative landing limit of 150,000 lbs/2 months in 2004. As in 2004, landings of widow rockfish are not to exceed 10% of the poundage of yellowtail rockfish landed in their midwater trawl fishery;

- the Makah Tribe proposes a petrale sole trip limit of 50,000 lbs/2 months for their fishermen for the entire year. Otherwise, trip and cumulative landing limits for Pacific cod, English sole, rex sole, arrowtooth flounder, and Other Flatfish will be the same as specified at the start of the year for the non-tribal limited entry trawl fishery (same as No Action);
- the Makah Tribe proposes a new pollock test fishery as part of their directed midwater trawl fishery in 2004. If successful targeting of pollock is demonstrated in this fishery, the Makah Tribe proposes a directed pollock fishery in 2005 that is coincident with the tribal whiting fishery.

Action Alternative 2

Tribal management measures are the same as those described in Action Alternative 1, except under this alternative the analysis includes a tribal lingcod harvest guideline of 50 mt.

Action Alternative 3

Tribal management measures are the same as those described in Action Alternative 1, except under this alternative the analysis includes a tribal lingcod harvest guideline of 100 mt.

2.2.4.5 Washington Recreational

The No Action Alternative

In 2004, the Washington recreational fishery was open year round for groundfish except lingcod, which was open from to the Saturday closest to March 16 (March 13) through the Sunday closest to October 15 (October 17). There was a recreational groundfish bag limit of 15 fish per day including rockfish and lingcod. Of the 15 recreational groundfish allowed to be landed per day, only 10 could be rockfish, with no retention of canary or yelloweye rockfish, and a sublimit of two lingcod with a 24-inch minimum size during the open lingcod season. A “C-shaped” Yelloweye Rockfish Conservation Area (YRCA) was established where recreational groundfish and recreational halibut fishing was prohibited. The YRCA was defined by the following coordinates:

48°18' N. lat./125°18' W. long.,
48°18' N. lat./124°59' W. long.,
48°11' N. lat./125°11' W. long.,
48°11' N. lat./124°59' W. long.,
48°04' N. lat./125°11' W. long.,
48°04' N. lat./124°59' W. long.,
48°00' N. lat./125°18' W. long., and
48°00' N. lat./124°59' W. long.

The Washington Department of Fish and Wildlife (WDFW) used their Ocean Sampling Program to monitor groundfish catches inseason. If canary or yelloweye rockfish harvest guidelines were projected to be attained inseason, WDFW would close the recreational groundfish fishery to inside the 30 fm contour to reduce impacts on these species; an inseason depth restriction would apply only in specific high bycatch areas..

Action Alternative 1

The WDFW is not proposing any changes to their recreational groundfish fishery from status quo (No Action).

Action Alternative 2

The WDFW is not proposing any changes to their recreational groundfish fishery from status quo (No Action).

Action Alternative 3

The WDFW is not proposing any changes to their recreational groundfish fishery from status quo (No Action).

2.2.4.6 Oregon Recreational

The No Action Alternative

In 2004, the Oregon recreational groundfish fishery is open year round with no depth restrictions except during June through September when the fishery is open only inside 40 fm. Catches are also managed using a 10 marine fish daily-bag-limit including rockfish, greenling (*Hexagrammos* spp.), cabezon, and other groundfish species, but excluding salmon, lingcod, perch species, sturgeon, sanddabs, striped bass, tuna, and baitfish. There is no retention of canary and yelloweye rockfish. Anglers can keep two lingcod with a 24-inch minimum size and one Pacific halibut with a 32-inch minimum size when the halibut season is open. Additionally, there is a minimum size limit of 16 in. for cabezon and a 10 in. minimum size limit for greenling species.

The Oregon Department of Fish and Wildlife (ODFW) will use their Ocean Sampling Program to monitor groundfish catches inseason. If canary or yelloweye rockfish harvest guidelines are projected to be attained inseason, ODFW would close the recreational groundfish fishery to inside a management line specified with waypoints at approximately 30 fm to reduce impacts on these species. The ODFW preserved the option of closing the recreational fishery outside 30 fm only in specific high bycatch areas to provide some management flexibility.

Action Alternative 1

The ODFW is not proposing any changes to their recreational groundfish fishery from status quo (No Action). However, they intend to explore inseason management options for their recreational groundfish fishery during 2005-2006 that include:

- reducing the closure period outside of 40 fm if the duration of the total season is reduced from 12 months due to management of nearshore species. Impacts would not exceed harvest guidelines on overfished species;
- implementing gear restrictions and/or release techniques to reduce the impact of overfished rockfish species if successful techniques are developed, researched, reviewed, and accepted. Impacts would not exceed harvest guidelines on overfished species;
- moving from large offshore closures (i.e., all areas outside the 40 fm management line) to closing hotspots of known canary and yelloweye rockfish concentrations or opening col spots of areas known to have no or low concentrations of canary and yelloweye rockfish. Impacts would not exceed harvest guidelines on overfished species;

Action Alternative 2

The ODFW is not proposing any changes to their recreational groundfish fishery from status quo (No Action). However, they intend to explore inseason management options for their recreational groundfish fishery during 2005-2006 that include:

- reducing the closure period outside of 40 fm if the duration of the total season is reduced from 12 months due to management of nearshore species. Impacts would not exceed harvest guidelines on overfished species;
- implementing gear restrictions and/or release techniques to reduce the impact of overfished rockfish species if successful techniques are developed, researched, reviewed, and accepted. Impacts would not exceed harvest guidelines on overfished species;
- moving from large offshore closures (i.e., all areas outside the 40 fm management line) to closing hotspots of known canary and yelloweye rockfish concentrations or opening col spots of areas known to have no or low concentrations of canary and yelloweye rockfish. Impacts would not exceed harvest guidelines on overfished species;

Action Alternative 3

The ODFW is not proposing any changes to their recreational groundfish fishery from status quo (No Action). However, they intend to explore inseason management options for their recreational groundfish fishery during 2005-2006 that include:

- reducing the closure period outside of 40 fm if the duration of the total season is reduced from 12 months due to management of nearshore species. Impacts would not exceed harvest guidelines on overfished species;
- implementing gear restrictions and/or release techniques to reduce the impact of overfished rockfish species if successful techniques are developed, researched, reviewed, and accepted. Impacts would not exceed harvest guidelines on overfished species;
- moving from large offshore closures (i.e., all areas outside the 40 fm management line) to closing hotspots of known canary and yelloweye rockfish concentrations or opening col spots of areas known to have no or low concentrations of canary and yelloweye rockfish. Impacts would not exceed harvest guidelines on overfished species;

2.2.4.7 California Recreational

The No Action Alternative

The No Action management measures for the California recreational fishery are those regulations in place as of May 2004. The daily-bag-limit is 10 fish in the rockfish, greenling, cabezon (RGC) complex, of which one can be bocaccio (10-inch minimum size), three can be cabezon (15-inch minimum size), and two can be greenling species (12 inch minimum size). Additionally, one lingcod with a 30-inch minimum size could be caught during the April through October recreational groundfish season (the limits at the start of the year were 2 lingcod per day at a 24-inch minimum size, but were changed inseason to avoid the possibility of lingcod overharvest as occurred in 2003). Up to five California scorpionfish can be taken per day with a 10-inch minimum size limit during January through February and July through December. A zero fm to 10 fm closure around the Farallon Islands is in place to reduce the estimated take of shallow nearshore rockfish. Additionally, regional management measures (California management regions are dubbed Rockfish/Lingcod Management Areas (RLMAs)) are in place as described below.

<u>Southern Rockfish/Lingcod Management Area (U.S./Mexico Border to Pt. Conception at 34°27' N. lat.)</u>

The California recreational groundfish fishery regulations south of Pt. Conception under the No Action alternative would be the same as described above except for the following changes:

- Groundfish open March through December inside 60 fm (closed January through February).
- California scorpionfish can only be retained during March, April, November, and December.

Central Rockfish/Lingcod Management Area (Pt. Conception to Cape Mendocino at 40°10' N. lat.)

The California recreational groundfish fishery regulations for the area between Pt. Conception and Pt. San Pedro under the No Action alternative would be the same as described above except for the following changes:

- Groundfish open January, February, and September through December inside 30 fm; and May through August inside 20 fm (closed March through April).

Northern Rockfish/Lingcod Management Area (Cape Mendocino to the California/Oregon Border)

The California recreational groundfish fishery regulations for the area between Cape Mendocino and the California/Oregon border under the No Action alternative would be the same as described above except for the following changes:

- If canary or yelloweye rockfish harvest guidelines are projected to be attained inseason, CDFG would close the recreational groundfish fishery to inside a management line specified with waypoints at approximately 30 fm to reduce impacts on these species. An inseason depth restriction would apply only in specific high bycatch areas.

Action Alternative 1

Action Alternative 1 management measures for the California recreational fishery are the most conservative regulations considered for 2005-2006. Under this alternative the daily-bag-limit is **5 fish in the RGC (rockfish, greenling, cabezon) complex**, of which one can be bocaccio (10-inch minimum size), **one can be cabezon** (15-inch minimum size), and **one can be greenling species** (12 inch minimum size). Additionally, **one lingcod with a 28-inch minimum size could be caught during the April through October recreational groundfish season** (note that seasons vary by region and alternative as described below). Up to five California scorpionfish can be taken per day with a 10-inch minimum size limit. **Shore-based divers only (without boats) and shore-based anglers would be exempt from the seasonal closures for rockfish, greenlings, California scorpionfish, California sheephead, and ocean whitefish.** Additionally, regional management measures are analyzed under this alternative as described below. All other management measures not differentially specified or described under this alternative are status quo (same as No Action).

Southern Rockfish/Lingcod Management Area (U.S./Mexico Border to Pt. Conception at 34°27' N. lat.)

The California recreational groundfish fishery regulations south of Pt. Conception under Action Alternative 1 would be the same as described above except for the following changes:

- Groundfish other than California scorpionfish, but including select non-groundfish species (California sheephead and ocean whitefish) open May through September inside 40 fm (closed January through April and October through December) (Figure 2.2-1);
- California scorpionfish can only be retained during March, April, and July through September inside 40 fm (closed January, February, May, June, and October through December) (Figure 2.2-1).

Central Rockfish/Lingcod Management Area (Pt. Conception to Cape Mendocino at 40°10' N. lat.)

The California recreational groundfish fishery regulations for the area between Pt. Conception and Cape Mendocino under Action Alternative 1 would be the same as described above except for the following changes:

- Groundfish including California scorpionfish, and including select non-groundfish species (California sheephead and ocean whitefish) open in June inside 40 fm; and July through October inside 20 fm (closed January through May and November through December) (Figure 2.2-2);
- For 2005-06, a new management line at Pigeon Point (37°11' N. lat.) is proposed for use inseason, in addition to current management lines already available. This line is proposed to provide federal consistency with the California Nearshore FMP, which defines two RLMA regions in central California (from Pt. Conception to Cape Mendocino) with a division at Pigeon Point, and to assist with the data stream for groundfish catch data, which is sampled and estimated in these four regions statewide in the new CRFS sampling program. The management line at Pigeon Point provides a division within the Central RLMA and results in a North-Central and South-Central RLMA. While this alternative combines the two areas in this EIS analysis, there might be different regulations adopted inseason for the North-Central and South-Central RLMAs.

Northern Rockfish/Lingcod Management Area (Cape Mendocino to the California/Oregon Border)

The California recreational groundfish fishery regulations for the area between Cape Mendocino and the California/Oregon border under the No Action alternative would be the same as described above except for the following changes:

- Groundfish and ocean whitefish open in July through October inside 40 fm (closed January through June and November through December) (Figure 2.2-3).

Action Alternative 2

Action Alternative 2 management measures for the California recreational fishery result in intermediate effects relative to the other action alternatives considered for 2005-2006. Under this alternative the daily-bag-limit is 10 fish in the RGC (rockfish, greenling, cabezon) complex (status quo), of which one can be bocaccio (10-inch minimum size), **two can be cabezon** (15-inch minimum size), and **one can be greenling species** (12 inch minimum size). Additionally, **two lingcod with a 26-inch minimum size could be caught during the April through October recreational groundfish season** (note that seasons vary by region and alternative as described below). **All divers (boats permitted while diving for rockfish or other closed species during closed periods provided no hook and line gear on board or in possession while diving to catch rockfish) and shore-based anglers would be exempt from the seasonal closures for rockfish, greenlings, California scorpionfish, California sheephead, and ocean whitefish.** Additionally, regional management measures are analyzed under this alternative as described below. All other management measures not differentially specified or described under this alternative are status quo (same as No Action).

Southern Rockfish/Lingcod Management Area (U.S./Mexico Border to Pt. Conception at 34°27' N. lat.)

The California recreational groundfish fishery regulations south of Pt. Conception under Action Alternative 1 would be the same as described above except for the following changes:

- Groundfish other than California scorpionfish, but including select non-groundfish species (California sheephead and ocean whitefish) open May through September inside 40 fm (closed January through April and October through December) (Figure 2.2-1);
- California scorpionfish can only be retained during March, April, and July through September inside 40 fm (closed January, February, May, June, and October through December) (Figure 2.2-1).

Central Rockfish/Lingcod Management Area (Pt. Conception to Cape Mendocino at 40°10' N. lat.)

The California recreational groundfish fishery regulations for the area between Pt. Conception and Cape Mendocino under Action Alternative 1 would be the same as described above except for the following changes:

- Groundfish including California scorpionfish, and including select non-groundfish species (California sheephead and ocean whitefish) open in June inside 40 fm; and July through October inside 20 fm (closed January through May and November through December) (Figure 2.2-2);
- For 2005-06, a new management line at Pigeon Point (37°11' N. lat.) is proposed for use inseason, in addition to current management lines already available. This line is proposed to provide federal consistency with the California Nearshore FMP, which defines two RLMA regions in central California (from Pt. Conception to Cape Mendocino) with a division at Pigeon Point, and to assist with the data stream for groundfish catch data, which is sampled and estimated in these four regions statewide in the new CRFS sampling program. The management line at Pigeon Point provides a division within the Central RLMA and results in a North-Central and South-Central RLMA. While this alternative combines the two areas in this EIS analysis, there might be different regulations adopted inseason for the North-Central and South-Central RLMAs.

Northern Rockfish/Lingcod Management Area (Cape Mendocino to the California/Oregon Border)

The California recreational groundfish fishery regulations for the area between Cape Mendocino and the California/Oregon border under the No Action alternative would be the same as described above except for the following changes:

- Groundfish and ocean whitefish open in July through October inside 40 fm (closed January through June and November through December) (Figure 2.2-3).

Action Alternative 3

Action Alternative 3 management measures for the California recreational fishery are the most liberal regulations considered for 2005-2006. Under this alternative the daily-bag-limit is 10 fish in the RGC (rockfish, greenling, cabezon) complex (status quo), of which one can be bocaccio (10-inch minimum size), **three can be cabezon** (15-inch minimum size), and **two can be greenling species** (12 inch minimum size). Additionally, **two lingcod with a 24-inch minimum size could be caught during the April through October recreational groundfish season** (note that seasons vary by region and alternative as described below). **All divers (boats permitted while diving for rockfish or other closed species during closed periods provided no hook and line gear on board or in possession while diving to catch rockfish) and shore-based anglers would be exempt from the seasonal closures for rockfish, greenlings, California scorpionfish, California sheephead, and ocean whitefish.** Additionally, regional management measures are analyzed under this alternative as described below. All other management measures not differentially specified or described under this alternative are status quo (same as No Action).

Southern Rockfish/Lingcod Management Area (U.S./Mexico Border to Pt. Conception at 34°27' N. lat.)

The California recreational groundfish fishery regulations south of Pt. Conception under Action Alternative 1 would be the same as described above except for the following changes:

- Groundfish other than California scorpionfish, but including select non-groundfish species (California sheephead and ocean whitefish) open May through September inside 40 fm (closed January through April and October through December) (Figure 2.2-1);
- California scorpionfish can only be retained during March, April, and July through September inside 40 fm (closed January, February, May, June, and October through December) (Figure 2.2-1).

Central Rockfish/Lingcod Management Area (Pt. Conception to Cape Mendocino at 40°10' N. lat.)

The California recreational groundfish fishery regulations for the area between Pt. Conception and Cape Mendocino under Action Alternative 1 would be the same as described above except for the following changes:

- Groundfish including California scorpionfish, and including select non-groundfish species (California sheephead and ocean whitefish) open in June inside 40 fm; and July through October inside 20 fm (closed January through May and November through December) (Figure 2.2-2);
- For 2005-06, a new management line at Pigeon Point (37°11' N. lat.) is proposed for use inseason, in addition to current management lines already available. This line is proposed to provide federal consistency with the California Nearshore FMP, which defines two RLMA regions in central California (from Pt. Conception to Cape Mendocino) with a division at Pigeon Point, and to assist with the data stream for groundfish catch data, which is sampled and estimated in these four regions statewide in the new CRFS sampling program. The management line at Pigeon Point provides a division within the Central RLMA and results in a North-Central and South-Central RLMA. While this alternative combines the two areas in this EIS analysis, there might be different regulations adopted inseason for the North-Central and South-Central RLMAs.

Northern Rockfish/Lingcod Management Area (Cape Mendocino to the California/Oregon Border)

The California recreational groundfish fishery regulations for the area between Cape Mendocino and the California/Oregon border under the No Action alternative would be the same as described above except for the following changes:

- Groundfish and ocean whitefish open in July through October inside 40 fm (closed January through June and November through December) (Figure 2.2-3).

2.2.5 Alternatives Considered, But Eliminated From Detailed Study

Any alternative total catch OYs with less than a 50% probability of rebuilding to B_{MSY} within T_{MAX} are not compliant with the MSA as interpreted in a 2000 Federal Court ruling (*Natural Resources Defense Council* v. *Daley, April 25, 2000, U.S. Court of Appeals for the District of Columbia Circuit*). Such alternatives do not meet the purpose and need for action and thus are not analyzed in this EIS.

2.3 Comparison of the Environmental Consequences

Table 2.3-1 summarizes the analysis of physical, biological, and socioeconomic effects of the alternatives presented in Chapters 3-8. These effects are qualitatively assessed in Table 2.3-1 based on the best professional judgement of resource experts that contributed to this EIS. The Council Preferred Alternative is expected to allow the stocks to rebuild to MSY biomass levels. Until stocks are rebuilt, there will likely be significant adverse impacts on the groundfish fishery and groundfish-dependent economies on the West Coast.

2.4 Social Net Benefit Analysis

Net benefit analysis takes costs and benefits into account from a national perspective. Net benefit analysis uses measures of real costs and benefits to all entities affected by an action in order to assess the net effect on the nation. The minimum standard for a cost-benefit analysis is a qualitative listing of positive and negative impacts. From there, an attempt is made to quantify or provide some indicators of the scale of the impacts and, if possible, to assign a monetary value to those changes.

TABLE 2.1-1a. Council preferred alternatives for acceptable biological catches (ABCs) and total catch optimum yields (OYs) (mt) for **2005**. (Overfished stocks in CAPS). (Page 63 of 2)

			2005 ABC and OY Alternatives							
	2004 ABCs/OYs		Low OY		Med OY		High OY		Council OY[a/]	
Stock	ABC	OY	ABC	OY	ABC	OY	ABC	OY	ABC	OY
LINGCOD - coastwide	1,385	735	2,922	918	2,922	2,588	2,922	2,636	2,922	2,414
Columbia and US-Vanc. areas			1,874	574	1,874	1,874	1,874	1,874		
Eureka, Monterey, and Conception areas			1,048	344	1,048	714	1,048	762		
Pacific Cod	3,200	3,200	3,200	1,600			3,200	3,200	3,200	1,600
Pacific Whiting (Coastwide)	514,441	250,000	181,286	181,286	362,57	362,573	725,146	725,146		
Sablefish (Coastwide)	8,487	7,786	8,368	6,500	8,368	7,761	8,368	8,335	8,368	7,761
N. of 36° (Monterey north)	8,185	7,510		6,270		7,486		8,040		7,486
S. of 36° (Conception area)	302	276		230		275		295		275
PACIFIC OCEAN PERCH	980	444			966	447			966	447
Shortbelly Rockfish	13,900	13,900			13,900	13,900			13,900	13,900
WIDOW ROCKFISH	3,460	284	2,833	0	3,218	285	3,668	505	3,218	285
CANARY ROCKFISH[b/]	256	47	270	43	270	48	270	48	270	
Chilipepper Rockfish	2,700	2,000			2,700	2,000			2,700	2,000
BOCACCIO	400	250	447	134	566	307	745	713	566	307
Splitnose Rockfish	615	461			615	461			615	461
Yellowtail Rockfish	4,320	4,320			3,896	3,896			3,896	3,896
Shortspine Thornyhead - N. of 34°27'	1,030	983			1,055	999			1,055	999
Longspine Thornyhead - N. of 36°	2,461	2,461			2,461	2,461			2,461	2,461
Longspine Thornyhead - S. of 36°	390	195			390	195			390	195
COWCOD - S. of 36° (Conception area)	5	2.4	5	2.1			5	2.4	5	2.1
COWCOD - N. of 36° (Monterey area)	19	2.4	19	2.1			19	2.4	19	2.1
DARKBLOTCHED	240	240			269	269			269	269
YELLOWEYE	53	22	54	24	54	27	54	28	54	26
Nearshore Species										
Black WA	540	540			540	540			540	540
Black OR-CA	775	775			753	753			753	753
Minor Rockfish North	3,680	2,250			3,680	2,250			3,680	2,250
Nearshore HG		122				122				122
Shelf HG		968				968				968
Slope HG		1,160				1,160				1,160
Remaining Rockfish North	1,612	1,216			1,612	1,216			1,612	1,216
Bocaccio	318	238			318	238			318	238
Chilipepper - Eureka	32	32			32	32			32	32
Redstripe	576	432			576	432			576	432
Sharpchin	307	230			307	230			307	230
Silvergrey	38	28			38	28			38	28
Splitnose	242	182			242	182			242	182

TABLE 2.1-1a. Council preferred alternatives for acceptable biological catches (ABCs) and total catch optimum yields (OYs) (mt) for **2005**. (Overfished stocks in CAPS). (Page 64 of 2)

			2005 ABC and OY Alternatives							
	2004 ABCs/OYs		Low OY		Med OY		High OY		Council OY[a/]	
Stock	ABC	OY	ABC	OY	ABC	OY	ABC	OY	ABC	OY
Yellowmouth	99	74			99	74			99	74
Other Rockfish North	2,068	1,034			2,068	1,034			2,068	1,034
Minor Rockfish South	3,412	1,968			3,412	1,968			3,412	1,968
Nearshore HG		615				615				615
Shelf HG		714				714				714
Slope HG		639				639				639
Remaining Rockfish South	854	689			854	689			854	689
Bank	350	262			350	262			350	262
Blackgill	343	306			343	306			343	306
Sharpchin	45	34			45	34			45	34
Yellowtail	116	87			116	87			116	87
Other Rockfish South	2,558	1,279			2,558	1,279			2,558	1,279
Cabezon (off CA only)	Managed under "Other Fish"		88	44	103	69	103	91	103	69
Dover Sole	8,510	7,440			8,510[c/]	7,476			8,510[c/]	7,476
English Sole	3,100	3,100			3,100	3,100			3,100	3,100
Petrale Sole	2,762	2,762			2,762	2,762			2,762	2,762
Arrowtooth Flounder	5,800	5,800			5,800	5,800			5,800	5,800
Other Flatfish	7,700	7,700	4,400	2,200			12,000	12,000		
Other Fish[d/]	14,700	14,700	14,700	7,350			14,700	14,700	14,597	7,298

a/ Council OY is the Council's preferred harvest alternative for 2005.

b/ The canary rockfish ABC and OY are based on the Council's adopted rebuilding strategy that has a rebuilding target year of 2074, a specified harvest control rule (F = 0.220), and comports to a P_{MAX} (probability of successful rebuilding within the maximum allowable time period) of 60%. The OY varies by the commercial:recreational catch share due to the fact that the recreational fishery takes smaller fish and therefore has a greater "per ton" impact than the commercial fishery.

c/ The projected ABC for Dover sole is not currently available.

d/ The cabezon harvest specifications will be subtracted from the Other Fish complex by INPFC area.

TABLE 2.1-1b. Council preferred alternatives for acceptable biological catches (ABCs) and total catch optimum yields (OYs) (mt) for **2006**. (Overfished stocks in CAPS). (Page 1 of 2)

			2006 ABC and OY Alternatives							
	2004 ABCs/OYs		Low OY		Med OY		High OY		Council OY[a/]	
Stock	ABC	OY	ABC	OY	ABC	OY	ABC	OY	ABC	OY
LINGCOD - coastwide	1,385	735	2,716	940	2,716	2,414	2,716	2,459	2,716	2,414
Columbia and US-Vanc. Areas			1,694	574	1,694	1,694	1,694	1,694		
Eureka, Monterey, and Conception areas			1,021	366	1,021	719	1,021	764		
Pacific Cod	3,200	3,200	3,200	1,600			3,200	3,200	3,200	1,600
Pacific Whiting (Coastwide)	514,441	250,000	114,296	114,296	228,59	228,593	457,186	457,186		
Sablefish (Coastwide)	8,487	7,786	8,175	6,500	8,175	7,634	8,175	8,149	8,175	7,634
N. of 36° (Monterey north)	8,185	7,510		6,270		7,363		7,860		7,363
S. of 36° (Conception area)	302	276		230		271		289		271
PACIFIC OCEAN PERCH	980	444			934	447			934	447
Shortbelly Rockfish	13,900	13,900			13,900	13,900			13,900	13,900
WIDOW ROCKFISH	3,460	284	2,670	0	3,059	289	3,510	513	3,059	289
CANARY ROCKFISH[b/]	256	47	279	45	279	51	279	51	279	
Chilipepper Rockfish	2,700	2,000			2,700	2,000			2,700	2,000
BOCACCIO	400	250	443	140	549	308	733	704	549	308
Splitnose Rockfish	615	461			615	461			615	461
Yellowtail Rockfish	4,320	4,320			3,681	3,681			3,681	3,681
Shortspine Thornyhead - N. of 34°27'	1,030	983			1,077	1,018			1,077	1,018
Longspine Thornyhead - N. of 36°	2,461	2,461			2,461	2,461			2,461	2,461
Longspine Thornyhead - S. of 36°	390	195			390	195			390	195
COWCOD - S. of 36° (Conception area)	5	2.4	5	2.1			5	2.4	5	2.1
COWCOD - N. of 36° (Monterey area)	19	2.4	19	2.1			19	2.4	19	2.1
DARKBLOTCHED	240	240			294	294			294	294
YELLOWEYE	53	22	54	25	54	28	54	29	55	27
Nearshore Species										
Black WA	540	540			540	540			540	540
Black OR-CA	775	775			736	736			736	736
Minor Rockfish North	3,680	2,250			3,680	2,250			3,680	2,250
Nearshore HG		122				122				122
Shelf HG		968				968				968
Slope HG		1,160				1,160				1,160
Remaining Rockfish North	1,612	1,216			1,612	1,216			1,612	1,216
Bocaccio	318	238			318	238			318	238
Chilipepper - Eureka	32	32			32	32			32	32
Redstripe	576	432			576	432			576	432
Sharpchin	307	230			307	230			307	230
Silvergrey	38	28			38	28			38	28
Splitnose	242	182			242	182			242	182

TABLE 2.1-1b. Council preferred alternatives for acceptable biological catches (ABCs) and total catch optimum yields (OYs) (mt) for **2006**. (Overfished stocks in CAPS). (Page 2 of 2)

			2006 ABC and OY Alternatives							
	2004 ABCs/OYs		Low OY		Med OY		High OY		Council OY[a/]	
Stock	ABC	OY	ABC	OY	ABC	OY	ABC	OY	ABC	OY
Yellowmouth	99	74			99	74			99	74
Other Rockfish North	2,068	1,034			2,068	1,034			2,068	1,034
Minor Rockfish South	3,412	1,968			3,412	1,968			3,412	1,968
Nearshore HG		615				615				615
Shelf HG		714				714				714
Slope HG		639				639				639
Remaining Rockfish South	854	689			854	689			854	689
Bank	350	262			350	262			350	262
Blackgill	343	306			343	306			343	306
Sharpchin	45	34			45	34			45	34
Yellowtail	116	87			116	87			116	87
Other Rockfish South	2,558	1,279			2,558	1,279			2,558	1,279
Cabezon (off CA only)	Managed under "Other Fish"		94	63	108	69	108	107	108	69
Dover Sole	8,510	7,440			8,510[c/]	7,564			8,510[c/]	7,564
English Sole	3,100	3,100			3,100	3,100			3,100	3,100
Petrale Sole	2,762	2,762			2,762	2,762			2,762	2,762
Arrowtooth Flounder	5,800	5,800			5,800	5,800			5,800	5,800
Other Flatfish	7,700	7,700	4,400	2,200			12,000	12,000		
Other Fish[d/]	14,700	14,700	14,700	7,350			14,700	14,700	14,592	7,296

a/ Council OY is the Council's preferred harvest alternative for 2006.

b/ The canary rockfish ABC and OY are based on the Council's adopted rebuilding strategy that has a rebuilding target year of 2074, a specified harvest control rule (F = 0.220), and comports to a P_{MAX} (probability of successful rebuilding within the maximum allowable time period) of 60%. The OY varies by the commercial:recreational catch share due to the fact that the recreational fishery takes smaller fish and therefore has a greater "per ton" impact than the commercial fishery.

c/ The projected ABC for Dover sole is not currently available.

d/ The cabezon harvest specifications will be subtracted from the Other Fish complex by INPFC area.

TABLE 2.1-2. Projected median harvest levels (mt) for cabezon in waters off California corresponding to three harvest control rules for the “new catch & 1947-present CPUE index” analysis, 2004-2007. Results are shown for two F_{MSY} proxies ($F_{50\%}$ and $F_{45\%}$).

	F_{MSY} proxy – $F_{50\%}$			F_{MSY} proxy – $F_{45\%}$		
Year	40-10	60-20	ABC	40-10	60-20	ABC
2004	62	26	82	74	31	99
2005	80	44	88	91	51	103
2006	97	63	94	107	72	108
2007	100	74	97	110	83	109

TABLE 2.1-3. Projected lingcod spawning stock biomass and relative depletion north (LCN) and south (LCS) of the Eureka-Columbia INPFC management area boundary at 43° N. lat. Data from Jagielo *et al.* (2004).

	LCN			LCS			Coastwide		
Year	Biomass	Target	Ratio	Biomass	Target	Ratio	Biomass	Target	Ratio
2002	6,376	8,321	0.766	3,885	8,108	0.479	10,261	16,428	0.625
2003	8,477	8,321	1.019	4,482	8,108	0.553	12,959	16,428	0.789
2004	10,661	8,321	1.281	5,656	8,108	0.698	16,317	16,428	0.993

TABLE 2.2-1. Proposed harvest guidelines and harvest targets by selected species and fishery sector for 2005 and 2006. (Page 1 of 2)

Species	Year	Council-Preferred OY (mt)	Fishery Sector	Sharing Formula (see section 2.2)	Harvest Guideline or Target (mt)
Black Rockfish (off CA and OR)	2005	753	CA Total	42% of OY	316
			CA Rec. Total	55% of CA Total	175
			CA NS Comm. Total	45% of CA Total	141
			CA Total N. 40°10' N. lat.	60% of CA Total	190
			CA Rec. N. 40°10' N. lat.	39% of CA Total N. 40°10' N. lat.	74
			CA NS Comm. N. 40°10' N. lat.	61% of CA Total N. 40°10' N. lat.	116
			CA Total S. 40°10' N. lat.	40% of CA Total	126
			CA Rec. S. 40°10' N. lat.	80% of CA Total S. 40°10' N. lat.	101
			CA NS Comm. S. 40°10' N. lat.	20% of CA Total S. 40°10' N. lat.	25
			OR Total	58% of OY	437
	2006	736	CA Total	42% of OY	309
			CA Rec. Total	55% of CA Total	170
			CA NS Comm. Total	45% of CA Total	139
			CA Total N. 40°10' N. lat.	60% of CA Total	185
			CA Rec. N. 40°10' N. lat.	39% of CA Total N. 40°10' N. lat.	72
			CA NS Comm. N. 40°10' N. lat.	61% of CA Total N. 40°10' N. lat.	113
			CA Total S. 40°10' N. lat.	40% of CA Total	124
			CA Rec. S. 40°10' N. lat.	80% of CA Total S. 40°10' N. lat.	99
			CA NS Comm. S. 40°10' N. lat.	20% of CA Total S. 40°10' N. lat.	25
			OR Total	58% of OY	427
Canary Rockfish	2005 & 2006	NA	CA Rec.		9.3
			OR Rec.		6.8
			WA Rec.		1.7

TABLE 2.2-1. Proposed harvest guidelines and harvest targets by selected species and fishery sector for 2005 and 2006. (Page 2 of 2)

Species	Year	Council-Preferred OY (mt)	Fishery Sector	Sharing Formula (see section 2.2)	Harvest Guideline or Target (mt)
Lingcod	2005 & 2006	2,414	CA Total	See section 2.2	612
			CA Rec.		422
			OR-WA Total		1,801
	2005		OR Rec.		132
			WA Rec.		74
	2006		OR Rec.		154
			WA Rec.		85
Yelloweye	2005 & 2006	26 in 2005 27 in 2006	CA Rec.	See section 2.2	3.7
			OR-WA Rec.		6.7
			OR. Rec.		3.2
			WA Rec.		3.5

TABLE 2.2-2. Estimated mortality (mt) of overfished West Coast groundfish species by fishery in 2004 based on April 2004 Council actions that describe effects under the **No Action Alternative**. (Page 1 of 1)

Fishery	Bocaccio[a/]	Canary	Cowcod	Dkbl	Lingcod	POP	Widow	Yelloweye
Limited Entry Groundfish								
Trawl- Non-whiting	51.0	10.1	0.5	73.5	104.7	90.7	2.5	0.3
Fixed Gear	13.4	0.9	0.1	0.8	20.0	0.3	0.5	2.5
Whiting								
At-sea whiting motherships	▨	0.9	▨	1.4	0.3	1.7	59.7	0.0
At-sea whiting cat-proc	▨	1.3	▨	7.6	0.4	10.1	84.6	0.4
Shoreside whiting	▨	0.4	▨	0.5	0.7	0.4	29.9	0.0
Tribal whiting	▨	4.7	▨	0.0	0.5	1.5	37.1	0.0
Open Access								
Groundfish directed	10.6	1.0	0.1	0.2	70.0	0.1	▨	0.6
CA Halibut	0.1	▨	▨	0.0	2.0	0.0	▨	▨
CA Gillnet[b/]	0.5	▨	▨	0.0	▨	0.0	0.0	▨
CA Sheephead [b/]	▨	▨	▨	0.0	▨	0.0	0.0	0.0
CPS- wetfish [b/]	0.3	▨	▨	▨	▨	▨	▨	▨
CPS- squid[c/]	▨	▨	▨	▨	▨	▨	▨	▨
Dungeness crab [b/]	0.0	▨	0.0	0.0	▨	0.0	▨	▨
HMS b/	▨	0.0	0.0	0.0	▨	▨	▨	▨
Pacific Halibut [b/]	0.0	▨	0.0	0.0	▨	0.0	0.0	0.5
Pink shrimp	0.1	0.5	0.0	0.0	0.5	0.0	0.1	0.1
Ridgeback prawn	0.1	0.0	0.0	0.0	0.0	0.0	0.0	0.0
Salmon troll	0.2	1.6	0.0	0.0	0.3	0.0	0.0	0.2
Sea Cucumber	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
Spot Prawn (trap)	▨	▨	▨	▨	▨	▨	▨	▨
Tribal								
Midwater Trawl	▨	2.3	▨	0.0	0.1	0.0	40.0	0.0
Bottom Trawl	▨	0.5	▨	0.0	9.0	0.0	0.0	0.0
Troll	▨	0.5	▨	0.0	1.0	0.0	▨	0.0
Fixed gear	▨	0.3	▨	0.0	15.0	0.0	0.0	2.3
Recreational Groundfish								
WA	▨	1.7	▨	▨	65.0	▨	▨	3.5
OR	▨	6.8	▨	▨	109.7	▨	1.4	3.2
CA	62.8	9.3	1.8	▨	268.9	▨	1.4	3.7
Research: Based on 2 most recent NMFS trawl shelf and slope surveys, the IPHC halibut survey, and LOAs with expanded estimates for south of Pt. Conception.								
	2.0	1.0	▨	1.6	3.0	3.0	1.5	1.1
Non-EFP Total	141.1	43.8	2.5	85.6	671.1	107.8	258.7	18.5
EFPs[d/]								
CA: NS FF trawl	10.0	0.5	0.5	▨	20.0	▨	▨	0.5
OR: DTS[e/]	▨	0.1	▨	6.0	▨	18.0	▨	0.1
WA: AT trawl	▨	1.5	▨	3.0	4.5	8.5	5.5	0.5
WA: dogfish LL	▨	0.1	▨	0.5	2.0	0.5	0.5	1.0
WA: pollock	▨	0.1	▨	▨	▨	▨	1.5	0.1
EFP Subtotal	10.0	2.3	0.5	9.5	26.5	27.0	7.5	2.2
TOTAL	151.1	46.1	3.0	95.1	697.6	134.8	266.2	20.7
2004 OY	250	47.3	4.8	240	735	444	284	22
Difference	98.9	1.2	1.8	144.9	37.4	309.2	17.8	1.3
Percent of OY	60.4%	97.5%	62.5%	39.6%	94.9%	30.4%	93.7%	93.9%
Key	▨	= not applicable; trace amount (<0.01 mt); or not reported in available data sources.						

a/ South of 40°10' N. lat.

b/ Mortality estimates are not hard numbers; based on the GMT's best professional judgement.

c/ Bycatch amounts by species unavailable, but bocaccio occurred in 0.1% of all port samples and other rockfish in another 0.1% of all port samples (and squid fisheries usually land their whole catch). In 2001, out of 84,000 mt total landings 1 mt was groundfish. This suggests that total bocaccio was caught in trace amounts.

d/ Values are proposed EFP bycatch caps, not estimates of total mortality. The EFP is terminated inseason if the cap is projected to be attained early.

e/ The darkblotched rockfish and Pacific ocean perch caps are not defined yet for this EFP but are expected to be lower than the placeholders in this scorecard.

TABLE 2.2-3. Estimated mortality (mt) of overfished West Coast groundfish species by fishery in 2005 under **Action Alternative 1**. (Page 1 of 1)

Fishery	Bocaccio[a/]	Canary[b/]	Cowcod	Dkbl	Lingcod	POP	Widow	Yelloweye
Limited Entry Groundfish								
Trawl- Non-whiting	34.6	8.0	0.2	63.1	85.6	56.4	1.3	0.4
Fixed Gear[c/]	13.4	0.9	0.1	1.2	20.0	0.4	0.5	2.5
Whiting								
At-sea whiting motherships		0.6		2.7	0.2	3.6	46.2	0.1
At-sea whiting cat-proc		0.9		3.8	0.3	5.1	65.5	0.2
Shoreside whiting		0.3		0.4	0.5	0.3	19.7	0.0
Tribal whiting		4.1		0.0	0.5	1.6	15.8	0.0
Open Access								
Groundfish directed	10.6	1.0	0.1	0.2	70.0	0.1		0.6
CA Halibut	0.1			0.0	2.0	0.0		
CA Gillnet[d/]	0.5			0.0		0.0	0.0	
CA Sheephead d/				0.0		0.0	0.0	0.0
CPS- wetfish d/	0.3							
CPS- squid[e/]								
Dungeness crab d/	0.0		0.0	0.0		0.0		
HMS d/		0.0	0.0	0.0				
Pacific Halibut d/	0.0		0.0	0.0		0.0	0.0	0.5
Pink shrimp	0.1	0.5	0.0	0.0	0.5	0.0	0.1	0.1
Ridgeback prawn	0.1	0.0	0.0	0.0	0.0	0.0	0.0	0.0
Salmon troll	0.2	1.6	0.0	0.0	0.3	0.0	0.0	0.2
Sea Cucumber	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
Spot Prawn (trap)								
Tribal								
Midwater Trawl		1.6		0.0	0.1	0.0	40.0	
Bottom Trawl		0.5		0.0	9.0	0.0	0.0	0.0
Troll		0.5		0.0	1.0	0.0		
Fixed gear		0.4		0.0	15.0	0.0	0.0	2.3
Recreational Groundfish								
WA		1.7			74.0			3.5
OR		6.8			132.0		1.4	3.2
CA	51.8	8.7	0.4		334.3		0.3	1.5
Research: Based on 2 most recent NMFS trawl shelf and slope surveys, the IPHC halibut survey, and LOAs with expanded estimates for south of Pt. Conception.								
	0.4	1.1		3.8	4.5	3.6	0.9	1.0
Non-EFP Total	112.1	39.2	0.8	75.2	749.8	71.1	191.7	16.1
EFPs[f/]								
CA: Sel. FF trawl	10.0	0.5	0.5		20.0			0.5
OR: Sel. FF trawl		0.4		0.5	6.5	0.2		0.2
WA: AT trawl		2.5		3.0	4.5	18.0	5.5	0.5
WA: dogfish LL		0.1		0.5	2.0	8.5	0.5	1.0
WA: pollock		0.1					1.5	0.1
EFP Subtotal	10.0	3.6	0.5	4.0	33.0	26.7	7.5	2.2
TOTAL	122.1	42.8	1.3	79.2	782.8	97.8	199.2	18.4
2005 OY	307		4.2	269	2,414	447	285	26
Difference	184.9		2.9	189.8	1,631.2	349.2	85.8	7.6
Percent of OY	39.8%		31.0%	29.4%	32.4%	21.9%	69.9%	70.6%
Key	▨	= not applicable; trace amount (<0.01 mt); or not reported in available data sources.						

a/ South of 40°10' N. lat.

b/ The canary rockfish OY has yet to be decided.

c/ Fixed gear mortality estimates are the higher of those impacts assumed under the No Action Alternative or those estimated for the primary sablefish fishery (see section 2.2.4).

d/ Mortality estimates are not hard numbers; based on the GMT's best professional judgement.

e/ Bycatch amounts by species unavailable, but bocaccio occurred in 0.1% of all port samples and other rockfish in another 0.1% of all port samples (and squid fisheries usually land their whole catch). In 2001, out of 84,000 mt total landings 1 mt was groundfish. This suggests that total bocaccio was caught in trace amounts.

f/ Values are proposed EFP bycatch caps, not estimates of total mortality. The EFP is terminated inseason if the cap is projected to be attained early.

TABLE 2.2-4. Estimated mortality (mt) of overfished West Coast groundfish species by fishery in 2005 under **Action Alternative 2**. (Page 1 of 1)

Fishery	Bocaccio[a]	Canary[b]	Cowcod	Dkbl	Lingcod	POP	Widow	Yelloweye
Limited Entry Groundfish								
Trawl- Non-whiting	44.0	9.9	0.3	65.9	112.7	57.0	1.4	0.5
Fixed Gear[c]	13.4	0.9	0.1	1.2	20.0	0.4	0.5	2.5
Whiting								
At-sea whiting motherships	▨	1.4	▨	5.8	0.5	7.7	99.2	0.3
At-sea whiting cat-proc	▨	2.0	▨	8.2	0.7	10.9	140.5	0.4
Shoreside whiting	▨	0.6	▨	0.8	1.0	0.6	42.2	0.0
Tribal whiting	▨	5.2	▨	0.1	0.6	2.1	20.1	0.0
Open Access								
Groundfish directed	10.6	1.0	0.1	0.2	70.0	0.1	▨	0.6
CA Halibut	0.1	▨	▨	0.0	2.0	0.0	▨	▨
CA Gillnet[d]	0.5	▨	▨	0.0	▨	0.0	0.0	▨
CA Sheephead[d]	▨	▨	▨	0.0	▨	0.0	0.0	0.0
CPS- wetfish [d]	0.3	▨	▨	▨	▨	▨	▨	▨
CPS- squid[e]	▨	▨	▨	▨	▨	▨	▨	▨
Dungeness crab[d]	0.0	▨	0.0	0.0	▨	0.0	▨	▨
HMS[d]	▨	0.0	0.0	0.0	▨	▨	▨	▨
Pacific Halibut[d]	0.0	▨	0.0	0.0	▨	0.0	0.0	0.5
Pink shrimp	0.1	0.5	0.0	0.0	0.5	0.0	0.1	0.1
Ridgeback prawn	0.1	0.0	0.0	0.0	0.0	0.0	0.0	0.0
Salmon troll	0.2	1.6	0.0	0.0	0.3	0.0	0.0	0.2
Sea Cucumber	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
Spot Prawn (trap)	▨	▨	▨	▨	▨	▨	▨	▨
Tribal								
Midwater Trawl	▨	1.6	▨	0.0	0.1	0.0	40.0	▨
Bottom Trawl	▨	0.5	▨	0.0	22.7	0.0	0.0	0.0
Troll	▨	0.5	▨	0.0	18.1	0.0	▨	▨
Fixed Gear	▨	0.4	▨	0.0	9.1	0.0	0.0	2.3
Recreational Groundfish								
WA	▨	1.7	▨	▨	65.0	▨	▨	3.5
OR	▨	6.8	▨	▨	109.7	▨	1.4	3.2
CA	51.8	8.7	0.4	▨	334.3	▨	0.3	1.5
Research: Based on 2 most recent NMFS trawl shelf and slope surveys, the IPHC halibut survey, and LOAs with expanded estimates for south of Pt. Conception.								
	0.4	1.1	▨	3.8	4.5	3.6	0.9	1.0
Non-EFP Total	121.5	44.4	0.9	86.0	771.8	82.4	346.6	16.6
EFPs[f]								
CA: Sel. FF trawl	10.0	0.5	0.5	▨	20.0	▨	▨	0.5
OR: Sel. FF trawl	▨	0.4	▨	0.5	6.5	0.2	▨	0.2
WA: AT trawl	▨	2.5	▨	3.0	4.5	18.0	5.5	0.5
WA: dogfish LL	▨	0.1	▨	0.5	2.0	8.5	0.5	1.0
WA: pollock	▨	0.1	▨	▨	▨	▨	1.5	0.1
EFP Subtotal	10.0	3.6	0.5	4.0	33.0	26.7	7.5	2.2
TOTAL	131.5	48.0	1.4	90.0	804.8	109.1	**354.1**	18.8
2005 OY	307		4.2	269	2,414	447	285	26
Difference	175.5		2.8	179.0	1,609.2	337.9	**-69.1**	7.2
Percent of OY	42.8%		33.3%	33.5%	33.3%	24.4%	**124.2%**	72.5%
Key	▨	= not applicable; trace amount (<0.01 mt); or not reported in available data sources.						

[a] South of 40°10' N. lat.

[b] The canary rockfish OY has yet to be decided.

[c] Fixed gear mortality estimates are the higher of those impacts assumed under the No Action Alternative or those estimated for the primary sablefish fishery (see section 2.2.4).

[d] Mortality estimates are not hard numbers; based on the GMT's best professional judgement.

[e] Bycatch amounts by species unavailable, but bocaccio occurred in 0.1% of all port samples and other rockfish in another 0.1% of all port samples (and squid fisheries usually land their whole catch). In 2001, out of 84,000 mt total landings 1 mt was groundfish. This suggests that total bocaccio was caught in trace amounts.

[f] Values are proposed EFP bycatch caps, not estimates of total mortality. The EFP is terminated inseason if the cap is projected to be attained early.

TABLE 2.2-5. Estimated mortality (mt) of overfished West Coast groundfish species by fishery in 2005 under **Action Alternative 3**. (Page 1 of 1)

Fishery	Bocaccio[a/]	Canary[b/]	Cowcod	Dkbl	Lingcod	POP	Widow	Yelloweye
Limited Entry Groundfish								
Trawl- Non-whiting	44.0	10.6	0.3	66.6	116.6	57.4	1.4	0.5
Fixed Gear[c/]	13.4	0.9	0.1	1.2	20.0	0.4	0.5	2.5
Whiting								
At-sea whiting motherships		2.9		12.2	1.0	16.2	209.6	0.6
At-sea whiting cat-proc		4.1		17.3	1.4	23.0	297.0	0.8
Shoreside whiting		1.2		1.6	2.2	1.2	89.3	0.0
Tribal whiting		5.2		0.1	0.6	2.1	20.1	0.0
Open Access								
Groundfish directed	10.6	1.0	0.1	0.2	70.0	0.1		0.6
CA Halibut	0.1			0.0	2.0	0.0		
CA Gillnet[d/]	0.5			0.0		0.0	0.0	
CA Sheephead d/				0.0		0.0	0.0	0.0
CPS- wetfish d/	0.3							
CPS- squid[e/]								
Dungeness crab d/	0.0		0.0	0.0		0.0		
HMS d/		0.0	0.0	0.0				
Pacific Halibut d/	0.0		0.0	0.0		0.0	0.0	0.5
Pink shrimp	0.1	0.5	0.0	0.0	0.5	0.0	0.1	0.1
Ridgeback prawn	0.1	0.0	0.0	0.0	0.0	0.0	0.0	0.0
Salmon troll	0.2	1.6	0.0	0.0	0.3	0.0	0.0	0.2
Sea Cucumber	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
Spot Prawn (trap)								
Tribal								
Midwater Trawl		1.6		0.0	0.1	0.0	40.0	
Bottom Trawl		0.5		0.0	35.2	0.0	0.0	0.0
Troll		0.5		0.0	55.6	0.0		
Fixed Gear		0.4		0.0	9.1	0.0	0.0	2.3
Recreational Groundfish								
WA		1.7			65.0			3.5
OR		6.8			109.7		1.4	3.2
CA	51.8	8.7	0.4		334.3		0.3	1.5
Research: Based on 2 most recent NMFS trawl shelf and slope surveys, the IPHC halibut survey, and LOAs with expanded estimates for south of Pt. Conception.								
	0.4	1.1		3.8	4.5	3.6	0.9	1.0
Non-EFP Total	121.5	49.3	0.9	103.0	828.1	104.0	660.6	17.3
EFPs[f/]								
CA: Sel. FF trawl	10.0	0.5	0.5		20.0			0.5
OR: Sel. FF trawl		0.4		0.5	6.5	0.2		0.2
WA: AT trawl		2.5		3.0	4.5	18.0	5.5	0.5
WA: dogfish LL		0.1		0.5	2.0	8.5	0.5	1.0
WA: pollock		0.1					1.5	0.1
EFP Subtotal	10.0	3.6	0.5	4.0	33.0	26.7	7.5	2.2
TOTAL	131.5	**52.9**	1.4	107.0	861.1	130.7	**668.1**	19.6
2005 OY	307		4.2	269	2,414	447	285	26
Difference	175.5		2.8	162.0	1,552.9	316.3	**-383.1**	6.4
Percent of OY	42.8%		33.3%	39.8%	35.7%	29.2%	**234.4%**	75.2%

Key ▨ = not applicable; trace amount (<0.01 mt); or not reported in available data sources.

a/ South of 40°10' N. lat.

b/ The canary rockfish OY has yet to be decided.

c/ Fixed gear mortality estimates are the higher of those impacts assumed under the No Action Alternative or those estimated for the primary sablefish fishery (see section 2.2.4).

d/ Mortality estimates are not hard numbers; based on the GMT's best professional judgement.

e/ Bycatch amounts by species unavailable, but bocaccio occurred in 0.1% of all port samples and other rockfish in another 0.1% of all port samples (and squid fisheries usually land their whole catch). In 2001, out of 84,000 mt total landings 1 mt was groundfish. This suggests that total bocaccio was caught in trace amounts.

f/ Values are proposed EFP bycatch caps, not estimates of total mortality. The EFP is terminated inseason if the cap is projected to be attained early.

TABLE 2.2-6. 2004 Trip limits and gear requirements[a/] for limited entry trawl gear north of 40°10' N. lat.[b/] Other limits and requirements apply. Read Sections IV. A. and B. NMFS actions before using this table. (Page 1 of 3)

		JAN-FEB	MAR-APR	MAY-JUN	JUL-AUG	SEP-OCT	NOV-DEC
	Rockfish Conservation Area[l/] (RCA):						
	North of 40°10' N. lat.	75 fm - modified 200 fm [k/]	60 fm - 200 fm	60 fm - 150 fm	75 fm - 150 fm		
	Small footrope or midwater trawl gear is required shoreward of the RCA; all trawl gear (large footrope, midwater trawl, and small footrope gear) is permitted seaward of the RCA.						
	A vessel may have more than one type of limited entry bottom trawl gear on board, but the most restrictive trip limit associated with the gear on board applies for that trip and will count toward the cumulative trip limit for that gear. A vessel that is trawling within the RCA (or other closed area) with trawl gear authorized for use within the RCA (or other closed area) may not have any other type of trawl gear on board. See IV.A.(14)(iv) for details.						
1	Minor slope rockfish[c/]	4,000 lb/ 2 months		8,000 lb/ 2 months			
2	Pacific ocean perch	3,000 lb/ 2 months					
3	DTS complex	Providing only large footrope or midwater trawl gear is used to land any groundfish species during the entire limit period, then large footrope trawl trip limits apply. If small footrope gear[g/] is used at any time in any area (North or South of 40o10' N. lat., shoreward or seaward of RCA) during the entire limit period, then small footrope trawl limits apply.					
4	Sablefish						
5	large footrope or midwater trawl gear	9,300 lb/ 2 months		16,000 lb/ 2 months			11,000 lb/ 2 months
6	small footrope gear[g/]	2,000 lb/ 2 months		10,000 lb/ 2 months			5,000 lb/ 2 months
7	Longspine thornyhead						
8	large footrope or midwater trawl gear	15,000 lb/ 2 months		18,000 lb/ 2 months			
9	small footrope gear[g/]	1,000 lb/ 2 months					
10	Shortspine thornyhead						
11	large footrope or midwater trawl gear	3,150 lb/ 2 months		4,500 lb/ 2 months			
12	small footrope gear[g/]	1,000 lb/ 2 months		3,000 lb/ 2 months			1,000 lb/ 2 months
13	Dover sole						
14	large footrope or midwater trawl gear	67,500 lb/ 2 months		32,000 lb/ 2 months			50,000 lb/ 2 months
15	small footrope gear[g/]	10,000 lb/ 2 months		27,000 lb/ 2 months			18,000 lb/ 2 months

TABLE 2.2-6. 2004 Trip limits and gear requirements[a/] for limited entry trawl gear north of 40°10' N. lat.[b/] Other limits and requirements apply. Read Sections IV. A. and B. NMFS actions before using this table. (Page 2 of 3)

		JAN-FEB	MAR-APR	MAY-JUN	JUL-AUG	SEP-OCT	NOV-DEC
16	Flatfish	Providing only large footrope or midwater trawl gear is used to land any groundfish species during the entire limit period, then large footrope trawl trip limits apply. If small footrope gear[g/] is used at any time in any area (North or South of 40o10' N. lat., shoreward or seaward of RCA) during the entire limit period, then small footrope trawl limits apply.					
17	All other flatfish, Petrale sole, & Rex sole						
18	large footrope or midwater trawl gear for All other flatfish[d/] & Rex sole	100,000 lb/ 2 months					
19	large footrope or midwater trawl gear for Petrale sole	Not limited	100,000 lb/ 2 months				Not limited
20	small footrope gear[g/]	30,000 lb/ 2 months, no more than 10,000 lb/ 2 months of which may be petrale sole.		80,000 lb/ 2 months, no more than 30,000 lb/ 2 months of which may be petrale sole.			70,000 lb/ 2 months, no more than 20,000 lb/ 2 months of which may be petrale sole.
21	Arrowtooth flounder						
22	large footrope or midwater trawl gear	Not limited	150,000 lb/ 2 months				Not limited
23	small footrope gear[g/]	4,000 lb/ 2 months	11,000 lb/ 2 months				8,000 lb/ 2 months
24	Whiting[e/]	Before the primary whiting season: 20,000 lb/trip -- During the primary season: mid-water trawl permitted in the RCA. See IV.B.(3)(b) for season and trip limit details. -- After the primary whiting season: 10,000 lb/trip					
25	Minor shelf rockfish[c/] & Widow rockfish						
26	large footrope trawl	CLOSED[f/]					
27	midwater trawl for Widow rockfish	Before the primary whiting season: CLOSED[f/] – During primary whiting season: In trips of at least 10,000 lb of whiting, combined widow and yellowtail limit of 500 lb/ trip, cumulative widow limit of 1,500 lb/ month. Mid-water trawl permitted in the RCA. See IV.B.(3)(b) for primary whiting season and trip limit details. -- After the primary whiting season: CLOSED[f/]					12,000 lb/ 2 months
28	midwater for Minor shelf rockfish or small footrope trawl[g/] for minor shelf & widow	300 lb/ month		1,000 lb/ month, no more than 200 lb/ month of which may be yelloweye rockfish			300 lb/ month
29	Canary rockfish						
30	large footrope trawl	CLOSED[f/]					
31	midwater or small footrope trawl[g/]	100 lb/ month		300 lb/ month		100 lb/ month	

TABLE 2.2-6. 2004 Trip limits and gear requirements[a/] for limited entry trawl gear north of 40°10' N. lat.[b/] Other limits and requirements apply. Read Sections IV. A. and B. NMFS actions before using this table. (Page 3 of 3)

		JAN-FEB	MAR-APR	MAY-JUN	JUL-AUG	SEP-OCT	NOV-DEC
32	Yellowtail						
33	large footrope trawl	CLOSED[f/]					
34	midwater trawl	Before the primary whiting season: CLOSED[f/] -- During primary whiting season: In trips of at least 10,000 lb of whiting: combined widow and yellowtail limit of 500 lb/ trip, cumulative yellowtail limit of 2,000 lb/ month. Mid-water trawl permitted in the RCA. See IV.B.(3)(b) for primary whiting season and trip limit details. -- After the primary whiting season: CLOSED[f/]					18,000 lb/ 2 months
35	small footrope trawl[g/]	In landings without flatfish, 1,000 lb/ month. As flatfish bycatch, per trip limit is the sum of 33% (by weight) of all flatfish except arrowtooth flounder, plus 10% (by weight) of arrowtooth flounder. Total yellowtail landings not to exceed 10,000 lb/ 2 months, no more than 1,000 lb/ month of which may be landed without flatfish.					
36	Minor nearshore rockfish						
37	large footrope trawl	CLOSED[f/]					
38	midwater or small footrope trawl[g/]	300 lb/ month					
39	Lingcod[h/]						
40	large footrope trawl	CLOSED[f/]					
41	midwater or small footrope trawl[g/]	800 lb/ 2 months		1,000 lb/ 2 months		800 lb/ 2 months	
42	Other Fish[i/]	Not limited					

a/ Gear requirements and prohibitions are explained above. See IV. A.(14).

b/ "North" means 40°10' N. lat. to the U.S.-Canada border. 40°10' N. lat. is about 20 nm south of Cape Mendocino, CA.

c/ Bocaccio and chilipepper are included in the trip limits for minor shelf rockfish and splitnose rockfish is included in the trip limits for minor slope rockfish.

d/ "Other" flatfish means all flatfish at 50 CFR 660.302 except those in this Table 3 with species specific management measures, including trip limits.

e/ The whiting "per trip" limit in the Eureka area shoreward of 100 fm is 10,000 lb/ trip all year. Outside Eureka area, the 20,000 lb/ trip limit applies. See IV. B.(3).

f/ Closed means that it is prohibited to take and retain, possess, or land the designated species in the time or area indicated. See IV. A.(7).

g/ Small footrope trawl means a bottom trawl net with a footrope no larger than 8 inches (20 cm) in diameter.

h/ The minimum size limit for lingcod is 24 inches (61 cm) total length.

i/ Other fish are defined at 50 CFR 660.302, as those groundfish species or species groups for which there is no trip limit, size limit, quota, or harvest guideline.

j/ The "Rockfish Conservation Area" is a gear and/or sector specific closed area generally described by depth contours but specifically defined by lat/long coordinates set out at IV. A.(17)(f), that may vary seasonally.

k/ The "modified 200 fm" line is modified to exclude certain petrale sole areas from the RCA.

TABLE 2.2-7. 2004 trip limits and gear requirementsa/ for limited entry trawl gear south of 40°10' n. lat..[b/] Other limits and requirements apply. Read Sections IV. A. and B. NMFS actions before using this table. (Page 4 of 2)

		JAN-FEB	MAR-APR	MAY-JUN	JUL-AUG	SEP-OCT	NOV-DEC
	Rockfish Conservation Area[j/] (RCA):						
	40°10' - 34°27' N. lat.	75 fm - 150 fm (additional closure between the shoreline and 10 fm around the Farallon Islands)		100 fm - 150 fm (additional closure between the shoreline and 10 fm around the Farallon Islands)		75 fm - 150 fm (additional closure between the shoreline and 10 fm around the Farallon Islands)	
	South of 34°27' N. lat.	75 fm - 150 fm along the mainland coast; shoreline - 150 fm around islands		100 fm - 150 fm along the mainland coast; shoreline - 150 fm around islands		75 fm - 150 fm along the mainland coast; shoreline - 150 fm around islands	
	Small footrope or midwater trawl gear is required shoreward of the RCA; all trawl gear (large footrope, midwater trawl, and small footrope gear) is permitted seaward of the RCA.						
	A vessel may have more than one type of limited entry bottom trawl gear on board, but the most restrictive trip limit associated with the gear on board applies for that trip and will count toward the cumulative trip limit for that gear. A vessel that is trawling within the RCA (or other closed area) with trawl gear authorized for use within the RCA (or other closed area) may not have any other type of trawl gear on board. See IV.A.(14)(iv) for details.						
1	Minor slope rockfish[c/]						
2	40°10' - 38° N. lat.	7,000 lb/ 2 months		50,000 lb/ 2 months			
3	South of 38° N. lat.	40,000 lb/ 2 months					
4	Splitnose						
5	40°10' - 38° N. lat.	7,000 lb/ 2 months		50,000 lb/ 2 months			
6	South of 38° N. lat.	40,000 lb/ 2 months					
7	DTS complex	If fishing North of 40o10' N. lat. at any time during the cumulative limit period, differential trip limits based on footrope size and crossover provisions will apply during the entire limit period. See Table 3 (North) and Section A. (12) for more details					
8	Sablefish	11,250 lb/ 2 months		14,500 lb/ 2 months			
9	Longspine thornyhead	15,000 lb / 2 months		18,000 lb / 2 months			
10	Shortspine thornyhead	3,000 lb/ 2 months		4,500 lb/ 2 months			
11	Dover sole	39,000 lb/ 2 months		49,000 lb/ 2 months			
12	Flatfish	If fishing North of 40o10' N. lat. at any time during the cumulative limit period, differential trip limits based on footrope size and crossover provisions will apply during the entire limit period. See Table 3 (North) and Section A. (12) for more details					
13	All other flatfish[d/] & Rex sole	100,000 lb/ 2 months	All other flatfish plus petrale & rex sole: 100,000 lb/ 2 months, no more than 20,000 lb/ 2 months of which may be petrale sole	All other flatfish plus petrale & rex sole: 120,000 lb/ 2 months, no more than 20,000 lb/ 2 months of which may be petrale sole			120,000 lb/ 2 months
14	Petrale sole	No limit					No limit
15	Arrowtooth flounder	No limit	10,000 lb/ 2 months				No limit
16	Whiting[e/]	Before the primary whiting season: 20,000 lb/trip -- During the primary whiting season: mid-water trawl permitted in the RCA. See IV.B.(3)(b) for season and trip limit details. -- After the primary whiting season: 10,000 lb/trip					
17	Minor shelf rockfish, Widow, and Chilipepper rockfish[c/]	Providing only large footrope trawl gear is used to land any groundfish species during the entire limit period, then large footrope limit applies.					
18	large footrope trawl for Minor shelf rockfish	300 lb/ month					

TABLE 2.2-7. 2004 trip limits and gear requirementsa/ for limited entry trawl gear south of 40°10' n. lat..[b/] Other limits and requirements apply. Read Sections IV. A. and B. NMFS actions before using this table. (Page 5 of 2)

			JAN-FEB	MAR-APR	MAY-JUN	JUL-AUG	SEP-OCT	NOV-DEC
19		large footrope trawl for Chilipepper rockfish	2,000 lb/ 2 months		12,000 lb/ 2 months		8,000 lb/ 2 months	
20		large footrope or midwater trawl for Widow rockfish	CLOSED[f/]					
21		midwater for Minor shelf or Chilipepper rockfish or small footrope trawl[g/] for minor shelf, widow & chilipepper	300 lb/ month					
22	Bocaccio		Providing only large footrope trawl gear is used to land any groundfish species during the entire limit period, then large footrope limit applies.					
23		large footrope trawl	100 lb/month					
24		midwater or small footrope trawl[g/]	CLOSED[f/]					
25	Canary rockfish							
26		large footrope trawl	CLOSED[f/]					
27		midwater or small footrope trawl[g/]	100 lb/ month		300 lb/ month		100 lb/ month	
28	Cowcod		CLOSED[f/]					
29	Minor nearshore rockfish							
30		large footrope trawl	CLOSED[f/]					
31		midwater or small footrope trawl[g/]	300 lb/ month					
32	Lingcod[h/]							
33		large footrope trawl	CLOSED[f/]					
34		midwater or small footrope trawl[g/]	800 lb/ 2 months		1,000 lb/ 2 months		800 lb/ 2 months	
35	Other Fish[i/]		Not limited					

a/ Gear requirements and prohibitions are explained above. See IV. A.(14).

b/ "South" means 40°10' N. lat. to the U.S.-Mexico border. 40°10' N. lat. is about 20 nm south of Cape Mendocino, CA.

c/ Yellowtail is included in the trip limits for minor shelf rockfish and POP is included in the trip limits for minor slope rockfish.

d/ "Other" flatfish means all flatfish at 50 CFR 660.302 except those in this Table 3 with species specific management measures, including trip limits.

e/ The whiting "per trip" limit in the Eureka area shoreward of 100 fm is 10,000 lb/ trip all year. Outside Eureka area, the 20,000 lb/ trip limit applies. See IV. B.(3).

f/ Closed means that it is prohibited to take and retain, possess, or land the designated species in the time or area indicated. See IV. A.(7).

g/ Small footrope trawl means a bottom trawl net with a footrope no larger than 8 inches (20 cm) in diameter.

h/ The minimum size limit for lingcod is 24 inches (61 cm) total length.

i/ Other fish are defined at 50 CFR 660.302, as those groundfish species or species groups for which there is no trip limit, size limit, quota, or harvest guideline.

j/ The "Rockfish Conservation Area" is a gear and/or sector specific closed area generally described by depth contours but specifically defined by lat./long. coordinates set out at IV. A.(17)(f), that may vary seasonally.

TABLE 2.2-8. Trip limits, the seasonal RCA configuration, and estimated impacts to target and overfished species under the **No Action Alternative** (status quo as of May 2004).

		Mortality (mt)		
		North	South	Total
Rebuilding Species	Lingcod	67.6	34.8	102.4
	Canary	9.1	0.8	9.9
	POP	91.2	0.0	91.2
	Darkblotched	61.0	12.5	73.5
	Widow	2.4	0.1	2.5
	Bocaccio	0.0	40.2	40.2
	Yelloweye	0.1	0.1	0.3
	Cowcod	0.0	0.5	0.5
Target Species	Sablefish	2,446	620	3,065
	Longspine	522	256	778
	Shortspine	589	260	848
	Dover	4,666	1,969	6,634
	Arrowtooth	1,724	211	1,936
	Petrale	2,155	237	2,392
	Other Flat	3,768	2,125	5,893
	Slope Rock	203	332	536

		RCA Boundaries (fm)		Bimonthly Cumulative Limits (mt)							
Subarea	Period	Inside Line	Outside Line	Sablefish	Long-spine	Short-spine	Dover	Other Flatfish	Petrale sublimit	Arrow-tooth	Slope Rock
North of 40°10'	1	75	150	9,300	15,000	3,100	67,500	100,000	No Limit	No Limit	4,000
	2	60	150	9,300	15,000	3,100	67,500	100,000	100,000	150,000	4,000
	3	60	150	16,000	18,000	4,500	32,000	100,000	100,000	150,000	8,000
	4	75	150	16,000	18,000	4,500	32,000	100,000	100,000	150,000	8,000
	5	75	150	16,000	18,000	4,500	32,000	100,000	100,000	150,000	8,000
	6	75	150	11,000	18,000	4,500	50,000	100,000	No Limit	No Limit	8,000
North Small Footrope Limit	1	75	150	2,000	1,000	1,000	10,000	30,000	10,000	4,000	
	2	60	150	2,000	1,000	1,000	10,000	30,000	10,000	4,000	
	3	60	150	10,000	1,000	3,000	27,000	80,000	30,000	11,000	
	4	75	150	10,000	1,000	3,000	27,000	80,000	30,000	11,000	
	5	75	150	10,000	1,000	3,000	27,000	80,000	30,000	11,000	
	6	75	150	5,000	1,000	1,000	18,000	70,000	20,000	8,000	
38° - 40°10'	1	75	150	11,200	15,000	3,000	39,000	100,000	No Limit	No Limit	10,000
	2	75	150	11,200	15,000	3,000	39,000	100,000	20,000	10,000	10,000
	3	100	150	14,500	18,000	4,500	49,000	120,000	20,000	10,000	50,000
	4	100	150	14,500	18,000	4,500	49,000	120,000	20,000	10,000	50,000
	5	75	150	14,500	18,000	4,500	49,000	120,000	20,000	10,000	50,000
	6	75	150	14,500	18,000	4,500	49,000	120,000	No Limit	No Limit	50,000
South of of 38°	1	75	150	11,200	15,000	3,000	39,000	100,000	No Limit	No Limit	40,000
	2	75	150	11,200	15,000	3,000	39,000	100,000	20,000	10,000	40,000
	3	100	150	14,500	18,000	4,500	49,000	120,000	20,000	10,000	50,000
	4	100	150	14,500	18,000	4,500	49,000	120,000	20,000	10,000	50,000
	5	75	150	14,500	18,000	4,500	49,000	120,000	20,000	10,000	50,000
	6	75	150	14,500	18,000	4,500	49,000	120,000	No Limit	No Limit	50,000

TABLE 2.2-9. Trip limits, the seasonal RCA configuration, and estimated impacts to target and overfished species under **Action Alternative 1**. (Page 1 of 1)

		Mortality (mt)		
		North	South	Total
Rebuilding Species	Lingcod	63.6	22.1	85.6
	Canary	7.5	0.5	8.0
	POP	56.4	0.0	56.4
	Darkblotched	51.5	11.6	63.1
	Widow	1.3	0.1	1.3
	Bocaccio	0.0	34.6	34.6
	Yelloweye	0.3	0.1	0.4
	Cowcod	0.0	0.2	0.2
Target Species	Sablefish	2,264	551	2,815
	Longspine	597	285	882
	Shortspine	616	275	891
	Dover	4,372	1,959	6,332
	Arrowtooth	1,564	211	1,775
	Petrale	1,908	234	2,142
	Other Flatfish + English Sole	3,123	1,084	4,207
	Slope Rock	203	388	592

		RCA Boundaries (fm)		Bimonthly Cumulative Limits (mt)							
Subarea	Period	Inside Line	Outside Line	Sablefish	Long-spine	Short-spine	Dover	Other Flatfish	Petrale sublimit	Arrow-tooth	Slope Rock
North of 40°10'	1	75	150	8,000	15,000	3,500	60,000	100,000	No Limit	No Limit	8,000
	2	75	150	8,000	15,000	3,500	60,000	100,000	85,000	150,000	8,000
	3	60	150	18,000	23,000	4,900	32,000	100,000	85,000	150,000	8,000
	4	60	150	18,000	23,000	4,900	32,000	100,000	85,000	150,000	8,000
	5	60	150	18,000	23,000	4,900	32,000	100,000	85,000	150,000	8,000
	6	75	150	8,000	15,000	3,500	60,000	100,000	No Limit	No Limit	8,000
North Selective Flatfish Trawl Limit	1	75	150	2,000	1,000	1,000	10,000	30,000	10,000	6,000	
	2	75	150	2,000	1,000	1,000	10,000	40,000	15,000	8,000	
	3	60	150	8,000	1,000	3,000	15,000	40,000	15,000	8,000	
	4	60	150	8,000	1,000	3,000	15,000	40,000	15,000	8,000	
	5	60	150	8,000	1,000	3,000	15,000	40,000	15,000	8,000	
	6	75	150	5,000	1,000	1,000	10,000	30,000	10,000	8,000	
South of of 40°10'	1	75	150	13,000	19,000	4,200	46,000	100,000	No Limit	No Limit	40,000
	2	75	150	13,000	19,000	4,200	46,000	100,000	85,000	10,000	40,000
	3	75	150	13,000	19,000	4,200	46,000	100,000	85,000	10,000	40,000
	4	75	150	13,000	19,000	4,200	46,000	100,000	85,000	10,000	40,000
	5	75	150	13,000	19,000	4,200	46,000	100,000	85,000	10,000	40,000
	6	75	150	13,000	19,000	4,200	46,000	100,000	No Limit	No Limit	40,000

TABLE 2.2-10. Trip limits, the seasonal RCA configuration, and estimated impacts to target and overfished species under **Action Alternative 2**. (Page 1 of 1)

		Mortality (mt)		
		North	South	Total
Rebuilding Species	Lingcod	86.1	26.6	112.7
	Canary	9.4	0.6	9.9
	POP	57.0	0.0	57.0
	Darkblotched	54.1	11.8	65.9
	Widow	1.3	0.1	1.4
	Bocaccio	0.0	44.0	44.0
	Yelloweye	0.4	0.1	0.5
	Cowcod	0.0	0.3	0.3
Target Species	Sablefish	2,614	597	3,211
	Longspine	544	285	829
	Shortspine	596	275	871
	Dover	4,794	1,968	6,762
	Arrowtooth	1,607	211	1,818
	Petrale	2,149	246	2,395
	Other Flatfish	4,099	1,338	5,438
	Slope Rock	203	388	592

		RCA Boundaries (fm)		Bimonthly Cumulative Limits (mt)							
Subarea	Period	Inside Line	Outside Line	Sablefish	Long-spine	Short-spine	Dover	Other Flatfish	Petrale sublimit	Arrow-tooth	Slope Rock
North of 40°10'	1	75	150	8,000	15,000	3,500	60,000	120,000	No Limit	No Limit	8,000
	2	75	150	8,000	15,000	3,500	60,000	120,000	95,000	150,000	8,000
	3	100	150	18,000	23,000	4,900	32,000	120,000	95,000	150,000	8,000
	4	100	150	18,000	23,000	4,900	32,000	120,000	95,000	150,000	8,000
	5	100	150	18,000	23,000	4,900	32,000	120,000	95,000	150,000	8,000
	6	75	150	8,000	15,000	3,500	60,000	120,000	No Limit	No Limit	8,000
North Selective Flatfish Trawl Limit	1	75	150	2,000	1,000	1,000	10,000	40,000	15,000	6,000	
	2	75	150	2,000	1,000	1,000	10,000	40,000	15,000	6,000	
	3	100	150	10,000	1,000	3,000	25,000	55,000	17,000	11,000	
	4	100	150	10,000	1,000	3,000	25,000	55,000	17,000	11,000	
	5	100	150	10,000	1,000	3,000	25,000	55,000	17,000	11,000	
	6	75	150	5,000	1,000	1,000	10,000	40,000	15,000	8,000	
South of 40°10'	1	75	150	13,000	19,000	4,200	46,000	120,000	No Limit	No Limit	40,000
	2	75	150	13,000	19,000	4,200	46,000	120,000	95,000	10,000	40,000
	3	100	150	13,000	19,000	4,200	46,000	120,000	95,000	10,000	40,000
	4	100	150	13,000	19,000	4,200	46,000	120,000	95,000	10,000	40,000
	5	75	150	13,000	19,000	4,200	46,000	120,000	95,000	10,000	40,000
	6	75	150	13,000	19,000	4,200	46,000	120,000	No Limit	No Limit	40,000

TABLE 2.2-11. Trip limits, the seasonal RCA configuration, and estimated impacts to target and overfished species under **Action Alternative 3**. (Page 1 of 1)

		Mortality (mt)		
		North	South	Total
Rebuilding Species	Lingcod	89.9	26.7	116.6
	Canary	10.0	0.6	10.6
	POP	57.4	0.0	57.4
	Darkblotched	54.8	11.9	66.6
	Widow	1.3	0.1	1.4
	Bocaccio	0.0	44.0	44.0
	Yelloweye	0.4	0.1	0.5
	Cowcod	0.0	0.3	0.3
Target Species	Sablefish	2,692	620	3,312
	Longspine	544	285	829
	Shortspine	596	275	871
	Dover	4,691	1,968	6,659
	Arrowtooth	1,607	211	1,818
	Petrale	2,258	246	2,504
	Other Flatfish	4,498	1,338	5,837
	Slope Rock	203	388	592

		RCA Boundaries (fm)		Bimonthly Cumulative Limits (mt)							
Subarea	Period	Inside Line	Outside Line	Sablefish	Long-spine	Short-spine	Dover	Other Flatfish	Petrale sublimit	Arrow-tooth	Slope Rock
North of 40°10'	1	75	150	9,000	15,000	3,500	60,000	120,000	No Limit	No Limit	8,000
	2	75	150	9,000	15,000	3,500	60,000	120,000	100,000	150,000	8,000
	3	100	150	18,000	23,000	4,900	32,000	120,000	100,000	150,000	8,000
	4	100	150	18,000	23,000	4,900	32,000	120,000	100,000	150,000	8,000
	5	100	150	18,000	23,000	4,900	32,000	120,000	100,000	150,000	8,000
	6	75	150	9,000	15,000	3,500	60,000	120,000	No Limit	No Limit	8,000
North Selective Flatfish Trawl Limit	1	75	150	2,000	1,000	1,000	12,000	75,000	20,000	6,000	
	2	75	150	2,000	1,000	1,000	12,000	75,000	20,000	6,000	
	3	100	150	10,000	1,000	3,000	18,000	85,000	25,000	11,000	
	4	100	150	10,000	1,000	3,000	18,000	85,000	25,000	11,000	
	5	100	150	10,000	1,000	3,000	18,000	85,000	25,000	11,000	
	6	75	150	5,000	1,000	1,000	12,000	75,000	20,000	8,000	
South of 40°10'	1	75	150	13,500	19,000	4,200	46,000	120,000	No Limit	No Limit	40,000
	2	75	150	13,500	19,000	4,200	46,000	120,000	100,000	10,000	40,000
	3	100	150	13,500	19,000	4,200	46,000	120,000	100,000	10,000	40,000
	4	100	150	13,500	19,000	4,200	46,000	120,000	100,000	10,000	40,000
	5	75	150	13,500	19,000	4,200	46,000	120,000	100,000	10,000	40,000
	6	75	150	13,500	19,000	4,200	46,000	120,000	No Limit	No Limit	40,000

TABLE 2.2.-12. 2004 trip limits for limited entry fixed gear north of 40°10' N. lat.[a/] Other limits and requirements apply. Read Sections IV. A. and B. NMFS actions before using this table. (Page 1 of 1)

		JAN-FEB	MAR-APR	MAY-JUN	JUL-AUG	SEP-OCT	NOV-DEC
Rockfish Conservation Area[h/] (RCA):							
	North of 46°16' N. lat.	shoreline - 100 fm					
	46°16' N. lat. - 40°10' N. lat.	30 fm - 100 fm					
1	Minor slope rockfish[d/]	4,000 lb/ 2 months					
2	Pacific ocean perch	1,800 lb/ 2 months					
3	Sablefish	300 lb/ day, or 1 landing per week of up to 900 lb, not to exceed 3,600 lb/ 2 months					
4	Longspine thornyhead	10,000 lb/ 2 months					
5	Shortspine thornyhead	2,100 lb/ 2 months					
6	Dover sole	5,000 lb/ month					
7	Arrowtooth flounder						
8	Petrale sole						
9	Rex sole						
10	All other flatfish[b/]						
11	Whiting[c/]	10,000 lb/ trip					
12	Minor shelf rockfish, widow, and yellowtail rockfish[d/]	200 lb/ month					
13	Canary rockfish	CLOSED[e/]					
14	Yelloweye rockfish						
15	Minor nearshore rockfish	5,000 lb/ 2 months, no more than 1,200 lb of which may be species other than black or blue rockfish[f/]					
16	Lingcod[g/]	CLOSED[e/]		400 lb/ month			CLOSED[e/]
17	Other fish[i/]	Not limited					

a/ "North" means 40°10' N. lat. to the U.S.-Canada border. 40°10' N. lat. is about 20 nm south of Cape Mendocino, CA.

b/ "Other flatfish" means all flatfish at 50 CFR 660.302 except those in this Table 4 with species specific management measures, including trip limits.

c/ The whiting "per trip" limit in the Eureka area shoreward of 100 fm is 10,000 lb/ trip all year. Outside Eureka area, the 20,000 lb/ trip limit applies. See IV. B.(3).

d/ Bocaccio and chilipepper are included in the trip limits for minor shelf rockfish and splitnose rockfish is included in the trip limits for minor slope rockfish.

e/ Closed means that it is prohibited to take and retain, possess, or land the designated species in the time or area indicated. See IV. A.(7).

f/ For black rockfish north of Cape Alava (48˚09'30" N. lat.), and between Destruction Island (47˚40'00" N. lat.) and Leadbetter Point (46˚38'10" N. lat.), there is an additional limit of 100 lb or 30 percent by weight of all fish on board, whichever is greater, per vessel, per fishing trip.

g/ The minimum size limit for lingcod is 24 inches (61 cm) total length.

h/ The "Rockfish Conservation Area" is a gear and/or sector specific closed area generally described by depth contours but specifically defined by lat./long. coordinates set out at IV. A.(17)(f), that may vary seasonally.

i/ Other fish are defined at 50 CFR 660.302, as those groundfish species or species groups for which there is no trip limit, size limit, quota, or harvest guideline.

TABLE 2.2-13. 2004 trip limits for limited entry fixed gear south of 40°10' n. lat.[a/] Other limits and requirements apply. Read Sections IV. A. and B. NMFS actions before using this table. (Page 1 of 2)

		JAN-FEB	MAR-APR	MAY-JUN	JUL-AUG	SEP-OCT	NOV-DEC
	Rockfish Conservation Area[g/] (RCA):						
	40°10' - 34°27' N. lat.	30 fm - 150 fm (also applies around islands, there is an additional closure between the shoreline and 10 fm around the Farallon Islands)		20 fm - 150 fm (also applies around islands, there is an additional closure between the shoreline and 10 fm around the Farallon Islands)		30 fm - 150 fm (also applies around islands, there is an additional closure between the shoreline and 10 fm around the Farallon Islands)	
	South of 34°27' N. lat.	60 fm - 150 fm (also applies around islands)					
1	Minor slope rockfish[d/]						
2	40°10' - 38° N. lat.	7,000 lb/ 2 months		50,000 lb/ 2 months			
3	South of 38° N. lat.	40,000 lb/ 2 months					
4	Splitnose						
5	40°10' - 38° N. lat.	7,000 lb/ 2 months		50,000 lb/ 2 months			
6	South of 38° N. lat.	40,000 lb/ 2 months					
7	Sablefish						
8	40°10' - 36° N. lat.	300 lb/ day, or 1 landing per week of up to 900 lb, not to exceed 3,600 lb/ 2 months					
9	South of 36° N. lat.	350 lb/ day, or 1 landing per week of up to 1,050 lb					
10	Longspine thornyhead	10,000 lb/ 2 months					
11	Shortspine thornyhead	2,000 lb/ 2 months					
12	Dover sole	5,000 lb/ month When fishing for Pacific sanddabs, vessels using hook-and-line gear with no more than 12 hooks per line, using hooks no larger than "Number 2" hooks, which measure 11 mm (0.44 inches) point to shank, and up to 1 lb (0.45 kg) of weight per line are not subject to the RCAs.					
13	Arrowtooth flounder						
14	Petrale sole						
15	Rex sole						
16	All other flatfish[b/]						
17	Whitingc/	10,000 lb/ trip					
18	Minor shelf rockfish, widow, and yellowtail rockfish[d/]						
19	40°10' - 34°27' N. lat.	300 lb/ 2 months	CLOSED[e/]	200 lb/ 2 months		300 lb/ 2 months	
20	South of 34°27' N. lat.	CLOSED[e/]	2,000 lb/ 2 months				
21	Chilipepper rockfish	2,000 lb/ 2 months, this opportunity only available seaward of the nontrawl RCA					
22	Canary rockfish	CLOSED[e/]					
23	Yelloweye rockfish	CLOSED[e/]					
24	Cowcod	CLOSED[e/]					
25	Bocaccio						
26	40°10' - 34°27' N. lat.	200 lb/ 2 months	CLOSED[e/]	100 lb/ 2 months		200 lb/ 2 months	
27	South of 34°27' N. lat.	CLOSED[e/]	300 lb/ 2 months				

TABLE 2.2-13. 2004 trip limits for limited entry fixed gear south of 40°10' n. lat.[a/] Other limits and requirements apply. Read Sections IV. A. and B. NMFS actions before using this table. (Page 2 of 2)

		JAN-FEB	MAR-APR	MAY-JUN	JUL-AUG	SEP-OCT	NOV-DEC
28	Minor nearshore rockfish						
29	Shallow nearshore						
30	40°10' - 34°27' N. lat.	300 lb/ 2 months	CLOSED[e/]	500 lb/ 2 months	600 lb/ 2 months	500 lb/ 2 months	300 lb/ 2 months
31	South of 34°27' N. lat.	CLOSED[e/]	300 lb/ 2 months				
32	Deeper nearshore						
33	40°10' - 34°27' N. lat.	500 lb/ 2 months	CLOSED[e/]	500 lb/ 2 months		400 lb/month	500 lb/ 2 months
34	South of 34°27' N. lat.	CLOSED[e/]	500 lb/ 2 months	600 lb/ 2 months			400 lb/ 2 months
35	California scorpionfish	CLOSED[e/]	300 lb/ 2 months		400 lb/ 2 months		300 lb/ 2 months
36	Lingcod[f/]	CLOSED[e/]		400 lb/ month, when nearshore open			CLOSED[e/]
37	Other fish[h/]	Not limited					

a/ "South" means 40°10' N. lat. to the U.S./Mexico border. 40°10' N. lat. is about 20 nm south of Cape Mendocino, CA.

b/ "Other flatfish" means all flatfish at 50 CFR 660.302 except those in this Table 4 with species specific management measures, including trip limits.

c/ The whiting "per trip" limit in the Eureka area shoreward of 100 fm is 10,000 lb/ trip all year. Outside Eureka area, the 20,000 lb/ trip limit applies. See IV. B.(3).

d/ POP is included in the trip limits for minor slope rockfish.

e/ Closed means that it is prohibited to take and retain, possess, or land the designated species in the time or area indicated. See IV. A.(7).

f/ The minimum size limit for lingcod is 24 inches (61 cm) total length.

g/ The "Rockfish Conservation Area" is a gear and/or sector specific closed area generally described by depth contours but specifically defined by lat/long coordinates set out at IV. A.(17)(f) that may vary seasonally.

h/ Other fish are defined at 50 CFR 660.302, as those groundfish species or species groups for which there is no trip limit, size limit, quota, or harvest guideline.

TABLE 2.2-14. Revised 2004 sablefish primary fishery tier limits and projected bycatch of depleted species associated with all sablefish catch in the limited entry fixed gear fishery under the No Action Alternative. Seaward boundary of RCA at 100 fm North of 40°10' and at 150 fm South of 40°10'. (Page 1 of 1)

	Coastwide	Gear rates and bycatch		Combined
	summary	Longline	Pot	bycatch
Total catch allocated (mt)	**2,545**			
Observed sablefish discard rate	15.91%	14.89%	18.00%	
Discard mortality percentage of landed mt + discarded mt	3.65%	3.39%	4.207%	
Assumed discard mortality (mt)	93			
Landed catch target (mt)	**2,452**			
Amount allocated to:				
DTL (mt)	368			
Primary fishery (mt)	**2,084**			
Primary fishery tier limits (lb)				
Tier 1	64,253	64,300		
Tier 2	29,206	29,200		
Tier 3	16,689	16,700		
Percent of total catch, by area	100%			
Percent of area catch, by gear		63.1%	36.8%	
Estimated distribution of total catch, by gear	2,545	1,607	938	
Bycatch ratios[a/]				
Lingcod		0.368%	0.148%	
Widow rockfish		0.001%	0.000%	
Canary rockfish		0.036%	0.000%	
Yelloweye rockfish		0.081%	0.000%	
Bocaccio rockfish[b/]		0.000%	0.000%	
Cowcod rockfish[b/]		0.000%	0.000%	
Pacific ocean perch		0.018%	0.000%	
Darkblotched rockfish		0.045%	0.009%	
Projected bycatch impacts (mt)				
Lingcod		5.9	1.4	**7.3**
Widow rockfish		0.0	0.0	**0.0**
Canary rockfish		0.6	0.0	**0.6**
Yelloweye rockfish		1.3	0.0	**1.3**
Bocaccio rockfish[b/]		0.0	0.0	**0.0**
Cowcod rockfish[b/]		0.0	0.0	**0.0**
Pacific ocean perch		0.3	0.0	**0.3**
Darkblotched rockfish		0.7	0.1	**0.8**

a/ The bycatch ratios are calculated by dividing the total catch of each species by the total poundage of sablefish that was caught.

b/ Please note that the observer data on which these rates are based include no observations from south of Ft. Bragg, CA, so these are likely underestimates of true bycatch.

TABLE 2.2-15. Proposed 2005 sablefish primary fishery tier limits and projected bycatch of depleted species associated with all sablefish catch in the limited entry fixed-gear fishery under all action alternatives. (Page 1 of 2)

	Action Alternatives											
	Alt.1 Seaward boundary of the RCA at 150 fm				Alt. 2 Seaward boundary of the RCA at 125 fm				Alt. 3 Seaward boundary of the RCA at 100 fm			
	Fleet summary	Gear rates/bycatch Longline	Gear rates/bycatch Pot	Coastwide bycatch	Fleet summary	Gear rates/bycatch Longline	Gear rates/bycatch Pot	Coastwide bycatch	Fleet summary	Gear rates/bycatch Longline	Gear rates/bycatch Pot	Coastwide bycatch
Total catch allocated (mt)	**2,536**				**2,536**				**2,536**			
Observed sablefish discard rate	18.49%	19.24%	17.82%		15.6%	16.42%	17.84%		15.6%	14.12%	18.01%	
Discard mortality percentage of landed mt + discarded mt	**4.3%**	**4.5%**	**4.2%**		**4.0%**	**3.8%**	**4.2%**		**3.6%**	**3.2%**	**4.2%**	
Assumed discard mortality (mt)	110				100				90			
Landed catch target (mt)	**2,426**				**2,436**				**2,446**			
Amount allocated to:												
DTL (mt)	364				365				367			
Primary fishery (mt)	**2,062**				**2,070**				**2,079**			
Primary fishery tier limits (lb)												
Tier 1	63,574	63,600			63,833	63,800			64,087	64,100		
Tier 2	28,897	28,900			29,015	29,000			29,131	29,100		
Tier 3	16,513	16,500			16,580	16,600			16,646	16,600		
Percent of catch, by gear		65%	35%			65%	35%			65%	35%	
Amount of catch, by gear	2,536	1,648	888		2,536	1,648	888		2,536	1,648	888	
Bycatch ratios[a/]												
Lingcod		0.183%	0.059%			0.282%	0.080%			0.400%	0.151%	
Widow rockfish		0.000%	0.000%			0.000%	0.000%			0.001%	0.000%	
Canary rockfish		0.005%	0.000%			0.025%	0.000%			0.042%	0.000%	
Yelloweye rockfish		0.034%	0.000%			0.060%	0.000%			0.089%	0.000%	
Bocaccio rockfish[b/]		0.000%	0.000%			0.000%	0.000%			0.000%	0.000%	
Cowcod rockfish [b/]		0.000%	0.000%			0.000%	0.000%			0.000%	0.000%	
Pacific ocean perch		0.024%	0.000%			0.022%	0.000%			0.017%	0.000%	
Darkblotched rockfish		0.068%	0.009%			0.055%	0.009%			0.041%	0.009%	

TABLE 2.2-15. Proposed 2005 sablefish primary fishery tier limits and projected bycatch of depleted species associated with all sablefish catch in the limited entry fixed-gear fishery under all action alternatives. (Page 2 of 2)

	Action Alternatives											
	Alt.1 Seaward boundary of the RCA at 150 fm				Alt. 2 Seaward boundary of the RCA at 125 fm				Alt. 3 Seaward boundary of the RCA at 100 fm			
	Fleet summary	Gear rates/bycatch		Coastwide bycatch	Fleet summary	Gear rates/bycatch		Coastwide bycatch	Fleet summary	Gear rates/bycatch		Coastwide bycatch
		Longline	Pot			Longline	Pot			Longline	Pot	
Projected bycatch mortality impacts (mt)												
Lingcod		3.0	0.5	**3.5**		4.7	0.7	**5.4**		6.6	1.3	**7.9**
Widow rockfish		0.0	0.0	**0.0**		0.0	0.0	**0.0**		0.0	0.0	**0.0**
Canary rockfish		0.1	0.0	**0.1**		0.4	0.0	**0.4**		0.7	0.0	**0.7**
Yelloweye rockfish		0.6	0.0	**0.6**		1.0	0.0	**1.0**		1.5	0.0	**1.5**
Bocaccio rockfish [b/]		0.0	0.0	**0.0**		0.0	0.0	**0.0**		0.0	0.0	**0.0**
Cowcod rockfish [b/]		0.0	0.0	**0.0**		0.0	0.0	**0.0**		0.0	0.0	**0.0**
Pacific ocean perch		0.4	0.0	**0.4**		0.4	0.0	**0.4**		0.3	0.0	**0.3**
Darkblotched rockfish		1.1	0.1	**1.2**		0.9	0.1	**1.0**		0.7	0.1	**0.8**

a/ The bycatch ratios are calculated by dividing the total catch of each species by the total poundage of sablefish that was caught.

b/ Please note that the observer data on which these rates are based include no observations from south of Ft. Bragg, CA, so these are likely underestimates of true bycatch.

TABLE 2.2-16. Proposed 2005 sablefish primary fishery tier limits and projected bycatch of depleted species associated with all sablefish catch in the limited entry fixed gear fishery assuming the same RCA configuration as in the No Action Alternative. Seaward boundary of RCA at 100 fm North of 40°10' and at 150 fm South of 40°10'. (Page 1 of 1)

	Coastwide	Gear rates and bycatch		Combined
	summary	Longline	Pot	bycatch
Total catch allocated (mt)	**2,536**			
Observed sablefish discard rate	15.91%	14.89%	18.00%	
Discard mortality percentage of				
landed mt + discarded mt	3.65%	3.39%	4.207%	
Assumed discard mortality (mt)	93			
Landed catch target (mt)	**2,443**			
Amount allocated to:				
DTL (mt)	367			
Primary fishery (mt)	**2,077**			
Primary fishery tier limits (lb)				
Tier 1	64,034	64,000		
Tier 2	29,106	29,100		
Tier 3	16,632	16,600		
Percent of total catch, by area	100%			
Percent of area catch, by gear		63.2%	36.9%	
Estimated distribution of total catch, by gear	2,536	1,601	935	
Bycatch ratios[a/]				
Lingcod		0.368%	0.148%	
Widow rockfish		0.001%	0.000%	
Canary rockfish		0.036%	0.000%	
Yelloweye rockfish		0.081%	0.000%	
Bocaccio rockfish[b/]		0.000%	0.000%	
Cowcod rockfish[b/]		0.000%	0.000%	
Pacific ocean perch		0.018%	0.000%	
Darkblotched rockfish		0.045%	0.009%	
Projected bycatch impacts (mt)				
Lingcod		5.9	1.4	**7.3**
Widow rockfish		0.0	0.0	**0.0**
Canary rockfish		0.6	0.0	**0.6**
Yelloweye rockfish		1.3	0.0	**1.3**
Bocaccio rockfish[b/]		0.0	0.0	**0.0**
Cowcod rockfish[b/]		0.0	0.0	**0.0**
Pacific ocean perch		0.3	0.0	**0.3**
Darkblotched rockfish		0.7	0.1	**0.8**

a/ The bycatch ratios are calculated by dividing the total catch of each species by the total poundage of sablefish that was caught.
b/ Please note that the observer data on which these rates are based include no observations from south of Ft. Bragg, CA, so these are likely underestimates of true bycatch.

TABLE 2.2-17. 2004 trip limits for open access gears north of 40°10' N. lat.[a/] Other limits and requirements apply. Read Sections IV. A. and C. NMFS actions before using this table. (Page 1 of 1)

		JAN-FEB	MAR-APR	MAY-JUN	JUL-AUG	SEP-OCT	NOV-DEC
	Rockfish Conservation Area[h/] (RCA):						
	North of 46°16' N. lat.	shoreline - 100 fm					
	46°16' N. lat. - 40°10' N. lat.	30 fm - 100 fm					
1	Minor slope rockfish[b/]	Per trip, no more than 25% of weight of the sablefish landed					
2	Pacific ocean perch	100 lb/ month					
3	Sablefish	300 lb/ day, or 1 landing per week of up to 900 lb, not to exceed 3,600 lb/ 2 months					
4	Thornyheads	CLOSED[e/]					
5	Dover sole	3,000 lb/month, no more than 300 lb of which may be species other than Pacific sanddabs.					
6	Arrowtooth flounder						
7	Petrale sole						
8	Rex sole						
9	All other flatfish[c/]						
10	Whiting	300 lb/ month					
11	Minor shelf rockfish, widow and yellowtail rockfish[b/]	200 lb/ month					
12	Canary rockfish	CLOSED[e/]					
13	Yelloweye rockfish	CLOSED[e/]					
14	Minor nearshore rockfish	5,000 lb/ 2 months, no more than 1,200 lb of which may be species other than black or blue rockfish[f/]					
15	Lingcod[f/]	CLOSED[e/]		300 lb/ month			CLOSED[e/]
16	Other Fish[g/]	Not limited					
17	PINK SHRIMP EXEMPTED TRAWL (not subject to RCAs)						
18	North	Effective April 1 - October 31, 2004: groundfish 500 lb/day, multiplied by the number of days of the trip, not to exceed 1,500 lb/trip. The following sublimits also apply and are counted toward the overall 500 lb/day and 1,500 lb/trip groundfish limits: lingcod 300 lb/month (minimum 24 inch size limit); sablefish 2,000 lb/month; canary, thornyheads and yelloweye rockfish are PROHIBITED. All other groundfish species taken are managed under the overall 500 lb/day and 1,500 lb/trip groundfish limits. Landings of these species count toward the per day and per trip groundfish limits and do not have species-specific limits. The amount of groundfish landed may not exceed the amount of pink shrimp landed.					
19	SALMON TROLL						
20	North	Salmon trollers may retain and land up to 1 lb of yellowtail rockfish for every 2 lbs of salmon landed, with a cumulative limit of 200 lb/month, both within and outside of the RCA. This limit is within the 200 lb per month combined limit for minor shelf rockfish, widow rockfish and yellowtail rockfish, and not in addition to that limit. All groundfish species are subject to the open access limits, seasons and RCA restrictions listed in the table above.					

[a/] "North" means 40°10' N. lat. to the U.S.-Canada border. 40°10' N. lat. is about 20 nm south of Cape Mendocino, CA.

[b/] Bocaccio and chilipepper rockfishes are included in the trip limits for minor shelf rockfish and splitnose rockfish is included in the trip limits for minor slope rockfish.

[c/] "Other flatfish" means all flatfish at 50 CFR 660.302 except those in this Table 5 with species specific management measures, including trip limits.

[d/] For black rockfish north of Cape Alava (48°09'30" N. lat.), and between Destruction Island (47°40' N. lat.) and Leadbetter Point (46°38'10" N. lat.), there is an additional limit of 100 lbs or 30 percent by weight of all fish on board, whichever is greater, per vessel, per fishing trip.

[e/] Closed means that it is prohibited to take and retain, possess, or land the designated species in the time or area indicated. See IV. A.(7).

[f/] The size limit for lingcod is 24 inches (61 cm) total length.

[g/] Other fish are defined at 50 CFR 660.302, as those groundfish species or species groups for which there is no trip limit, size limit, quota, or harvest guideline.

[h/] The "Rockfish Conservation Area" is a gear and/or sector specific closed area generally described by depth contours, but specifically defined by lat./long. coordinates set out at IV. A.(17)(f), that may vary seasonally.

TABLE 2.2-18. 2004 trip limits for open access gears south of 40°10' N. lat.[a/] other limits and requirements apply. Read Sections IV. A. and C. NMFS actions before using this table. (Page 1 of 2)

		JAN-FEB	MAR-APR	MAY-JUN	JUL-AUG	SEP-OCT	NOV-DEC
	Rockfish Conservation Area[g/] (RCA):						
	40°10' - 34°27' N. lat.	30 fm - 150 fm (also applies around islands, there is an additional closure between the shoreline and 10 fm around the Farallon Islands)		20 fm - 150 fm (also applies around islands, there is an additional closure between the shoreline and 10 fm around the Farallon Islands)		30 fm - 150 fm (also applies around islands, there is an additional closure between the shoreline and 10 fm around the Farallon Islands)	
	South of 34°27' N. lat.	60 fm - 150 fm (also applies around islands)					
1	Minor slope rockfish[b/]						
2	40°10' - 38° N. lat.	Per trip, no more than 25% of weight of the sablefish landed					
3	South of 38° N. lat.	10,000 lb/ 2 months					
4	Splitnose	200 lb/ month					
5	Sablefish						
6	40°10' - 36° N. lat.	300 lb/ day, or 1 landing per week of up to 900 lb, not to exceed 3,600 lb/ 2 months					
7	South of 36° N. lat.	350 lb/ day, or 1 landing per week of up to 1,050 lb					
8	Thornyheads						
9	40°10' - 34°27' N. lat.	CLOSED[e/]					
10	South of 34°27' N. lat.	50 lb/ day, no more than 1,000 lb/ 2 months					
11	Dover sole	3,000 lb/month, no more than 300 lb of which may be species other than Pacific sanddabs. When fishing for Pacific sanddabs, vessels using hook-and-line gear with no more than 12 hooks per line, using hooks no larger than "Number 2" hooks, which measure 11 mm (0.44 inches) point to shank, and up to 1 lb of weight per line are not subject to the RCAs.					
12	Arrowtooth flounder						
13	Petrale sole						
14	Rex sole						
15	All other flatfish[c/]						
16	Whiting	300 lb/ month					
17	Minor shelf rockfish, widow and chilipepper rockfish[b/]						
18	40°10' - 34°27' N. lat.	300 lb/ 2 months	CLOSED[e/]	200 lb/ 2 months		300 lb/ 2 months	
19	South of 34°27' N. lat.	CLOSED[e/]	500 lb/ 2 months				
20	Canary rockfish	CLOSED[e/]					
21	Yelloweye rockfish	CLOSED[e/]					
22	Cowcod	CLOSED[e/]					
23	Bocaccio						
24	40°10' - 34°27' N. lat.	200 lb/ 2 months	CLOSED[e/]	100 lb/ 2 months		200 lb/ 2 months	
25	South of 34°27' N. lat.	CLOSED[e/]	100 lb/ 2 months				
26	Minor nearshore rockfish						
27	Shallow nearshore						
28	40°10' - 34°27' N. lat.	300 lb/ 2 months	CLOSED[e/]	500 lb/ 2 months	600 lb/ 2 months	500 lb/ 2 months	300 lb/ 2 months
29	South of 34°27' N. lat.	CLOSED[e/]	300 lb/ 2 months				
30	Deeper nearshore						
31	40°10' - 34°27' N. lat.	500 lb/ 2 months	CLOSED[e/]	500 lb/ 2 months		400 lb/month	500 lb/ 2 months
32	South of 34°27' N. lat.	CLOSED[e/]	500 lb/ 2 months	600 lb/ 2 months			400 lb/ 2 months
33	California scorpionfish	CLOSED[e/]	300 lb/ 2 months		400 lb/ 2 months		300 lb/ 2 months

TABLE 2.2-18. 2004 trip limits for open access gears south of 40°10' N. lat.[a/] other limits and requirements apply. Read Sections IV. A. and C. NMFS actions before using this table. (Page 2 of 2)

		JAN-FEB	MAR-APR	MAY-JUN	JUL-AUG	SEP-OCT	NOV-DEC
34	Lingcod[d/]	CLOSED[e/]		300 lb/ month, when nearshore open			CLOSED[e/]
35	Other Fish[f/]	Not limited					
36	PINK SHRIMP EXEMPTED TRAWL GEAR (not subject to RCAs)						
37	South	Effective April 1 - October 31, 2004: Groundfish 500 lb/day, multiplied by the number of days of the trip, not to exceed 1,500 lb/trip. The following sublimits also apply and are counted toward the overall 500 lb/day and 1,500 lb/trip groundfish limits: lingcod 300 lb/ month (minimum 24 inch size limit); sablefish 2,000 lb/ month; canary, thornyheads and yelloweye rockfish are PROHIBITED. All other groundfish species taken are managed under the overall 500 lb/day and 1,500 lb/trip groundfish limits. Landings of these species count toward the per day and per trip groundfish limits and do not have species-specific limits. The amount of groundfish landed may not exceed the amount of pink shrimp landed.					
38	PRAWN AND, SOUTH OF 38°57'30" N. LAT., CALIFORNIA HALIBUT AND SEA CUCUMBER EXEMPTED TRAWL						
39	EXEMPTED TRAWL Rockfish Conservation Area[g/] (RCA):						
40	40°10' - 34°27' N. lat.	75 fm - 150 fm (additional closure between the shoreline and 10 fm around the Farallon Islands)		100 fm - 150 fm (additional closure between the shoreline and 10 fm around the Farallon Islands)		75 fm - 150 fm (additional closure between the shoreline and 10 fm around the Farallon Islands)	
41	South of 34°27' N. lat.	75 fm - 150 fm along the mainland coast; shoreline - 150 fm around islands		100 fm - 150 fm along the mainland coast; shoreline - 150 fm around islands		75 fm - 150 fm along the mainland coast; shoreline - 150 fm around islands	
42		Groundfish 300 lb/trip. Trip limits in this table also apply and are counted toward the 300 lb groundfish per trip limit. The amount of groundfish landed may not exceed the amount of the target species landed, except that the amount of spiny dogfish landed may exceed the amount of target species landed. Spiny dogfish are limited by the 300 lb/trip overall groundfish limit. The daily trip limits for sablefish coastwide and thornyheads south of Pt. Conception and the overall groundfish "per trip" limit may not be multiplied by the number of days of the trip. Vessels participating in the California halibut fishery south of 38o57'30" N. lat. are allowed to (1) land up to 100 lb/day of groundfish without the ratio requirement, provided that at least one California halibut is landed and (2) land up to 3,000 lb/month of flatfish, no more than 300 lb of which may be species other than Pacific sanddabs, sand sole, starry flounder, rock sole, curlfin sole, or California scorpionfish (California scorpionfish is also subject to the trip limits and closures in line 33).					

a/ "South" means 40°10' N. lat. to the U.S.-Mexico border. 40°10' N. lat. is about 20 nm south of Cape Mendocino, CA.

b/ Yellowtail rockfish is included in the trip limits for minor shelf rockfish and POP is included in the trip limits for minor slope rockfish.

c/ "Other flatfish" means all flatfish at 50 CFR 660.302 except those in this Table 5 with species specific management measures, including trip limits.

d/ The size limit for lingcod is 24 inches (61 cm) total length.

e/ Closed means that it is prohibited to take and retain, possess, or land the designated species in the time or area indicated. See IV. A.(7).

f/ Other fish are defined at 50 CFR 660.302, as those groundfish species or species groups for which there is no trip limit, size limit, quota, or harvest guideline.

g/ The "Rockfish Conservation Area" is a gear and/or sector specific closed area generally described by depth contours, but specifically defined by lat./long. coordinates set out at IV. A.(17)(f), that may vary seasonally.

Southern RLMA Proposed 2005-06 Recreational Regulations

Species	Jan	Feb	Mar	Apr	May	Jun	July	Aug	Sep	Oct	Nov	Dec
Nearshore rockfish[a/]	▒	▒	▒	▒	< 40fm	< 40fm	< 40fm	< 40fm	< 40fm	▒	▒	▒
Shelf rockfish[b/]	▒	▒	▒	▒	< 40fm	< 40fm	< 40fm	< 40fm	< 40fm	▒	▒	▒
California scorpionfish	▒	▒	< 40fm	< 40fm	▒	▒	< 40fm	< 40fm	< 40fm	▒	▒	▒
Cabezon	▒	▒	▒	▒	< 40fm	< 40fm	< 40fm	< 40fm	< 40fm	▒	▒	▒
Greenlings (rock, kelp)	▒	▒	▒	▒	< 40fm	< 40fm	< 40fm	< 40fm	< 40fm	▒	▒	▒
California sheephead	▒	▒	▒	▒	< 40fm	< 40fm	< 40fm	< 40fm	< 40fm	▒	▒	▒
Ocean whitefish	▒	▒	▒	▒	< 40fm	< 40fm	< 40fm	< 40fm	< 40fm	▒	▒	▒
Lingcod	▨	▨	▨	▒	< 40fm	< 40fm	< 40fm	< 40fm	< 40fm	▒	▨	▨
Sanddabs												

Key:

	Allowed in all depths
< 40fm	Allowed only in waters < 40fm
▒	Closed
▨	Lingcod closed nesting season

a/ Nearshore rockfish are defined as black rockfish, black-and-yellow rockfish, blue rockfish, brown rockfish calico rockfish, China rockfish, copper rockfish, gopher rockfish, grass rockfish, kelp rockfish, olive rockfish, quillback rockfish, and treefish.

b/ Shelf rockfish include bocaccio, canary, cowcod, widow, yelloweye, yellowtail, shortbelly, bronzespotted chameleon, chilipepper, dwarf-red, flag, freckled, greenblotched, greenspotted, greenstriped, halfbanded, honeycomb, Mexican, pink, pinkrose, pygmy, redstripe, rosethorn, rosy, silvergrey, speckled, squarespot, starry, stripetail, swordspine, tiger, and vermilion rockfish. Note that the retention of canary, yelloweye, and cowcod rockfish is prohibited.

FIGURE 2.2-1. Proposed 2005-2006 California recreational fishery regulations for the Southern Rockfish/Lingcod Management Area south of Pt. Conception.

Central RLMA Proposed 2005-06 Recreational Regulations

Species	Jan	Feb	Mar	Apr	May	Jun	July	Aug	Sep	Oct	Nov	Dec
Nearshore rockfish[a/]	▒	▒	▒	▒	▒	< 40fm	< 20fm	< 20fm	< 20fm	< 20fm	▒	▒
Shelf rockfish[b/]	▒	▒	▒	▒	▒	< 40fm	< 20fm	< 20fm	< 20fm	< 20fm	▒	▒
California scorpionfish	▒	▒	▒	▒	▒	< 40fm	< 20fm	< 20fm	< 20fm	< 20fm	▒	▒
Cabezon	▒	▒	▒	▒	▒	< 40fm	< 20fm	< 20fm	< 20fm	< 20fm	▒	▒
Greenlings (rock, kelp)	▒	▒	▒	▒	▒	< 40fm	< 20fm	< 20fm	< 20fm	< 20fm	▒	▒
California sheephead	▒	▒	▒	▒	▒	< 40fm	< 20fm	< 20fm	< 20fm	< 20fm	▒	▒
Ocean whitefish	▒	▒	▒	▒	▒	< 40fm	< 20fm	< 20fm	< 20fm	< 20fm	▒	▒
Lingcod	▨	▨	▨	▒	▒	< 40fm	< 20fm	< 20fm	< 20fm	< 20fm	▨	▨
Sanddabs												

Key:

	Allowed in all depths
< 20fm	Allowed only in waters < 20fm
< 40fm	Allowed only in waters < 40fm
▒	Closed
▨	Lingcod closed nesting season

a/ Nearshore rockfish are defined as black rockfish, black-and-yellow rockfish, blue rockfish, brown rockfish, calico rockfish, China rockfish, copper rockfish, gopher rockfish, grass rockfish, kelp rockfish, olive rockfish, quillback rockfish, and treefish.

b/ Shelf rockfish include bocaccio, canary, cowcod, widow, yelloweye, yellowtail, shortbelly, bronzespotted chameleon, chilipepper, dwarf-red, flag, freckled, greenblotched, greenspotted, greenstriped, halfbanded, honeycomb, Mexican, pink, pinkrose, pygmy, redstripe, rosethorn, rosy, silvergrey, speckled, squarespot, starry, stripetail, swordspine, tiger, and vermilion rockfish. Note that the retention of canary, yelloweye, and cowcod rockfish is prohibited.

FIGURE 2.2-2. Proposed 2005-2006 California recreational fishery regulations for the Central Rockfish/Lingcod Management Area north of Pt. Conception to Cape Mendocino.

Northern RLMA Proposed 2005-06 Recreational Regulations

Species	**Jan**	**Feb**	**Mar**	**Apr**	**May**	**Jun**	**July**	**Aug**	**Sep**	**Oct**	**Nov**	**Dec**
Nearshore rockfish[a/]	■	■	■	■	■	■	< 40fm	< 40fm	< 40fm	< 40fm	■	■
Shelf rockfish[b/]	■	■	■	■	■	■	< 40fm	< 40fm	< 40fm	< 40fm	■	■
Cabezon	■	■	■	■	■	■	< 40fm	< 40fm	< 40fm	< 40fm	■	■
Greenling (rock, kelp)	■	■	■	■	■	■	< 40fm	< 40fm	< 40fm	< 40fm	■	■
California sheephead	■	■	■	■	■	■	< 40fm	< 40fm	< 40fm	< 40fm	■	■
Ocean whitefish	■	■	■	■	■	■	< 40fm	< 40fm	< 40fm	< 40fm	■	■
Lingcod	◩	◩	◩	■	■	■	< 40fm	< 40fm	< 40fm	< 40fm	◩	◩

Key:

< 40fm	Allowed only in waters < 40fm
■	Closed
◩	Lingcod closed nesting season

a/ Nearshore rockfish are defined as black rockfish, black-and-yellow rockfish, blue rockfish, brown rockfish, calico rockfish, China rockfish, copper rockfish, gopher rockfish, grass rockfish, kelp rockfish, olive rockfish, quillback rockfish, and treefish.

b/ Shelf rockfish include bocaccio, canary, cowcod, widow, yelloweye, yellowtail, shortbelly, bronzespotted chameleon, chilipepper, dwarf-red, flag, freckled, greenblotched, greenspotted, greenstriped, halfbanded, honeycomb, Mexican, pink, pinkrose, pygmy, redstripe, rosethorn, rosy, silvergrey, speckled, squarespot, starry, stripetail, swordspine, tiger, and vermilion rockfish. Note that the retention of canary, yelloweye, and cowcod rockfish is prohibited.

FIGURE 2.2-3. Proposed 2005-2006 California recreational fishery regulations for the Northern Rockfish/Lingcod Management Area north of Cape Mendocino.

3.0 WEST COAST MARINE ECOSYSTEMS AND ESSENTIAL FISH HABITAT

3.1 Affected Environment

3.1.1 West Coast Marine Ecosystems

Appendix A, Section 2.3.1 describes the West Coast fishery ecosystem. Marine ecosystems are influenced by the characteristics of the water column and underlying substrate. Key factors in the water column include water depth and temperature, vertical mixing, and currents. Temperature and depth place physiological limits on the distribution of species. Depth and water turbidity determine light penetration, which is required for primary production by phytoplankton. Vertical and horizontal mixing bring nutrients into the photic zone, the upper layers where light penetrates, further influencing the level of primary production. Large-scale surface and subsurface current systems affect water temperature, nutrients, and the transport of planktonic life forms, including larval fish. Nearshore and continental shelf zones are the most productive areas because the relatively shallow depths allow light penetration throughout the water column and complete mixing. Nonetheless, commercially important groundfish species are also found on the continental slope, the zone marking the transition from the shallower shelf to the deep abyssal plain. Physical characteristics of the bottom affect ecosystems. Large coastal features—islands and embayments, for example—affect water circulation. Bottom topography is important to the distribution of benthic species. As implied by their name, many rockfish species prefer hard substrate; flatfish, including commercially important species like Dover sole, require sand or mud substrate.

Climate change is also an important influence on the productivity of marine ecosystems, which in turn has an important effect on fishery production. Scientists have become more aware of cyclical climate changes in recent years. Many people are aware of the El Niño-Southern Oscillation phenomenon; strong events have had noticeable effects across the Pacific and continental U.S. El Niño events also affect West Coast marine ecosystems. During such an event warm water moves up the West Coast, inhibiting the upwelling of cold nutrient-rich water. With less nutrients available in the photic zone, primary production suffers, which also affects species higher up on the food chain, including many commercially important groundfish species. Scientists have also identified a much longer climate cycle, which they have dubbed the Pacific Decadal Oscillation, or PDO. This is a shift between periods of relatively warm sea surface temperatures off the West Coast and cooler water. During the warm phase, as with El Niño, fisheries production suffers. Scientists now realize that a warm phase began around 1976 and 1977, just at the time that domestic fisheries were expanding. As harvest rates increased dramatically, fish stocks were becoming less productive. By examining climate records scientists estimate that these cycles last for about 20 years, and there is evidence that West Coast waters recently entered a cooler phase, which should enhance productivity. This phenomenon is important when considering overfished species, because stock productivity is a key factor in estimating how much fishing mortality a stock can sustain and still rebuild in the time period dictated by the rebuilding plan.

3.1.2 Essential Fish Habitat

The MSA, as amended by the 1996 Sustainable Fisheries Act, requires NMFS and federal fishery councils to describe essential fish habitat (EFH) for the species they manage. They must also enumerate potential threats to EFH from both fishing and non-fishing activities. These descriptions are compiled as part of each FMP. NMFS completed this task for the West Coast in 1998. EFH descriptions have been incorporated into the groundfish FMP in a detailed appendix (available online at: http://www.nwr.noaa.gov/1sustfsh/efhappendix/page1.html). However, a subsequent court challenge at the national level has required NMFS and the fishery councils to go back and do a better job of identifying, characterizing, and proposing protection measures for EFH. NMFS Northwest Region is currently preparing an EIS to address this challenge. The completion date for this project is early 2006. Chapter 4 in Appendix A gives an overview of how EFH for the West Coast has been identified and characterized to date. That section of the appendix also details what is known about the effects of fishing and non-fishing activities on EFH.

Because EFH must be identified for each life stage of each species in the fishery management unit, when taken together groundfish EFH covers all marine and coastal waters in the West Coast EEZ. Currently, seven composite characterizations of different types have EFH have been identified. These are broad classifications based on bottom type, topography, and water depth.

Management measure alternatives that affect fishing activities having potential adverse effects on EFH must be evaluated. Evaluation of fishery effects on EFH is done through a consultation process with the NMFS Office of Habitat Conservation. One method of evaluating fishery effects is based on fishing effects on habitat types. As discussed in the groundfish FMP, fishing gear can damage benthic habitat, which may contribute to the kinds of ecological effects described in the previous section. Altered habitat may favor some species, contributing to a change in community structure, and more broadly, to the population productivity of fish populations caught in fisheries.

3.2 Criteria Used to Evaluate Impacts

The proposed action will directly and indirectly affect the level of fishing activity, which—to the degree certain types of fishing gear adversely affect essential fish habitat—could result in differential impacts among the alternatives. Increased fishing effort could lead to an increase in fishing-related impacts while a decrease in fishing effort would have the opposite effect. Thus, changes in fishing effort could be one way to evaluate the relative effects of the alternatives. However, there are limited data available on the distribution, intensity, and duration of fishing effort associated with the groundfish fisheries.[1/] Furthermore, different gear types have different kinds of impacts to habitat, although bottom trawl gear is likely to have the greatest impact because of its extensive contact with substrate. The effects of fishing gear on different types of habitat is not well understood either. For example, in high energy environments (e.g., strong wave action or currents) the relative effect of fishing gear may be modest compared to more stable, low energy environments. Currently, there is insufficient information to fully evaluate the effects of the proposed action on essential fish habitat.

Impacts of the proposed action at the ecosystem level are at least as difficult to predict. The direct effect of fishing authorized under the proposed action is to remove fish from ecosystems. This may change the relative abundance of species at different trophic levels, affecting ecosystem structure and contributing to follow-on indirect and cumulative effects. However, the nature, intensity, and location of these effects are not well-understood, especially across the range of marine ecosystems potentially affected by changes in the abundance of harvested groundfish species.

Given these limitations, projected groundfish landings and proposed closed areas are used as proxies for fishing effort as criteria to assess the relative effects of the alternatives on essential habitat and ecosystem function.

1/ Fishing locations are reported in logbooks required for limited entry trawl vessels. Similar reporting is not required for other sectors catching groundfish. To date, a model has not been developed to predict the distribution and intensity of fishing effort for a given set of management measures. As part of the EFH EIS referenced below, NMFS is developing a model to predict impacts on EFH includes a component for predicting fishing effort distribution and intensity.

When an agency is evaluating reasonably foreseeable significant adverse effects, there is incomplete or unavailable information, and the costs of obtaining it are exorbitant or the means unknown, the agency must: (1) so state, (2) describe the importance of the unavailable information to the assessment, (3) summarize any existing scientific information, and (4) evaluate impacts based on generally accepted scientific principals (40 CFR Part 1502.22), which may accord with the best professional judgement of agency staff. NMFS acknowledges that the information necessary to fully evaluate impacts to EFH and marine ecosystems, as described in the preceding paragraph, cannot be reasonably obtained at this time, and impacts are generally unknown. Necessary information may become available at a future date. As mentioned above, NMFS is preparing an EIS to comprehensively evaluate groundfish habitat and the effects of groundfish fishing on that habitat, in response to litigation (*American Oceans Campaign v. Daley et al.*, Civil Action No 99-982(GK)). This EIS is gathering more information about the effects of fishing in order to evaluate alternatives to minimize fishing effects on EFH to the extent practicable, as required by the Magnuson-Stevens Act. A predictive risk assessment model is being developed for this project, which will be used to develop alternatives for the designation and protection of EFH. The DEIS is scheduled for release in February 2005, and the EIS process will be completed (by signing of the ROD) in February 2006. (Given the schedule for the EFH EIS and the transition to a multi-year management system for groundfish harvest specifications, the earliest that any predictive use of this model might be used would be for the 2007-2008 management cycle.) The following evaluation is based on best professional judgement of NMFS and Council staff.

3.3 Discussion of Direct and Indirect Impacts

Appendix A Chapter 4 describes adverse impacts of fishing gear to essential fish habitat (EFH), including ecosystem effects, in general terms. Ecosystem effects are, almost by definition, indirect. Overfishing has reduced some fish stocks to levels that are a small fraction of estimated unfished biomass and may affect trophic relationships: these species are less available both as prey and predators. Direct effects to habitat result from the deployment of fishing gear that damages benthic habitat. Habitat modification can also have indirect ecological effects because different species may be better adapted to the altered habitat, displacing other species. Bottom trawl footrope restrictions implemented by the Council, which would apply under all the alternatives, make it difficult for fishers to access rock piles and other areas of complex topography (due to the risk of gear damage). This helps protect important, complex habitat and creates defacto refugia for species preferring that habitat type. Biodiversity impacts are directly and indirectly related to overfishing, to the degree that these species are extirpated in all or part of their range. For overfished species, the harvest level (OY) alternatives are based on different legally-compliant rebuilding strategies. The Council has adopted, and NMFS implemented, rebuilding plans for four overfished species—canary rockfish, darkblotched rockfish, lingcod, and Pacific ocean perch. The choice of OYs for these species is dictated by their rebuilding plans. (See Chapter 2 for a discussion of the OY alternatives.) In a separate action, the Council adopted rebuilding plans for the remaining four overfished species—bocaccio, cowcod, widow rockfish, and Pacific ocean perch—at the April 2004 meeting. Harvest level alternatives for these species vary based on the alternatives evaluated in that separate action (PFMC 2004a). In choosing the preferred alternative in that action, and adopting rebuilding plans for those species, the Council determined the harvest levels under the Council-preferred OY alternative for this biennial harvest specifications EIS. Under the rebuilding plans these harvest levels are predicted to rebuild the stocks to a target biomass approximating B_{MSY}, which will also reduce the likelihood of range contraction or extinction. This does not preclude, however, the cumulative effects of unfavorable environmental conditions or biological and behavioral constraints (inhibiting successful reproduction for example), which pose a remote possibility of localized or species extinction. Given the current state of knowledge and available data, it is not possible to quantitatively evaluate the ecosystem, habitat, and biodiversity effects of the alternatives. Section 3.5 qualitatively compares the relative impacts of the alternatives.

The effects of fishery management practices on the physical environment typically include such things as fishing gear effects on the ocean floor, changes in water quality associated with vessel traffic, and fish processing discards as a result of fishing practices. There are no data to suggest that characteristics of the California Current System or topography of the coast change with fishery management or fishing practices. However, there is information to indicate fishery management and fishing practices may have an effect on EFH.

In general, potential bottom trawl fishing-related impacts to groundfish habitat take the form of lost or discarded fishing gear and direct disturbance of the seafloor from contact by trawl nets. While the effects of fishing on groundfish habitat have not been directly investigated, there is some research exploring how gear affects habitat. Auster and Langton (1999) reviewed a variety of studies reporting habitat effects due to fishing for a wide range of habitats and gear types. Commonalities of all studies included immediate effects on species composition and diversity and a reduction of habitat complexity.

Bottom trawling gear is known to modify seafloor habitats by altering benthic habitat complexity and by removing or damaging infauna and sessile organisms (Freese, *et al.* 1999; Friedlander, *et al.* 1999). In a study on the shelf and slope off California, high-resolution sidescan-sonar images of the Eureka area revealed deep gouges on the seafloor believed to be caused by trawl doors (Friedlander *et al.* 1999). The effects of bottom trawling on a “hard bottom” (pebble, cobble, and boulder) seafloor was also investigated in the Gulf of Alaska, and results indicated a significant number of boulders were displaced and emergent epifauna were removed or damaged after a single pass with trawl gear. Casual observations during the Freese *et al.* (1999) study revealed that Sebastes species use cobble-boulder and epifaunal invertebrates for cover. When boulders are displaced they can still provide cover, but when piles of boulders are displaced it reduces the number and complexity of crevices (Freese *et al.* 1999).

Limited qualitative observations of fish traps, longlines, and gillnets dragged across the seafloor during set and retrieval showed results similar to mobile gear, such that some types of organisms living on the seabed were dislodged. Quantitative studies of acute and chronic effects of fixed gear on habitat have not been conducted (Auster and Langton 1999).

In addition to fishing activities, humans have many direct and indirect effects on groundfish habitat. However, these are considered cumulative impacts because the proposed action only regulates fishing activity. For the most part, the alternatives do not

In the last few decades, marine debris has also been recognized as posing a risk to marine organisms via entanglement and ingestion. Seafloor debris was surveyed from Point Conception, California, to the United States/Mexico international border at depths of 10 m to 200 m, and anthropogenic debris occurred on approximately 14% of the mainland shelf. Of the debris sampled, discarded fishing gear had the largest spatial coverage, followed by plastic, metal, and other debris (e.g., shoe soles and automobile parts) (Moore and Allen 1999). Less is known about the quantity of marine debris off Washington and Oregon, but it may be at levels that could negatively affect marine organisms.

3.4 Discussion of Cumulative Impacts

Cumulative effects result primarily in changes in the productivity of ecosystem components, which itself may be a result in fishery-induced changes in ecosystem structure. These factors include:

Climate variability. Climate cycles affect population productivity. Since predictions about future productivity are based on past relationships, between stock size and recruitment for example, if underlying conditions change, these predictions may be inaccurate. Thus, if climate is not or cannot be accounted for when modeling population dynamics, scientists may under- or over-predict population growth and sustainable fishery removals.

Ecosystem structure. Structural change becomes an effect itself (if resulting from fishery removals) that could interact cumulatively with the effects of the alternatives. Ultimately, it is the presence and differing abundances of species that constitutes ecosystem structure. The abundance of a given species is in turn the result of physiographic conditions (water temperature, relief, depth, etc.), processes external to an arbitrarily bounded system (e.g., fishing mortality), and interactions between system components (trophic relationships). Structure can change as a result of internal feedback. For example, scientists have posited “cultivation/depensation effects” that may lead to recruitment failure even though one would expect compensation to declines in biomass (MacCall 2002a; Walters and Kitchell 2001). (Compensatory response assumes that growth and survival are density dependent.)

Non-fishing impacts to habitat. These change physiographic conditions, which may produce changes in ecosystem structure. (See Section 4.4 in Appendix A.) While non-fishing human impacts have not been directly assessed on groundfish habitat, a study of flatfish in Puget Sound, Washington, indicated that anthropogenic stressors included chemical contaminant exposure and alteration of nearshore nursery habitats (Johnson, *et al.* 1998). The New England Fishery Management Council compiled a list of human-induced threats to fish habitat that may be used as a guide to factors affecting groundfish species off the West Coast. Oil, heavy metals, acid, chlorine, radioactive waste, herbicides and pesticides, sediments, greenhouse gases, and ozone loss are thought to be chemical factors that affect fish habitat. Biological threats can include the introduction of non-indigenous species, stimulation of nuisance and toxic algae, and the spread of disease. Human activities that may physically threaten fish habitat are dredging and disposal, mineral harvesting, vessel activity, shoreline alteration, and debris (Wilbur and Pentony 1999). With some notable exceptions (such as the live fish fishery in Southern California) most limited entry and directed open access fisheries do not occur in the inshore areas directly affected by these activities. However, according to EFH descriptions in the groundfish FMP, early life stages of some target species—such as Pacific cod, whiting, bocaccio, and English sole—use estuarine habitat, so these stocks could be affected if nearshore non-fishing activities reduce productivity by damaging habitat.

Past and future fishing activity and related management actions. Excluding whiting, the highest groundfish landings were in 1982, primarily because of very large catches of widow rockfish. Landings were lower, although fairly stable through the 1980s but began to decline steeply beginning in the early 1990s. Non-whiting landings fell by 67% between 1992 and 2002 (See Appendix A Table 6-1a-c, which show historical landings by weight, and exvessel revenue in current and inflation-adjusted dollars.) Using landings as a proxy for changes in fishing effort, past effort was substantially higher than is likely to occur in the near future. This activity likely resulted in substantial impacts to EFH and by reducing fish populations affecting ecosystem structure. The trawl vessel buyback program implemented in December 2003 retired about one third of the limited entry fleet. Although this may allow increases in landing limits and more fishing effort by the remaining vessels, the net effect is likely to be a reduction in total trawl effort. In the foreseeable future, the need to rebuild overfished groundfish stocks will likely constrain fishing effort to levels near or modestly above the level occurring at present. The distribution and intensity of fishing effort, and therefore impacts to EFH, could be affected by measures implemented pursuant to the EFH EIS mentioned above. Any such measures would likely come into effect in 2006.

3.5 Summary of Impacts

As discussed in Section 3.2, currently there is insufficient information to directly predict the impacts of the alternatives on EFH and the West Coast marine ecosystem. Two indirect measures that can be derived from catch projections produced by the trawl bycatch model (Hastie 2001; Hastie [2003]) are the area of the trawl RCA and projected total catch estimates of major target species.[2/] Although other gear types also have adverse impacts on EFH, current information, as discussed above, indicates that trawl gear has the greatest impact. Equally important to this evaluation, model outputs of projected catches are only available for the limited entry trawl sector. The limited entry trawl sector also accounts for a large proportion of landings, mainly north of 40º 10' N. lat. However, when making comparisons across gear types a correlation between landings and effort cannot be applied because of differences in both the unit of effort and catch per unit effort between gear types. For these reasons, projections of activity in the trawl sector is used as a proxy for the relative impact on EFH of the alternatives.

Table 3-1 shows the area of the trawl RCA under each alternative. RCA boundaries vary by two-month period; the values reported in the table are annual averages. The right-hand column expresses the area covered as a percentage of the size of the RCA under Alternative 1, which has the largest RCA. With some exceptions, bottom trawling is prohibited within the RCA. Impacts from bottom trawling are therefore substantially reduced. An alternative which implements an RCA covering a large area could result in reduced fishing impacts to EFH.

Table 3-2 uses catch projections stratified by the area seaward of the RCA versus shoreward of the RCA and north and south of 40º 10' N. lat. to present an index of catches by area. For each stratum the percentage reflects a multiple of lowest projected catch among the alternatives for that stratum. For example, Alternative 1 has the lowest projected catch in the area shoreward of the RCA north of 40º 10' N. lat., represented by the 100% value while the No Action Alternative, using the same modeling outputs, shows a projected catch 1.58 times (158%) Alternative 1 for this area. Projected catches may be used as a proxy for expected effort, although this simple approach must be qualified. Catch per unit effort is likely to vary by area and season because of changes in target species' abundance, bottom characteristics, and fishing strategy. This means that there is unlikely to be a one-to-one correlation between catch and effort when comparing a given area across alternatives and it is not possible to make statements about the relative effects on different areas within an alternative. Projected catches give a more direct indication of ecosystem effects as a measure of the removal of target species' biomass.

Using the two metrics described above, the relative impacts of the alternatives on EFH and marine ecosystems are summarized:

<u>The No Action Alternative</u>. This alternative has the second-largest trawl RCA among the alternatives. Looking at projected catches for all areas (the right-hand column in Table 3-2), the level of effort is likely to be equivalent to Alternatives 2 and 3. Projected catches seaward of the RCA are slightly higher than Alternatives 1 and 2, which may indicate a lower level of effort in these areas in comparison to those two alternatives. The No Action Alternative is predicted to have a greater impact on EFH and marine ecosystems than Alternative 1 and an impact equivalent to Alternatives 2 and 3.

<u>Alternative 1</u>. This alternative has the largest trawl RCA among the alternatives. It also is projected to result in the lowest catches among the alternatives overall and in each area except for seaward of the RCA in the north. Generally, seaward of the RCA Alternatives 1, 2, and 3 have very similar projected catches, which may indicate a similar level of impact on habitats in those areas. Alternative 1 is predicted to have the least impact on EFH and marine ecosystems of the alternatives.

<u>Alternative 2</u>. This alternative and Alternative 3 have the same size trawl RCA, which is two-thirds the size of the RCA under Alternative 1. They also have similar levels of projected catch. Projected catch

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[2/] The target species projections are for sablefish, dover sole, longspine and shortspine thornyheads, arrowtooth flounder, petrale sole, and other flatfish.

under Alternatives 2 and 3 in areas seaward of the RCA is similar to or slightly lower than projected catch under Alternative 1 and No Action, especially in the north. Shoreward of the RCA projected catch is higher than under No Action and Alternative 1. Alternatives 2 and 3 are predicted to affect EFH and marine ecosystems to the same degree, which is greater than Alternative 1 or No Action.

Alternative 3. This alternative is predicted to have an effect indistinguishable form Alternative 2, as discussed above.

Cumulative impacts. External factors that are likely to combine with effects of the proposed action to produce cumulative impacts are described in Section 3.4. There is insufficient information to determine if the relative magnitude of cumulative effects under the different alternatives will differ from the relative magnitude of direct and indirect effects. It is likely, however, that external factors would effect EFH and marine ecosystems in the same degree under all of the alternatives. Therefore, those alternatives producing greater direct and indirect impacts would be expected to result in greater cumulative impacts.

TABLE 3-1. Trawl rockfish conservation area (RCA) area (square miles) under the alternatives.

Alternative	North of 40º10'	South of 40º10'	Total	% of Largest RCA
No Action	9,259	4,394	13,653	91.8%
Alternative 1	10,033	4,832	14,865	100.0%
Alternative 2	5,438	4,394	9,832	66.1%
Alternative 3	5,438	4,394	9,832	66.1%

TABLE 3-2. Total catch of major target species by area by alternative, expressed as a percent of the lowest value in each stratum.

Alternative/Area	Shoreward of RCA	Seaward of RCA	All Areas
No Action			
North	158%	110%	113%
South	171%	109%	
Alternative 1			
North	100%	108%	100%
South	100%	100%	
Alternative 2			
North	234%	100%	112%
South	126%	101%	
Alternative 3			
North	254%	101%	115%
South	126%	102%	

4.0 GROUNDFISH SPECIES

4.1 Affected Environment: Groundfish Species

There are over 80 species of groundfish managed under the groundfish FMP. These species include over 60 species of rockfish in the family *Scorpaenidae*, 7 roundfish species, 12 flatfish species, assorted shark, skate, and a few miscellaneous bottom-dwelling marine fish species. Management of these groundfish species is based on principles outlined in the MSA, groundfish FMP, and national standard guidelines, which provide guidance on the 10 national standards in the MSA. Stock assessments are based on resource surveys, catch trends in West Coast fisheries, and other data sources. Section 7.1.3.4 describes, in general terms, how stock assessments are conducted and reviewed before they are applied in West Coast groundfish management. Table 3.2.0-1 in Appendix A depicts the latitudinal and depth distributions of groundfish species managed under the groundfish FMP.

The passage of the Sustainable Fisheries Act in 1996 incorporated current conservation and rebuilding mandates into the Magnuson-Stevens Act. These mandates, including abundance-based standards for declaring a stock overfished, in a "precautionary" status, or at levels that can support MSY (healthy or "rebuilt"), were subsequently incorporated in the groundfish FMP with adoption of Amendments 11 and 12. The abundance-based reference points for managing West Coast groundfish species are relative to an estimate of "virgin" or unexploited biomass of the stock, which is denoted as B_0 and is defined as the average equilibrium abundance of a stock's spawning biomass before it is affected by fishing-related mortality. The Magnuson-Stevens Act and national standard guidelines employ the MSY concept to frame management objectives. MSY represents a theoretical maximum surplus production from a population of constant size; national standard guidelines define it as "the largest long-term average catch or yield that can be taken from a stock or stock complex under prevailing ecological and environmental conditions." Thus, for a given population, and set of ecological conditions, there is a biomass that produces MSY (denoted as B_{MSY}), which is less than the equilibrium size in the absence of fishing (B_0). (Generally, population sizes above B_{MSY} are less productive, because of competition for resources.) The harvest rate used to specify harvest levels designed to achieve or sustain B_{MSY} is referred to as the Maximum Fishing Mortality Threshold (MFMT, denoted as F_{MSY}). There are two harvest specification reference points defined in the groundfish FMP, a total catch OY and an ABC. The OY is typically the management target and is usually less than the ABC, based on the need to rebuild stocks to B_{MSY} (see the following discussion). The ABC, which is the maximum allowable harvest, is calculated by applying an estimated or proxy F_{MSY} harvest rate to the estimated abundance of the exploitable stock.

The Council-specified proxy MSY abundance for most West Coast groundfish species is 40% of B_0 (denoted as $B_{40\%}$). The Council-specified threshold for declaring a stock overfished is when the stock's spawning biomass declines to less than 25% of B_0 (denoted as $B_{25\%}$). The Magnuson-Stevens Act and national standard guidelines refer to this threshold as the Minimum Stock Size Threshold or MSST. A rebuilding plan that specifies how total fishing-related mortality is constrained to achieve an MSY abundance level within the legally allowed time is required by the MSA and groundfish FMP when a stock is declared overfished.

Stocks estimated to be above the overfishing threshold, yet below an abundance level that supports MSY, are considered to be in the "precautionary zone." The Council has specified precautionary reductions in harvest rate for such stocks to increase abundance to $B_{40\%}$. The methodology for determining this precautionary reduction is described in the groundfish FMP and is referred to as the 40-10 adjustment. As the stock declines below $B_{40\%}$, the total catch OY is reduced from the ABC until, at 10% of B_0, the OY is set to zero. However, in practice the 40-10 adjustment only applies to stocks above $B_{25\%}$ (the MSST) because once a stock falls below this level, an adopted rebuilding plan supplants it. Most stocks with an estimated abundance greater than $B_{40\%}$ are managed by setting harvest to the ABC. Figure 2-3 in Appendix A presents this framework graphically. The California Department of Fish and Game has an analogous precautionary policy to the Council's 40-10 adjustment specified in their nearshore FMP. Called the 60-20 adjustment, the precautionary reduction of OY from the ABC would begin at 60% of B_0 until, at 20% of B_0, the OY is set to zero.

4.2 Criteria Used to Evaluate Impacts

Relative uncertainty of a stock's status is an important evaluation criterion. Most stocks managed under the groundfish FMP have never been assessed. These stocks may need a greater level of precautionary management to prevent overfishing. In cases where other constraints, such as management measures designed to rebuild overfished stocks, limit fishing access to unassessed stocks, precautions may be implicit in the alternatives. However, in other cases, where access to an unassessed stock is not so limited, stock status uncertainty may need to be directly factored into management decisions.

The relative effectiveness of alternative management measures to control fishing-related mortality (to attain but not exceed total catch OYs) is also used as an evaluation criteria despite the uncertainty of catch monitoring/estimating systems in the current management regime. This is because current catch monitoring systems are differentially effective and/or reliable by fishery sector. For instance, the recently-implemented NMFS West Coast Groundfish Observer Program is mandated for the limited entry trawl and the limited entry and open access fixed gear sectors, but not for recreational or tribal fisheries. Also, observer data is only available for the limited entry trawl sector with the limited entry and open access fixed gear observations anticipated in early 2004. Given that some species are differentially impacted by different fishing gears/sectors, data systems used in management by fishery sector and the precautions structured in alternative management measures are important considerations when evaluating impacts.

4.3 Discussion of Direct and Indirect Impacts

4.3.1 Alternative Harvest Levels

Alternative groundfish harvest levels contemplated for a change from status quo (2004 specifications) are based on new stock assessments (cabezon and lingcod), based on projections from the most recent assessment (bocaccio, black rockfish, canary rockfish, cowcod, Dover sole, sablefish, shortspine thornyheads, widow rockfish, yelloweye rockfish, and yellowtail rockfish), based on the potential application of precautionary harvest reductions for stocks and stock complexes that have not been formally assessed (Pacific cod, Other Fish, and Other Flatfish), or based on the need to analyze a range of potential bycatch effects prior to the next formal assessment (Pacific whiting).

4.3.1.1 Cabezon (in Waters off California)

The first assessment of cabezon (*Scorpaenichthys marmoratus*) on the West Coast was done last year (Cope *et al.* 2004) and formally approved by the Council for use in 2005-2006 management decision-making in March 2004. While cabezon are distributed coastwide along the West Coast, this assessment concentrated on the southern portion of the stock in waters off California because it was determined that the available data for the northern portion of the stock was insufficient for population evaluation. The predicted spawning output of the southern cabezon stock was 34.7% of the stocks initial, unfished biomass ($B_{35\%}$). While this is above the minimum stock size threshold (MSST) of $B_{25\%}$, it is below the target level of spawning output that is predicted to support maximum sustainable yield (MSY) of $B_{40\%}$ (or B_{MSY}). Therefore, according to the groundfish harvest policies in California and in Federal regulations, a precautionary reduction of the ABC is appropriate to achieve B_{MSY}. Two precautionary harvest policies are considered in this EIS: the Council's 40-10 rule and the 60-20 rule as specified in California's Nearshore FMP. Dr. Andre Punt, one of the contributing assessment authors, provided cabezon harvest projections for the southern portion of the stock under these two precautionary harvest policies, the ABC rule, and two harvest control rules ($F_{45\%}$ and $F_{50\%}$) (Table 2.1-2). The range of alternative harvest levels analyzed covers the broadest range of projected harvest levels given these varying harvest rates and policies.

The California Fish and Game Commission (CFGC) recommended using the proxy F_{MSY} harvest rate of $F_{45\%}$ (i.e., the harvest rate predicted to build the stock's biomass to B_{MSY}) to set the ABC and the 60-20 precautionary harvest policy to set the OY. Additionally, the CFGC recommended using the 2005-2007 average OY projected using these harvest policies and control rules to establish the 2005 and 2006 cabezon OY. The Council agreed to these recommendations and set a cabezon OY of 69 mt for 2005-2006 as their preferred harvest level (Council OY in Tables 2.1a and 2.1b). This OY is clearly more precautionary than the High OY alternative (91 mt and 107 mt in 2005 and 2006, respectively) which uses the same default $F_{45\%}$ harvest rate to determine the ABC, but with the OY reduced using the Council's 40-10 adjustment rather than CDFG's 60-20 adjustment. The Low OY alternative (44 mt and 63 mt in 2005 and 2006, respectively) has an ABC determined using a lower harvest rate of $F_{50\%}$ with the same 60-20 adjustment to determine the OY. It is noted that the SSC recommended an $F_{45\%}$ harvest rate as an F_{MSY} proxy for setting the ABC for groundfish species such as cabezon as a risk-neutral policy (PFMC 2000b). This proxy harvest rate is intermediate to the $F_{50\%}$ rate prescribed for species with lower potential productivity, such as rockfish, and the $F_{40\%}$ rate for more resilient species, such as flatfishes. The application of the very precautionary 60-20 adjustment to set the OY in the Council-preferred OY alternative is considered risk-averse.

4.3.1.2 Lingcod

A new lingcod (*Ophiodon elongatus*) assessment was done last year (Jagielo *et al.* 2004) and formally approved by the Council for use in 2005-2006 management decision-making in March 2004. This assessment updated the previous coastwide lingcod assessment (Jagielo *et al.* 2000). As in the last assessment, separate age-structured assessment models were constructed for northern areas (Columbia and U.S.-Vancouver INPFC areas) and southern areas (Conception, Monterey, and Eureka INPFC areas). Results from these two models were combined to obtain coastwide estimates of spawning biomass, the depletion level, and other relevant assessment outputs.

This assessment indicates that the lingcod stock has achieved its rebuilding objective of $B_{40\%}$ in the north (actually 28% above $B_{40\%}$), but was at $B_{31\%}$ in the south. However, the adopted lingcod rebuilding plan specifies a coastwide rebuilding objective. The Council's SSC, working in concert with the lead assessment author, recalculated the coastwide lingcod stock status in March 2004 using actual 2003 harvests (the assessment, which was completed during 2003, assumed harvest would be equal to the specified OY in 2003). Their calculations indicated that the spawning biomass at the start of 2004 was within 99.3% of B_{MSY} (or $B_{40\%}$) on a coastwide basis (Table 2.1-3). Therefore, the Council could not recommend to NMFS that the stock should be declared rebuilt.

The range of alternative lingcod harvest levels analyzed for 2005-2006 is based on the new assessment. The Low OY alternative applies the harvest control rule specified in the lingcod rebuilding plan ($F = 0.0531$ in the north and $F = 0.0610$ in the south) that was adopted as part of FMP Amendment 16-2 (PFMC 2003b) to the new north and south estimates of spawning biomass. The Medium OY alternative applies the new estimated harvest control rules to new biomass estimates and assumes a rebuilding probability (P_{MAX} or the probability of rebuilding in the maximum allowable time according to the

National Standard Guidelines) of 70%. The High OY alternative assumes new biomass and harvest control rule estimates with a P_{MAX} of 60%. The preferred Council OY alternative is to use the Medium OY alternative ABC projected for 2005 and 2006, but the OY projected for 2006 (2,414 mt, which is projected to be lower than 2005; Tables 2.1-1a and 2.1-1b) for both years. Implicit in this action is a regulatory amendment of the harvest control rule adopted in the rebuilding plan which comports with the process and standards criteria for rebuilding plans adopted under FMP Amendment 16-1 (PFMC 2003a).

4.3.1.3 Bocaccio (in Waters off California South of 40°10' N. Lat.)

The range of 2005-2006 harvest specifications for bocaccio is based on the most recent stock assessment (MacCall 2003b) and rebuilding analysis (MacCall 2003a). The range of harvest specifications attempts to analyze varying rebuilding probabilities and model uncertainties in the assessment and rebuilding analysis. Model uncertainties compelled the STAR Panel (Helser *et al.* 2003) and the SSC to recommend consideration of the STATc base model and the competing STARb1 and STARb2 models. The Council also limited the range of rebuilding probabilities considered for detailed analysis of rebuilding plans under FMP Amendment 16-3 (PFMC 2004a) to comply with P_{MAX} values ranging from 60% to 90%. Therefore, the range of bocaccio harvest specifications analyzed in this EIS represents the full range of plausible assessment model outputs and the P_{MAX} range of 60% to 90%. The Low OY specifications comport to the STARb2 model with a rebuilding probability of 90%. The Medium OY specifications are derived using the STATc base model with a rebuilding probability of 70% and the High OY specifications are structured using the STARb1 model with a rebuilding probability of 60%.

The Council adopted a bocaccio rebuilding plan during their final action on FMP Amendment 16-3 in April 2004. The adopted rebuilding plan parameters were determined using the STATc base model since the assessment author recommended this model as the most plausible. The adopted rebuilding plan has a 70% rebuilding probability, a target rebuilding year of 2023, and a harvest control rule specifying a constant harvest rate (F) of 0.0498. The harvest specifications in accord with the bocaccio rebuilding plan are ABCs of 566 mt and 549 mt for 2005 and 2006, respectively and OYs of 307 mt and 309 mt for 2005 and 2006, respectively (Tables 2.1-1a and 2.1-1b).

4.3.1.4 Black Rockfish (in Waters off Oregon and California)

A new black rockfish assessment was done for the portion of the coastwide stock occurring off the coasts of Oregon and California (Ralston and Dick 2003). Previous assessments were done for the portion of the stock occurring off the coasts of Oregon north of Cape Falcon and Washington. Alternative harvest levels in the assessment for the portion of the black rockfish stock occurring off Oregon and California were ranged to capture the major uncertainty of historical landings prior to 1978. Black rockfish catches prior to 1945 were assumed to be zero in the assessment. Many gaps in historical landings of black rockfish since 1945 were evident, and these landings were reconstructed using a variety of data sources. The base model assumed cumulative landings of black rockfish from all fisheries was 17,100 mt from 1945 to 1977. The projected 2005-2006 harvest specifications for black rockfish in the waters off Oregon and California used this base case catch scenario. The OY equals the ABC since the stock is predicted to be above B_{MSY}. The projected 2005 and 2006 ABCs/OYs for black rockfish are 753 mt and 736 mt, respectively.

4.3.1.5 Canary Rockfish

Alternative canary rockfish harvest levels are based on projections from the 2002 rebuilding analysis (Methot and Piner 2002a) and the Council's adoption of a canary rockfish rebuilding plan as part of FMP Amendment 16-2, which specifies rebuilding targets consistent with a P_{MAX} of 60% (the target rebuilding year [T_{TARGET}] specified in FMP Amendment 16-2 is 2074 and the harvest control rule (F) is 0.0220). Although canary rockfish were not assessed in 2003 or 2004, alternative harvest levels are analyzed because OY values depend on recreational and commercial catch sharing. This is because the recreational fishery tends to take smaller canary rockfish than the commercial fishery, and therefore, has a greater "per ton" impact on canary rockfish rebuilding than the commercial fishery. That is, as the recreational share of the available canary rockfish harvest increases, the OY decreases. The Low OY canary rockfish harvest level is based on 50% recreational and 50% commercial catch shares. The Medium OY and High OY alternatives are based on 39% recreational and 61% commercial catch shares, which represent the status quo catch shares adopted as harvest guidelines in 2004. All OY alternatives have the same rebuilding impact on canary rockfish and do not require re-specification of the target rebuilding year or harvest control rule adopted under FMP Amendment 16-2.

4.3.1.6 Cowcod

Alternative cowcod harvest specifications are derived from the rebuilding analysis conducted in 2000 (Butler and Barnes 2000). The Council limited the range of cowcod rebuilding probabilities considered for detailed analysis under FMP Amendment 16-3 (PFMC 2004a) to comply with P_{MAX} values ranging from 55% to 60%. Higher rebuilding probabilities could not be derived using the assessment and rebuilding analysis due to the limited input data and the model limitations in the cowcod assessment (Butler *et al.* 1999) and the rebuilding analysis. The Council adopted a cowcod rebuilding plan during their final action on FMP Amendment 16-3 in April 2004. The adopted rebuilding plan has a 60% rebuilding probability, a target rebuilding year of 2090, and a harvest control rule specifying a harvest rate (F) of 0.009. The harvest specifications in accord with the cowcod rebuilding plan are 2005 and 2006 ABCs of 5 mt and 19 mt for the Conception and Monterey INPFC areas, respectively, and OYs of 2.1 mt in each INPFC area for 2005 and 2006 (Tables 2.1-1a and 2.1-1b).

4.3.1.7 Darkblotched Rockfish

Darkblotched rockfish alternative harvest levels are based on projections from the most recent stock assessment and rebuilding analysis (Rogers 2003a). Harvest projections are influenced by recent strong recruitment (the 2000 and 2001 year classes), which has not been completely validated in the data used to assess the stock. The Scientific and Statistical Committee (SSC) STAR Lite Panel requested progressive inclusion of 1997-1999, 2000, and 2001 recruitment estimates (Ralston *et al.* 2003). Risk of error progressively increased from including those recruitment estimates because they were based on increasingly limited data. Rebuilding results were sensitive to the high 2000 and 2001 recruitment estimates, and including them allowed much greater OYs because those recruits are projected to enter the fishery in the future and help rebuild the stock before T_{MAX}. The ABCs, on the other hand, were not as affected because the 2000 and 2001 recruits were too small to have fully recruited to the fishery in 2004-2006. This led to OY estimates which were higher than the ABC, even given a 90% probability of rebuilding by the maximum allowable year (T_{MAX}). Since the Magnuson-Stevens Act does not allow harvest greater than the ABC, these ABC values are the harvest limits for these 2005 and 2006 specifications. The ABC projections for 2005 and 2006 are 269 mt and 294 mt, respectively. These projected harvest specifications are compliant with the darkblotched rockfish rebuilding plan adopted under FMP Amendment 16-2 (PFMC 2003b). The target rebuilding year remains unchanged from the rebuilding plan specification. The harvest control rule, which was amended during the 2004 specifications process (PFMC 2004b)[1/] also remains unchanged with this action.

1/ Regulatory amendment of adopted strategic rebuilding parameters, such as the harvest control rule, is compliant with the process and standards for groundfish rebuilding plans as adopted under FMP

4.3.1.8 Dover Sole

The 2005 and 2006 Dover sole ABC and OY are projected from the 2001 assessment (Sampson and Wood 2001). The 40-10 adjustment was applied to the ABC to derive the OY, since the stock's spawning biomass is estimated to be below 40% of its initial, unfished level.

4.3.1.9 Sablefish

The GMT recommended updating the sablefish ABC and OY ranges analyzed in last year's EIS for 2004 management. Therefore, updated harvest level alternatives are presented as derived in the 2002 assessment update (Schirripa 2002). The Low OY harvest level of 6,500 mt is based on the adopted OY for north of Pt. Conception in 2003. The Medium OY harvest level assumes a density-dependence recruitment hypothesis, but is derived using the stock's default F_{MSY} harvest rate of $F_{45\%}$. The High OY harvest level is based on the default $F_{45\%}$ harvest rate, but assumes recruitment variability is driven more by environmental regime shifts (regime shift hypothesis) than parental stock density. The 40-10 adjustment is applied to all the alternative OYs since the stock's spawning biomass is predicted to be less than 40% of its initial, unfished level (in 2002, $B_{32\%}$ under a density-dependence hypothesis and $B_{39\%}$ under a regime shift hypothesis).

The Council chose the Medium OY sablefish harvest specification as its preferred alternative for 2005-2006. Therefore, a coastwide OY of 7,761 mt of sablefish (7,486 mt for north of the Conception INPFC area; and 275 mt for the Conception INPFC area) is proposed under the Council-Preferred OY alternative for 2005. The 2002 assessment update projects a slight decrease in sablefish exploitable biomass in 2006. Therefore, under the Council-Preferred OY, the 2006 OY is 7,634 mt (7,363 mt for north of the Conception INPFC area; and 271 mt for the Conception INPFC area).

4.3.1.10 Shortspine Thornyhead

The 2005 and 2006 shortspine thornyhead ABC and OY are projected from the 2001 assessment (Piner and Methot 2001). The 40-10 adjustment was applied to the ABC to derive the OY, since the stock's spawning biomass is estimated to be below $B_{40\%}$.

4.3.1.11 Widow Rockfish

The range of 2005-2006 harvest specifications for widow rockfish is based on the most recent stock assessment (He *et al.* 2003b) and rebuilding analysis (He *et al.* 2003a). The range of harvest specifications attempts to analyze varying rebuilding probabilities and model uncertainties in the assessment and rebuilding analysis. Model uncertainties compelled the SSC to recommend consideration of the base model 8 and the competing models 7 and 9 in the He et al. (2003a) rebuilding analysis. The Council also limited the range of rebuilding probabilities considered for detailed analysis of rebuilding plans under FMP Amendment 16-3 (PFMC 2004a) to comply with P_{MAX} values ranging from 60% to 90%. Therefore, the range of widow rockfish harvest specifications analyzed in this EIS represents the full range of plausible assessment model outputs and the P_{MAX} range of 60% to 90%. The Low OY specifications comport to the model 7 results with a rebuilding probability of 90%. The Medium OY specifications are derived using the base model 8 with a rebuilding probability of 60% and the High OY specifications are structured using model 9 with a rebuilding probability of 60%.

Amendment 16-1. The harvest control rule is expected to change with every new, formally-adopted assessment.

The Council adopted a widow rockfish rebuilding plan during their final action on FMP Amendment 16-3 in April 2004. The adopted rebuilding plan parameters were determined using the base model 8 since the assessment author recommended this model as the most plausible. The adopted rebuilding plan has a 60% rebuilding probability, a target rebuilding year of 2038, and a harvest control rule specifying a constant harvest rate (F) of 0.0093. The harvest specifications in accord with the widow rockfish rebuilding plan are ABCs of 3,218 mt and 3,059 mt for 2005 and 2006, respectively and OYs of 285 mt and 289 mt for 2005 and 2006, respectively (Tables 2.1-1a and 2.1-1b).

4.3.1.12 Yelloweye Rockfish

The 2005 and 2006 yelloweye rockfish ABCs and OYs were projected from the 2002 rebuilding analysis (Methot and Piner 2002b). The Council adopted a yelloweye rockfish rebuilding plan during their final action on FMP Amendment 16-3 in April 2004. The adopted rebuilding plan has an 80% rebuilding probability, a target rebuilding year of 2058, and a harvest control rule specifying a constant harvest rate (F) of 0.0153. The harvest specifications in accord with the yelloweye rockfish rebuilding plan are 2005 and 2006 ABCs of 54 mt and 55 mt, respectively, and OYs of 26 mt and 27 mt in 2005 and 2006, respectively (Tables 2.1-1a and 2.1-1b).

4.3.1.13 Yellowtail Rockfish

The 2005 and 2006 yellowtail rockfish ABC and OY are projected from the 2003 assessment (Lai *et al.* 2003). Projected harvest specifications were derived using model YT2003N in the assessment, which updates the catch series used in the previous assessment (Tagart *et al.* 2000) with a newly revised series from Pacific Coast Fisheries Information Network (PacFIN), revised Canadian catches in INPFC area 3C, and new estimates of 1967-1976 foreign catches (Rogers 2003b). The OY equals the ABC, since the stock is estimated to be above the abundance level that supports MSY (or 40% of initial, unfished biomass). The yellowtail rockfish stock was estimated to be at 46% of its initial, unfished biomass in 2002 (Lai *et al.* 2003).

4.3.1.14 Other Fish

The Other Fish stock complex contains all the unassessed groundfish FMP species that are neither rockfish (family *Scorpaenidae*) or flatfish. These species include big skate (*Raja binoculata*), California skate (*Raja inornata*), leopard shark (*Triakis semifasciata*), longnose skate (*Raja rhina*), soupfin shark (*Galeorhinus zyopterus*), spiny dogfish (*Squalus acanthias*), finescale codling (*Antimora microlepis*), Pacific rattail (*Coryphaenoides acrolepis*), ratfish (*Hydrolagus colliei*), cabezon (*Scorpaenichthys marmoratus*) (north of the California-Oregon border at 42° N. lat.), and kelp greenling (*Hexagrammos decagrammus*).

The status quo No Action ABC/OY specified in 2004 (and in many previous years) for the Other Fish complex was 14,700 mt based on historical catches for these species. The portion of this ABC/OY attributed to the available harvest of cabezon in waters off California was deducted once those 2005-2006 harvest specifications were decided by the Council in April 2004. This deduction for the recently-assessed cabezon stock off California resulted in an ABC of 14,597 mt in 2005 and 14,592 mt in 2006 for the Other Fish complex. The GMT recommended consideration of a 50% reduction of the ABC to set the OY harvest target for the Other Fish complex based on the guidance provided by Restrepo et al. (1998) for determining precautionary harvest levels for unassessed stocks. The Council heeded this advice and established an OY for the Other Fish complex of 7,299 mt for 2005 and 7,296 mt in 2006 (Tables 2.1-1a and 2.1-1b).

4.3.1.15 Other Flatfish

The Other Flatfish complex contains all the unassessed flatfish species in the groundfish FMP. These species include butter sole (*Isopsetta isolepis*), curlfin sole (*Pleuronichthys decurrens*), flathead sole (*Hippoglossoides elassodon*), Pacific sanddab (*Citharichthys sordidus*), rex sole (*Glyptocephalus zachirus*), rock sole (*Lepidopsetta bilineata*), sand sole (*Psettichthys melanostictus*), and starry flounder (*Platichthys stellatus*).

Since the implementation of the Groundfish FMP in 1982, an ABC of 7,700 mt has been specified for all flatfish species other than Dover sole, English sole, petrale sole, and arrowtooth flounder. No stock assessments have been conducted for any of the species comprising the "Other Flatfish" category. The original basis for the specific value of 7,700 mt is not documented, though it is believed to have been derived from landed catches that occurred during the 1970s.

Beginning in 1998 with the adoption of FMP Amendment 11, the Council began a policy of specifying optimum yields (OYs) that included a precautionary reduction from the ABC in many cases where the ABC was derived from very limited modeling, or landings data, alone. A reduction of 25% was applied in cases with limited modeling ("data moderate"), and a 50% reduction was applied in most cases where ABCs were based on landed catch ("data poor"). However a precautionary reduction has not been applied to the ABC in specifying an OY for Other Flatfish. Due to uncertainty regarding the basis for the current ABC and the absence of a precautionary reduction in specifying recent OYs, the GMT undertook a review of specification options for Other Flatfish.

The species that comprise the Other Flatfish group occupy habitats that range from the continental slope to near-shore areas, including fresh-water estuaries. Species such as rex sole and sanddabs inhabit depths and bottom types that are well-sampled by NMFS trawl surveys, while others, such as starry flounder and sand sole, are found primarily in shallower depths than are sampled by the trawl surveys. Consequently, survey data may provide insight into the abundance of some, but not all, species within this category.

Commercial Landings and Prices

Landings of Other Flatfish species have varied considerably since 1981, with declines observed for most species. As presented in Table 4.3-1, for the five-year period ending in 2003, landings of rex sole, sand sole, and starry flounder were 61%, 75%, and 90% lower, respectively, than for the five-year period beginning in 1981. For sanddabs, the other major species in this group, landings increased by 54% between these two periods. The reduction in landings of the first three species could reflect lower abundance, a shift in the availability of the species to the fishery, a reduction in demand for these species, or some combination of these factors.

Between these two 5-year periods, real prices (adjusted using the west coast consumer price index for food, base=2000) for rex sole, sand sole, and starry flounder also fell substantially: by 54%, 62%, and 69% respectively (Table 4.3-1). Although the real price of sanddabs also declined by 44%, its price fell by the smallest percentage of the four species. These data suggest that changes in consumer demand may have played a role in the landings reductions of these species. Reduction in the fleet size of vessels targeting nearshore flatfish is another factor leading to lower landings. The number of such vessels dropped by about two-thirds over this period in Washington, with a similar attrition in northern Oregon.

Survey Trends

Two of the four species have been well-sampled by the NMFS triennial trawl (shelf) survey from 1977 to 2001. The catch of sanddabs and rex sole per unit of survey effort (swept area) have increased substantially since the early years of this survey (Table 4.3-2). The average of the CPUE estimates from 1998 and 2001 for sanddabs is nearly 19 times higher than the average of the CPUEs from 1977 and 1980. Average CPUE for rex sole in the last pair of surveys is more than 4 times higher than in the first pair. The increase in survey CPUE for these two species is at or above the high end of the range observed for petrale and English soles and arrowtooth flounder, all of which are believed to be near or above their target biomasses. Consequently, survey abundance trends provide no suggestion that the decline in rex sole landings is indicative of a decline in abundance. For both of these species, harvests at the high end of the range observed since 1981 have not resulted in any downward trend in survey CPUE (as illustrated in Figure 4.3-1). Figures 4.3-2 and 4.3-3 depict survey trends for the other flatfish species in the Other Flatfish complex.

Other Considerations

An important consideration in evaluating the vulnerability of these species lies in comparison of their size at maturity relative to their size when retained by trawl gear. For most of the Other Flatfish species, the lengths at which maturity is reached are not known with much precision. Estimates for many of these species rely on older "visual inspection" techniques that have been shown to be unreliable in comparisons with more recent histological studies. However, a substantial proportion of each of these species reach maturity between 20 cm and 30 cm in length (Casillas*, et al.* 1998; Castillo 1995). Since none of these species have been assessed, trawl fishery or survey selectivity curves have not been calculated. Based on selectivity curves estimated for Dover and English soles, it is likely that retention in trawl gear would also be increasing rapidly over some portion of this length range. As a result, it is probably reasonable to conclude that some percentages of these species have an opportunity to reproduce before they would be vulnerable to trawl gear.

Another factor is the accessibility of trawlers to some of these species. In California and Washington, trawl vessels are not allowed to fish within 3 miles of the coast. This restriction off California predates the Groundfish FMP by 20 years or more; however, it was not implemented off Washington until 2001. Therefore, the trawl fishery has very limited opportunities off these states to access starry flounder and sand sole. Nevertheless, the historical access of trawlers to these species north of California does not preclude the possibility that substantial depletions may have occurred in the past.

ABC Recommendation

The GMT recommends establishing a new ABC for the Other Flatfish group that is based on the highest 1981-2003 landings of sanddabs (1995) and rex sole (1982) and on the 1994-1998 average landings for the remaining species in the group. Since these amounts represent only landed catch, not total removals, discard data from studies occurring during the same eras were used to estimate the total catch that would have been associated with the landings (Table 4.3-3). This approach yields an ABC of 6,781 mt for the Other Flatfish complex.

OY Recommendation

The GMT believes that the available supporting information warrant the application of different precautionary reductions to two sets of species within the Other Flatfish group. For sanddabs and rex sole, the available trawl survey data, along with the sizes of selectivity and maturity lead the GMT to recommend a data-moderate reduction of 25% be used in calculating the contribution of these species to the Other Flatfish OY. The remaining species in the group are also likely to begin reproduction prior to retention by trawl gear, and two of the three states restrict access of trawlers to the primary depth distribution of the two species that have contributed the bulk of landings among the remaining species. However, environmental factors, such as estuarine and near-shore water quality, may also play an important role in the current status of starry flounder and sand sole. Since an assessment of starry flounder is currently scheduled to be conducted during 2005, the GMT believes it prudent to use a 50% precautionary reduction when calculating the OY component for these species.

As shown in Table 4.3-3, this approach would result in an OY of 4,909 mt, 93% of which would be derived from sanddabs and rex sole. Based on recent runs of the trawl bycatch model, the annual average discard of these species is expected to be about 28%. This would permit landings of roughly 3,500 mt, or about twice the annual average landings of these species over the 5-year period from 1999 to 2003. Because of the stability of recent landings of species other than sanddabs and rex sole, at levels near or below the calculated landed catch equivalent of their OY contribution, the GMT believes that setting a single OY for all Other Flatfish is sufficiently precautionary, at this time.

4.3.1.16 Pacific Cod

The status quo No Action ABC/OY specified in 2004 (and in many previous years) for Pacific cod *(Gadus macrocephalus*) was 3,200 mt based on historical landings for these species. The GMT recommended consideration of a 50% reduction of the ABC to set the OY harvest target for Pacific cod based on the guidance provided by Restrepo et al. (1998) for determining precautionary harvest levels for unassessed stocks. The Council heeded this advice and decided a Pacific cod OY of 1,600 mt for 2005 and 2006 (Tables 2.1-1a and 2.1-1b).

4.3.1.17 Pacific Whiting

Pacific whiting are assessed annually with the Council deciding harvest levels and management specifications every March. Therefore, Council and NMFS actions to be made for the 2005-2006 management cycle and analyzed herein do not include adoption of a Pacific whiting OY, nor management measures for the whiting-directed fishery. However, there is a need to analyze a broad range of possible whiting OYs to understand the potential bycatch implications of whiting-directed fisheries on overfished and other groundfish species. Likewise, potential management measures for the whiting fishery that might reduce bycatch are explored in section 4.3.2.1. The three alternative harvest levels for Pacific whiting are ranged as follows: Medium OY are the projected ABCs/OYs in 2005 and 2006 from the last assessment (Helser *et al.* 2004), the Low OY ABCs/OYs are half the Medium OY specifications, and High OY are double the Medium OY specifications. Bycatch implications of these alternative whiting harvest levels are explored below.

4.3.2 Alternative Management Measures

4.3.2.1 Limited Entry Trawl

Modeling Bycatch and Discard in the Limited Entry Trawl Fishery

NOAA Fisheries' Northwest Fisheries Science Center (NWFSC) began modeling trawl bycatch of species designated for rebuilding in the fall of 2001. The bycatch model is based on projecting future landings of major target species (excluding Pacific hake) by each permitted vessel, through use of recent landings data and a specified array of trip limits. Projected landings are then translated into estimates of total bycatch mortality, for species under rebuilding, through the application of bycatch ratios. Since its introduction, the bycatch model has undergone numerous changes to keep pace with the changing fishery management environment and the availability of new data. The purpose of this section is to briefly review the evolution of the model and to highlight changes in modeling procedures or input data that have been incorporated in the model used in the analyses herein.

Prior to April 2003, bycatch ratios used in the model were derived from three available sources of information: trawl logbooks and two research studies which deployed observers on a subset of voluntarily participating trawl vessels during some years between 1986 and 1996. The trawl fishery was stratified using area (north and south of 40°10' N. lat.), bimonthly period and target fishery, and bycatch ratios were specified for each stratum. The ratios were expressed in terms of total bycatch pounds per landed pound of the target species in each target fishery.

In April 2003, those bycatch ratios were replaced by new ones calculated from data collected between September 2001 and August 2002 by the West Coast Groundfish Observer Program (WCGOP). Because management was actively considering the use of depth-based closed areas, the bycatch data had to be stratified by depth to facilitate analysis of management options. Due to the limited number of observations during the first year of WCGOP's monitoring and the variances associated with bycatch ratios calculated from extensively stratified data, the previous stratification of the data into target fisheries and bimonthly periods was discontinued, in favor of depth. Subsequent modeling during 2003 utilized bycatch ratios that were expressed in terms of total bycatch pounds per landed pound of all target species combined. In order to partition projected vessel catch into appropriate depth strata, the depth distributions for each modeled target species were summarized from recent trawl logbook data for each vessel, where available. In cases where a vessel was not represented in the logbook data set, representative averages for vessels in the same area and size class were used.

For final analysis (in September 2003) of management measures for the 2004 fishery, the model was enhanced to provide estimates of total mortality for target species, using annual, species-specific discard rates calculated from the first year of observer data. These rates were used to calculate the total catch that would give rise to the landings projected by the model.

The principal data inputs to the bycatch model are derived from fish tickets, logbooks, and the WCGOP data base. As new data are added to each of these data sets, it is expected that the corresponding model inputs will be updated. As a general rule, data from multiple years are combined in a weighted manner, where more recent data are weighted more heavily. This is particularly important for current modeling of the trawl fishery, since management has changed dramatically in recent years. Although using only the most recent year to project the future might at first seem to be the best approach to addressing the rate of management change, there are important reasons for basing projections on multiple years.

First, fisheries may close prematurely in some years, as the inshore fishery did in 2003. Failure to incorporate multiple years into the projection process would provide no basis for projecting vessel activity during the same period the following year. This is also the case when data sets for the previous year are not fully complete at a time when modeling updates are needed. Even when components of the fishery are not closed, there may be considerable variation in the target species trip limits that are in effect for the same bimonthly period during a series of years. Vessel participation in the traditional groundfish fishery can also be affected by opportunities in other West Coast fisheries, such as hake, shrimp, and crab. Incorporating data from multiple years provides projections that are more robust to annual fluctuations in vessel participation than would reliance on the most recent single year. The model used throughout 2004 (and in this EIS) draws upon fish ticket and logbook data from the 2000 to 2003 fisheries. In combining data from these years, the data from 2000 receives roughly one-fifth the weight assigned to data from 2003.

For most species in the northern and southern areas, bycatch ratios are either lower or are little changed from the values employed in 2003 modeling. In both regions, bycatch ratios for lingcod are higher in most depth strata than the values used in 2003. For other species, where the percentage of increase in bycatch ratios appears large, the absolute differences are nearly always measured in hundredths or thousandths of a percent. There were relatively small increases in the coastwide discard rates for shortspine, petrale, and arrowtooth in depths greater then 150 fm. However, substantial downward trends were observed across all depths in the discard rates for sablefish, Dover sole, and minor flatfish species.

The effect of incorporating the second year of trawl observer data in the model can be exemplified by projecting impacts of overfished and target groundfish species using the same management scenarios analyzed in September 2003 for 2004. For four of the species (canary, yelloweye, cowcod, and widow), the change in bycatch is less than 1.5 mt, and for the first three of these, projected bycatch decreases. Projected bycatch of lingcod and Pacific ocean perch each increase by about 15 mt (or roughly 20%), but totals remain below 100 mt for each. Projected darkblotched bycatch decreases by about 20% (21 mt), while bocaccio bycatch falls by nearly 40% (8.9 mt). Projected discards for sablefish and minor flatfish decrease by roughly 40% (over 575 mt each) with the inclusion of the second year of observer data. Dover sole discard also decreased substantially, by more than 20% and 200 mt. Minor increases in discard, both in the 10-12% range, are estimated for shortspine and arrowtooth.

Following the September 2003 Council meeting, the trawl fleet approved a plan to buy back permits and vessel fishing endorsements from roughly one-third of the groundfish trawl fleet. The removal of these permitted vessels from the projection model has a substantial impact on the size of trip limits that can be supported by available amounts of target and bycatch species. In order not to overstate the effect of the buy back, attention was focused on previously latent or little-used permits that have recently been transferred to new holders. Where appropriate, the prior history of the new permit holder was substituted for the permit's actually history. In other such cases where an increase in permit landings is anticipated, a catch history that is representative of other similarly sized vessels in the same area was used.

Three minor revisions to the bycatch model were implemented for 2004. All of these involve the methods used to calculate and apply bycatch ratios. The first concerns the measurement of target species catch used in calculating and applying bycatch ratios; the second involves the geographic stratification of data that are used to calculate bycatch ratios; and the third involves the seasonal stratification of data that are used to calculate ratios. When the bycatch model was first developed, it did not contain procedures for calculating total catch amounts of the included target species. The model projected landings of these species and bycatch ratios for rebuilding species were calculated using landed catch of target species as the denominator. As referenced above, the model was modified prior to the September 2003 Council meeting, so that inclusion of discard rates for target species would allow the modeling of 2004 measures to automatically include calculation of total catches, based on the projected landings of each target species.

Holding other model parameters constant, a reduction in the discard rate of a particular species will not affect landed catch, but will reduce the total catch projected by the model. Aside from possible bycatch consequences, this reduction would allow the trip limits for those target species to be increased. But since bycatch ratios used in the model have been expressed in terms of the landed catch of target species, the reduction in target species discard would lead inevitably to an increase in projected bycatch of the rebuilding species. Commencing with modeling during 2004, the bycatch ratios were calculated with reference to the total catch of target species, and those ratios were applied to the projected total target species catches in the model.

Following the implementation of depth-specific bycatch rates, and a period in which darkblotched bycatch was underestimated for the fishery occurring between 38° N. lat. and 40°10' N. lat., bycatch rates for depth strata deeper than 150 fm have been calculated using a dividing line of 38° N. lat. for all species except Pacific ocean perch. Commencing with modeling during 2004, 40°10' N. lat. was used to delineate northern and southern bycatch rates for all species and depths, with the exception of darkblotched bycatch occurring in waters deeper than 150 fm.

As described above, the combination of limited observer data from the first year of data collection and the need to evaluate bycatch on a depth-specific basis resulted in discontinued use of seasonal bycatch rates in analysis conducted during 2003. With the accrual of a second year of observer data, the model reinstated some degree of seasonality in bycatch rates.

Within each depth strata, results are summarized according to four alternative approaches for stratifying bycatch results over the span of a calendar year. The first of these approaches is the same as used in 2003: all periods of the year are combined. In the second approach, data from bi-monthly periods 1,2, and 6 are combined into a winter season, and data from remaining periods form a summer season. In the third approach, Periods 1 and 6 form the winter season, Periods 3 and 4 represent the summer, and Periods 2 and 5 are combined to form a Spring-Fall transitional period. The final approach maintains each bi-monthly period as a stratum of analysis.

Due to management restrictions that encouraged northern vessels to fish seaward of the trawl RCA throughout most of the second year of data collection, the number of hauls and amount of target-species tonnage observed shoreward of the RCA north of 40°10' N. lat. fell dramatically. Only one-quarter to one-third of the unweighted combined observations within each depth stratum came from the second year. Even with the proposed method of combining data (using a 0.6 weight for the second year), the second year does not contribute even half of the target species poundage. Of particular note is the lack of observations shallower than 75 fm in Period 1–fewer than 20 hauls in both years combined. In addition to the regulatory factors encouraging the fleet to fish deeper in the north, the deep-water fishery was largely closed throughout the final three months of 2001. As a result, for tows starting outside of 150 fm, the second year of observation contributes between 57% and 61% of all observed tows and tonnage.

Unlike the northern region, the area south of 40°10' N. lat. had a large increase in the observed tows and tonnage in the nearshore depths (less than 60 fm) that remained open to fishing throughout all of the second year of observation. This increase is particularly useful for bycatch modeling, since these shoreward depth strata contained very little data from the first year of observation. The previous paucity of data resulted from the high percentage of first-year observations that were for hauls originating in depths that were later closed during 2003. Many of the first-year hauls observed in shallow depths were also targeting California halibut, and were subsequently removed from the data set. The level of observation in waters deeper than 150 fm during the second year is slightly higher, for the entire 12 months. However, the overall increase was driven by the substantially higher second-year level of observation during Periods 5 and 6. As discussed for the northern area, this was a direct result of the October closure of fishing for most deep-water species in 2001.

Both bycatch ratios and their coefficients of variation (CVs) exhibit considerable variability among 2-month periods. Some of this variability may reflect true underlying seasonal differences in the rates of species co-occurrence or availability to trawl gear. But limited sample sizes, combined with infrequent, large bycatch events, are also likely contributing factors to the observed ranges of values. Consequently, a balance must be struck between the desire that the bycatch model reflect the real variability in bycatch relationships throughout the course of a year and the desire to avoid a situation where random chance in the measurement of bycatch leads to the imposition of a trip list regime that contains unnecessary fluctuation from period to period.

It would also appear important that the same level of seasonal stratification be used for analysis of all potential depths restrictions within the general shallow and deep zones of each area. Failure to do so could result in attempts to avoid the implications of a 'high' 2-month bycatch ratio in the 'less than 75 fm' stratum, for example, by shifting to the 'less than 60 fm' stratum, where pooling of bycatch data across additional periods might, by itself, be responsible for producing a lower bycatch ratio for use in that period. This means that, within each area and general depth zone, the determination of appropriate seasonal stratification must be driven by the potential management depth stratum that represents the "weakest link" to seasonal disaggregation of the data. In light of sample sizes and CVs in the various strata, the approach for seasonal stratification for 2004 bycatch modeling is to use the two 6-month (winter/summer) seasons for all depth strata less than 100 fm, and to use the three 4-month (winter/transition/summer) seasons for depth strata greater than 150 fm.

Given these considerations, the SSC agreed with the recommended stratifications for the trawl bycatch model. The bycatch ratios for overfished groundfish species by area, depth, and season are found in Table 4.3-4. Bycatch ratios for important trawl target species by area, depth, and season are found in Table 4.3-5.

Analysis of Alternatives: Non-whiting Trawl Fisheries

This EIS analyzed the effect of varying limited entry trawl trip limits and RCA configurations targeting 8 mt, 10 mt, and 12 mt of canary rockfish impact, respectively in non-whiting directed groundfish trawl fisheries in 2005 and 2006. All the action alternatives specify the exclusive use of selective flatfish trawl gear shoreward of the trawl RCA, which is different than the No Action Alternative of exclusive use of small footrope gear shoreward of the trawl RCA.

Under Action Alternative 1, where the non-whiting trawl fishery is constrained to take no more than 8 mt of canary rockfish, the trawl RCA is extensive- larger than for the other analyzed alternatives (Table 2.2-9). Likewise trip limits are smaller than for the other action alternatives to minimize canary impacts. Total mortalities of all overfished species are estimated to be less under Action Alternative 1 relative to all the other action alternatives and the No Action Alternative. One effect of the large RCA is that smaller vessels forced to fish shoreward of the RCA using selective flatfish trawls[2/] are limited to depths shallower than 75 fm year-round and shallower than 60 fm during the summer periods 3-5 (May-October) in the north. Forcing vessels to fish this shallow does impact Dungeness crab in the north which are molting during summer months. There is also a significant loss of available trawl grounds for these vessels since Washington and California do not allow trawling within their state territorial waters (0-3 nm). The lower trip limits needed to minimize canary impacts also results in significant under-attainment of species allocated to the trawl fishery, most notably sablefish, Dover sole, petrale sole, Other Flatfish, English sole, and arrowtooth flounder. The projected impact to shortspine and longspine thornyheads is higher under this alternative due to the anticipated effect of shifting more effort seaward of the RCA in the north where these species are found.

Trip limits and RCA configurations under Action Alternative 2 are intermediate to those under the other action alternatives and most similar to the effects projected under the No Action Alternative (Tables 2.2-10 and 2.2-8). Under Action Alternative 2, the canary impacts were constrained to about 10 mt, and the RCA was configured to allow fishing shoreward of 100 fm through the summer periods 3-5 to access sablefish, petrale sole, Dover sole, and Other Flatfish species, which are distributed more shallow in the summer. However, constraining the fishery to 10 mt of canary rockfish does not allow year-round opportunity to fish out to 100 fm. It is noted that the action alternative analyses (Tables 2.2-9, 2.2-10, and 2.2-11) use selective trawl bycatch rates derived from the ODFW selective trawl EFP only during the

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2/ Exclusive use of selective flatfish trawls is contemplated only for the fishery north of 40°10' N. lat. South of 40°10' N. lat., only small footrope trawls are allowed shoreward of the trawl RCA under the action alternatives.

summer periods 3-5 since this was the timeframe when the EFP study was conducted. There are arguments for and against this analytical approach which are more thoroughly discussed below.

The trip limits and RCA configurations under Action Alternative 3 are the most liberal provided in this EIS. The same RCA configuration under Action Alternative 2 was modeled with higher trip limits under Action Alternative 3. Action Alternative 3 was structured to constrain the fishery to take 12 mt of canary rockfish. However, as shown in Table 2.2-11, target species OYs and allocations begin to constrain the fishery before 12 mt of canary are projected to be taken. The constraining target species that prevent a more liberal fishery under this alternative are sablefish, Dover sole, petrale sole, and shortspine thornyheads. With these species constraints, about 10.6 mt of canary are projected to be taken (Table 2.2-11).

All of the trawl action alternatives were modeled to stay within the allocations calculated using the Council-Preferred OYs adopted in April 2004. The GMT also modeled the trip limits, RCA configurations, and estimated species' impacts under the Low OY and High OY harvest levels. Table 4.3-6 indicates that with a similar 10 mt canary impact as Action Alternative 2 and a 75-150 fm trawl RCA, higher trip limits for sablefish, Dover sole, and petrale sole can be accommodated with the suite of High OYs listed in Tables 2.1-1a and -1b. Table 4.3-7 conversely shows that with a similar 10 mt canary impact and a similar trawl RCA configuration (with the exception of a deeper inline of 100 fm in periods 1 and 6 in the north), trip limits for sablefish, Dover sole, and Other Flatfish are appreciably lower with the suite of Low OYs in Tables 2.1-1a and -1b.

Bycatch rate data for the Oregon selective flatfish trawl are only available for periods 3, 4, and 5 (May - October). This presents a challenge in estimating what selective flatfish trawl bycatch rates should be for the remainder of the year since there is typically seasonality associated with bycatch that corresponds to the winter and summer seasons at a minimum and, for some species, seasonality that differs by bimonthly period. Trawl model outputs can be highly sensitive to period by period RCA and trip limit configurations depending on how they overlay with bycatch rates for those depths, months, and periods.

Initial configuration of the selective flatfish trawl model used several decision criteria for implementing bycatch rates across the year. The first step was to replace WCGOP bycatch rates in periods 3, 4, and 5 with selective flatfish trawl rates. The second step incorporates a precautionary principle for the remainder of the year using the following criteria: If WCGOP rates for a particular species were higher in other periods than in periods 3, 4, and 5, then WCGOP rates were left in place for the selective flatfish trawl model. If WCGOP rates were lower in the winter periods, then selective flatfish trawl rates were put in place for the entire year. This decision criteria is precautionary in the sense that bycatch rates for periods other than 3, 4, and 5 are likely to be higher than what may actually be the case for vessels using the selective flatfish trawl during those periods. However, model scenarios under this precautionary principle can still be liberalized substantially compared to the trawl model using WCGOP bycatch rates.

An alternative scenario is to apply the selective flatfish trawl rates year-round. This is decidedly less precautionary in that these rates are lower than the associated WCGOP rates. Since the selective flatfish trawl rates were derived from the ODFW EFP study, which was conducted May-October, it is not clear that these rates should apply year-round. However, ODFW preceded their EFP study with a research study that tested conventional and selective flatfish trawls in known areas of high canary rockfish abundance. While the selective flatfish trawl outperformed conventional trawls in terms of both flatfish catch efficiency and overall avoidance of shelf rockfish species, the bycatch rates were higher in the ODFW research study than in the EFP study (***NOTE: need ODFW research data and results***). The research study was also conducted in summer and winter months. However, the selective bycatch rates determined in the research study were lower than the WCGOP rates, which provides some rationale for using selective flatfish trawl bycatch rates during winter months. Figure 4.3-4 compares the canary bycatch rates by period using the WCGOP and selective flatfish EFP data. Expected mortality and resulting trip limits when selective flatfish trawl bycatch rates are applied under the assumption of Action Alternative 3 are shown in Table 4.3-8. This is directly comparable to Table 2.2-11 which provides the Action Alternative 3 results using a combination of selective flatfish trawl bycatch rates during periods 3-5 and WCGOP rates during periods 1, 2, and 6. Note that, with the same RCA configuration and bimonthly trip limits under both scenarios, the estimated mortality of canary rockfish is significantly less under the scenario where selective flatfish bycatch rates are applied year round (8.1 mt vs. 10.6 mt). Resolution of the preferred modeling approach needs to occur at the June 2004 Council meeting. If there is no preferred approach recommended by the SSC or GMT based on the technical merits of the studies and monitoring systems used to derive alternative trawl bycatch rates, then the Council may need to decide the approach based on a policy call of how much risk they are willing to take when setting trawl management measures. It is further noted that the WCGOP will provide observed discard data in the fishery in 2005 and 2006 if the selective flatfish trawl strategy is implemented in regulations. These WCGOP data will be used for inseason management decision-making during the 2005-2006 management period.

Analysis of Alternatives: Whiting Trawl Fisheries

This section describes sector allocations and impacts on rebuilding species for the range of Pacific whiting options described in 2.2.4.1. Deciding 2005 (and 2006) harvest specifications and management measures for whiting trawl fisheries is not part of the contemplated action in this EIS; however, it is still important to analyze these connected/anticipated actions[3/] so that potential bycatch implications in whiting-directed trawl fisheries are better understood. Allocations are estimated by: 1) setting the tribal allocation based on a sliding scale that is matched to the OY, 2) attributing a 2,000 mt mortality estimate to research and other non-whiting-directed fishing activities, and 3) calculating shoreside and at-sea allocations based on the remaining optimum yield. The shoreside allocation is equal to 42 percent, non-tribal mothership is equal to 24 percent, and the catcher processor allocation is equal to 34 percent of remaining OY.

The GMT reviewed recent observer data by year and sector in the whiting fishery and recommended that 2000-2003 weighted average bycatch rates for overfished species be used to analyze bycatch implications in this fishery. Data used for developing incidental catch rates are from NMFS observer data from the at-sea sector, and landed catch records for shoreside landings made by the shoreside and tribal sectors. That data is used to develop catch rates that are estimated by summing the catch of each rebuilding species and dividing that by the sum of Pacific whiting catch for each sector and year, for years 2000-2003 (Table 4.3-9). The analysis uses historical incidental catch rates from 2000-2003 in combination with a decay function that weighs 2003 rates at 40%, 2002 rates at 30%, 2001 rates at 20%, and 2000 rates at 10%. This approach is based on the notion that more recent seasons are likely to be more reflective of the projected season. These weighted average rates are applied to each sector allocation to estimate that sector's impacts on rebuilding species under each alternative (2005) whiting OY (Table 4.3-10). A similar treatment of 2006 whiting OY alternatives is not provided here, because the 2005 alternatives are considered adequately informative.

As can be seen from Table 4.3-10, the projected bycatch of widow rockfish in the whiting fishery alone under the Medium OY and High OY alternatives (whiting OYs of 362,573 mt and 725,146 mt, respectively) exceed the Council-Preferred widow rockfish OY of 285 mt in 2005. Therefore, with the assumptions underlying the GMT analysis of impacts and absent further precautionary strategies, Action

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3/ A new Pacific whiting assessment is anticipated this winter with subsequent Council action to set 2005 whiting harvest specifications and management measures scheduled for March 2005.

Alternatives 2 and 3 do not work given the widow impacts in the whiting fishery (Tables 2.2-4 and 2.2-5).

Precautionary strategies explored in this analysis (under Action Alternative 2) include establishing a whiting RCA defined with a shoreward boundary at the 75 fm management line and a seaward boundary at the 200 fm management line and/or closure of discrete areas with high widow rockfish bycatch rates (hotspot areas). The GMT reviewed the concept of establishing a whiting RCA and an analysis done by ODFW staff regarding widow rockfish area management using discrete closed areas where widow bycatch has been highest based on 1999-2003 observations from each whiting sector (Appendix B). This report demonstrates that establishing a whiting RCA, or choosing specific areas for closure can drastically reduce widow bycatch. The GMT suggested additional analyses to support a more comprehensive review of these bycatch management concepts. ODFW announced that they would hold three public meetings with shoreside whiting industry participants, present and discuss these ideas, and report the results. Pending review of additional analyses and a summary of industry comment, the GMT does not feel that these options are ready to be seriously considered and recommended to the Council in June. Barring resolution of uncertainties of widow area management a tiered EA with full analyses of these management concepts will be needed for the Council to consider widow area management when deciding whiting harvest specifications and management measures in March 2005.

Another consideration for managing widow rockfish in the whiting fishery is establishing a widow "penalty box". This management strategy is the assessment of a "days at sea" penalty on any vessel owner based on the poundage of widow rockfish caught by the vessel. That is, that fisherman would have to delay his participation in the ongoing fishery for a certain number of days based on the amount of widow rockfish landed in his previous trip. The penalty box has been employed in the shoreside whiting fishery to decrease the bycatch of yellowtail rockfish. Decreased catch rates of yellowtail rockfish by shoreside sector fishermen have been attributed to the penalty box strategy. It is not clear how this strategy would work for the at-sea sectors (motherships and catcher-processors) since it would not be economical to abruptly stop fishing once the fishing operation has started. Also, motherships simply process their fish at-sea and rely on catcher vessels to supply catch. Catcher vessels cannot functionally move far from the mothership since towing a full net of whiting cannot be practically done for long distances. An alternative strategy that is employed by some vessels in the catcher-processor sector is to monitor bycatch by area in real time for the entire fleet and actively avoid areas where widow bycatch has occurred. Such an adaptive strategy may work well given the 100% observer coverage in the at-sea sectors and the need to stay within the widow OY or face early closure of the whiting fishery.

4.3.2.2 Limited Entry Fixed Gear

Modeling Bycatch and Discard in the Limited Entry Fixed Gear Primary Sablefish Fishery

The NWFSC began modeling bycatch of overfished species in the groundfish trawl fishery in the fall of 2001. The evolution of that modeling was marked in 2003 by the introduction of bycatch data from the first year of trawl coverage, beginning in September 2001, by the WCGOP. The WCGOP began pilot coverage of the limited entry fixed gear sablefish fishery during the 2001 primary season, between August and October. However, full coverage of this fishery did not begin until 2002. For the trawl fleet, the existence of logbooks and studies that utilized onboard observers allowed parameterization and use of the bycatch model prior to the availability of observer data. However, comparable data sources were not available for the fixed gear fleet. Now that the WCGOP has processed data collected during the 7-month primary seasons in both 2002 and 2003, in addition to the pilot coverage from 2001, the development of a framework for modeling discard and bycatch in the fixed gear sablefish fisheries can advance.

Sablefish is the principal groundfish target species for most limited entry fixed gear vessels, which range in length from 33 feet to 95 feet. Limited entry vessels fish for sablefish primarily north of Monterey, California. Groundfish permits for these vessels can be endorsed for the use of longline and/or pot gears. The fleet typically fishes in depths greater than 80 fm, and has recently faced closures of some depths. These closures have been intended to reduce bycatch of overfished species.

While most of the fleet's sablefish catch is retained, some is discarded at sea. Reasons for at-sea discard include unmarketability and attainment of vessel landing limits. Also, since the price paid by processors for sablefish is dependent on fish size, small fish may sometimes be discarded, as fishermen seek to maximize the value of their landed catch allowances. Unlike most rockfish, sablefish do not have swim bladders that explode when the fish are retrieved rapidly from great depth. Consequently, if handled properly, discarded sablefish can experience high rates of survival (Olla, et al., 1998).

There are approximately 225 permits limited entry fixed gear permits, of which 164 are "sablefish-endorsed". Sablefish-endorsed permits provide the permit holder with an annual share of the sablefish allocated to the primary fishery for fixed gear permits. Sablefish-endorsed permits are assigned to one of three tiers: 1, 2 or 3. Of the 164 sablefish-endorsed permits, 28 are assigned to Tier 1, 42 to Tier 2, and 94 to Tier 3. Each Tier 1 permit receives 1.4% of the fishery allocation, with Tiers 2 and 3 receiving 0.64% and 0.36%, respectively. Each year, these shares are translated into amounts of poundage, or "tier limits", which may be caught during the primary fishery. For the 2003 season, these shares translated into tier limits of 53,000 for Tier 1, 24,000 for Tier 2 and 14,000 for Tier 3.

Holders of permits that are not sablefish-endorsed are not permitted to land amounts of sablefish in excess of daily/weekly trip limit provisions. During 2003, daily landing limits ranged from 300 –350 lbs. depending on the area fished. There was also a weekly option that provided the opportunity to make a single delivery during a week, up to a poundage threshold that ranged between 800 and 1,100 pounds. Landings made under either of these options are also capped by a 2-month limit, which normally falls between 2,100 and 3,600 pounds. Outside of the primary season, or following the attainment of their tier limits, holders of sablefish-endorsed permits may also land sablefish under the provisions of the daily/weekly limit.

The primary sablefish fishery currently takes place over a seven-month season from April 1 to October 31. The seven-month season was implemented first in 2002. During 2001, the season was open from August 15, 2001 to October 31, 2001. For several years prior to 2001, tier limits were assigned, but they could only be fished during a roughly 10-day window. Any primary season tonnage left uncaught would then be divided into equal limits that were available to permitted vessels during a two-week "mop-up" fishery. Permit holders can now land their tier limits at anytime during the 7-month season. However, once the primary season opens, all sablefish landed by a sablefish-endorsed permit is counted towards attainment of its tier limit.

Regulations allow for up to three sablefish-endorsed limited entry permits to be 'stacked' on a single vessel. Stacking additional sablefish-endorsed permits on a vessel allows the vessel to land sablefish up to the sum of the associated tier limits. However, stacking does not convey additive landing limits for any other species, nor for sablefish when caught under the daily/weekly option. For example, using 2003 tier limits, a vessel with a Tier 1 permit which bought or leased an additional Tier 2 and a Tier 3 permit could land a total of 91,000 lbs. of sablefish during the primary fishery (Tier 1 + Tier 2 + Tier 3 = 53,000 lb + 24,000 lb + 14,000 lb). Prior to 2002, there were no provisions for obtaining additional tier limits through permit stacking in this fishery. Permit stacking was implemented to increase the economic efficiency of the fleet and promote fleet capacity reduction.

The first step in modeling bycatch in the trawl fleet is projecting landed catch for each permit during each

2-month management period throughout the year. Since trip limits may change from one 2-month period to the next, this approach is necessary in order to capture seasonal differences in historic participation, as well as to facilitate analysis of alternative trip limit scenarios. Recent fish ticket and logbook data are used to project landings for target species, given trip limits and depth management constraints. These expected target species landings are then translated into projected total mortalities for target and overfished species, using relationships derived from observer data.

The structure of the limited entry primary fixed gear fishery for sablefish is fundamentally different. The sablefish tier limit that is provided to each sablefish-endorsed permit can be landed at any time and in any amounts throughout the 7-month season. Where trawl vessels commonly do not achieve full limits for all target species in each 2-month period, there is a reasonable expectation that seven months provides ample opportunity for all tier limits to be landed. Furthermore, the current 7-month length of the primary season has only existed since 2002. The shortness of this time series presents difficulties for determining when tier-limit fishing will occur, and for interpreting changes in fishery seasonality between 2002 and 2003. Shifts between these two years could represent an ordinary amount of inter-annual variability, reflecting the variability of alternative fishing opportunities or fluctuations in real or expected sablefish prices. Alternatively, they could represent a more permanent shift in behavior that reflects fishermen's increased understanding of how to maximize the value of their fishery participation, given this new structure.

To complicate matters further, with the fishery's stacking provisions, there is much greater opportunity for inter-annual movement of permits between vessels than is the case in the trawl fleet. Hence, the timing and location of future sablefish catch is dependent on the leasing arrangements for stacked permits. And, these leasing arrangements may not be fully resolved until after the season formally begins. Since permits may be stacked without regard to which gear is being used, the gear endorsement of a permit is not a sure indicator of the gear that will be used to catch its tier poundage. Thus, a similar degree of uncertainty may also be associated with the share of catch projected for longline and pot gears. Finally, there is no system of comprehensive logbooks for the fixed gear fleet, as there is for trawl.

In light of these issues, the existing structure of the trawl bycatch model is not particularly well suited for the task of estimating total mortality of sablefish and overfished species in the 2004 tier limit fishery. Since the stability of seasonal participation and gear share in this fishery is highly uncertain, it is reasonable to evaluate whether average discard and bycatch rates across all months and gears might be applied to the anticipated sablefish catch of each permit. In considering this option, attention should be paid to whether some method of combining observer data from the three available years produces distributions of observed poundage for each gear type that are at least roughly proportional to their fleet averages over 2002-2003. Similarly, the patterns of observed gear shares across months should approximate those evidenced by the fishery in 2002-2003.

For two of the overfished rockfish species–bocaccio and cowcod–bycatch rates are zero. Caution is urged in the use of these results, since no primary season landings south of Ft. Bragg, California were observed. Not surprisingly, bycatch ratios for lingcod, and canary and yelloweye rockfishes are significantly higher inside of 100 fm than they are outside of that depth. Even when compared to the adjoining 100-125 fm interval, the shoreward bycatch rates are three or more times higher. Bycatch ratios for darkblotched and Pacific ocean perch increase only slightly in moving from a 100 fm threshold to a 150 fm threshold. These tables also identify the percentages of sablefish caught and landed from each of these depth ranges. Since there are no logbook records for this fleet, these data represent the best available information regarding the depth distribution of tier-limit sablefish fishing over these time periods. Roughly 65 percent of the sablefish were caught outside of 150 fm, 76 percent outside of 125 fm, and 92% outside of 100 fm.

While bycatch is generally lower when pot gear is used, it is interesting to note that observed pot sets shallower than 150 fm had higher associated bycatch of lingcod than did longline sets in those depths. Discard rates for sablefish were generally higher for observed pot vessels, particularly in waters deeper than 125 fm. There is also a clear difference in the average depth of fishing between the two gears. The pot fleet caught 89 percent of its sablefish in waters deeper than 150 fm, compared to just 52 percent for the longline fleet. Eighty-nine percent of the longline caught sablefish were taken in waters deeper than 100 fm.

Several factors support the use of a relatively simple method of estimating sablefish discard and the bycatch of overfished species in the 2004-2006 primary sablefish fisheries. Given the newness of the current fishing structure and the inherent flexibilities conveyed by permit stacking and a 7-month cumulative limit period, there is considerable uncertainty regarding the temporal, geographic, and gear distributions of catch that will be realized. Holding each gear type individually accountable for its performance is not realistic because it is the gear that is used, not the permit's endorsement that will affect performance. Since a permit with either gear endorsement may be stacked on a vessel using either gear, and permits may be transferred to different holders even after the season begins, there is no way to attribute differential discard/bycatch impacts to permits on the basis of gear endorsement prior to the season. In addition to these difficulties in reliably modeling participation, the precision of bycatch estimates, given the currently available data, degrade rapidly as monthly strata are introduced.

For these reasons, the recommended approach for 2004-2006 is to use fleetwide, season-long estimates of discard and bycatch, and applying those to the total catch of sablefish allocated to this fishery. It is also recommended that a weighted combination of observer data from 2001-2003 be used in calculating bycatch results for this purpose. The following weights are used with data from each year: 2003: 0.4; 2002: 0.35; 2001: 0.25. While the bycatch ratios are derived from observations of only tier-limit fishing for sablefish, there are no other sources of information regarding bycatch in the portion of the fishery conducted under daily/weekly options. Finally, given the lack of observations south of the Ft. Bragg area, the reported bycatch estimates for bocaccio and cowcod are not likely to reflect the true impact on these stocks. This is particularly the case for the columns that reflect fishing shallower than 150 fm in Tables 2.2-14 and 2.2-15.

Analysis of Alternatives

The only quantitative analysis available for the limited entry fixed gear sector is for the portion of the fleet participating in the primary sablefish fishery. Table 2.2-14 shows results for the primary sablefish fishery under the No Action Alternative with recalculated tier limits using the OY rather than the ABC (see section 2.2.4.2). These results are compared to those for the action alternatives in Table 2.2-15. Note that the action alternatives differ by varying the size of the non-trawl RCA by adjusting the seaward boundary line. Therefore, under Action Alternative 1, there is a seaward RCA line of 150 fm coastwide. While this is status quo south of 40°10' N. lat., it is much more conservative than the status quo boundary of 100 fm north of 40°10' N. lat. Likewise Action Alternative 2, with a seaward RCA boundary of 125 fm is more liberal than status quo in the south and more conservative in the north. Lastly, Action Alternative 3 is much more liberal in the south and status quo in the north. To better understand the effect of managing the primary sablefish fishery with the Council-Preferred sablefish OY, Table 2.2-16 shows the impacts of the primary sablefish fishery using the status quo RCA configurations in the north and the south, but with tier limits calculated using the Council-Preferred 2005 sablefish OY. Not surprisingly, these impacts are the same as under the No Action Alternative since the greatest affect of fixed gear management strategies on overfished species, is the configuration of the non-trawl RCA. There is a seven-fold difference in the estimated canary rockfish impacts in the primary sablefish fishery under Action Alternative 1 relative to Action Alternative 3 (Table 2.2-15). However, this canary impact is still rather small at 0.7 mt given the liberal RCA boundary under Action Alternative 3. It is noted that the bycatch scorecards (Tables 2.2-2, 2.2-3, 2.2-4, and 2.2-5) have the same estimated impacts of overfished species for the limited entry fixed gear sector. This is because the estimated impacts by species in these tables are the higher of estimated impacts in the primary sablefish impact model (from Tables 2.2-14 and 2.2-15) or the impacts under the No Action Alternative using assumed discard rates (Table 2.2-2). However, there is clearly an effect of varying the size of the non-trawl RCA on the estimated mortality of overfished species that can only be addressed qualitatively. The estimated mortality of overfished shelf species (bocaccio, cowcod, canary, lingcod, widow, and yelloweye) would be progressively higher under Action alternatives 3, 2, and 1 since more fishing is progressively allowed in depths where these species are found. It is noted that new open access and limited entry fixed gear observation data from the WCGOP will be available in April and November 2005. Observations from fixed gear efforts in shallow water and south of Ft. Bragg, California are anticipated in these forthcoming data reports. These data will be used for inseason management decision-making during 2005-2006, which should decrease the uncertainty in impact assessment.

4.3.2.3 Open Access

The same qualitative assessment of limited entry fixed gear impacts under 2005-2006 management alternatives applies for the open access sector. The bycatch scorecards (Tables 2.2-2, 2.2-3, 2.2-4, and 2.2-5) do not differentiate the effect of a varying non-trawl RCA since there are no empirical observations yet available for this sector. However, there is clearly an effect of varying the size of the non-trawl RCA on the estimated mortality of overfished species that can only be addressed qualitatively. The estimated mortality of overfished shelf species (bocaccio, cowcod, canary, lingcod, widow, and yelloweye) would be higher under Action Alternative 3, than under Action Alternative 2, than under Action Alternative 1 since more fishing is progressively allowed in depths where these species are found. It is noted that new open access observation data from the WCGOP will be available in April and November 2005. Observations from fixed gear efforts in shallow water and south of Ft. Bragg, California are anticipated in these forthcoming data reports. These data will be used for inseason management decision-making during 2005-2006, which should decrease the uncertainty in impact assessment.

4.3.2.4 Tribal Fisheries

Description of Tribal Groundfish Fisheries

In 1994 the U.S. government formally recognized that the four Washington coastal tribes (Makah, Quileute, Hoh, and Quinault) have treaty rights to fish for groundfish; and concluded, in general terms, they may take half of the harvestable surplus of groundfish available in the tribes' usual and accustomed (U&A) fishing areas (described at 60 CFR 660.324). West Coast treaty tribes have formal allocations for sablefish, black rockfish, and Pacific whiting. Members of the four coastal treaty tribes participate in commercial, ceremonial, and subsistence fisheries for groundfish off the Washington coast. Participants in the tribal commercial fisheries use similar gear to non-tribal fishers. Groundfish caught in the tribal commercial fishery pass through the same markets as non-tribal commercial groundfish catch.

There are several groundfish species taken in tribal fisheries for which the tribes have no formal allocations, and some species for which no specific allocation has been determined. Rather than try to reserve specific allocations of these species, the tribes recommend trip limits for these species to the Council, who try to accommodate these fisheries. Tribal trip limits for groundfish species without tribal allocations are usually intended to constrain direct catch and incidental retention of overfished species in the tribal groundfish fisheries.

Thirteen western Washington tribes possess and exercise treaty fishing rights to halibut, including the four tribes that possess treaty fishing rights to groundfish. Tribal halibut allocations are divided into a tribal commercial component and the year-round ceremonial and subsistence component.

Approximately one-third of the tribal sablefish allocation is taken during an open competition fishery, in which vessels from the sablefish tribes all have access to this portion of the overall tribal sablefish allocation. The open competition portion of the allocation tends to be taken during the same period as the major tribal commercial halibut fisheries in March and April. The remaining two-thirds of the tribal sablefish allocation is split between the tribes according to a mutually agreed-upon allocation scheme. Specific sablefish allocations are managed by the individual sablefish tribes, beginning in March and lasting into the autumn, depending on vessel participation management measures used. Participants in the halibut and sablefish fisheries tend to use hook-and-line gear, as required by the International Pacific Halibut Commission. By agreement the tribes also use snap gear for equity reasons in the fully competitive halibut and sablefish fisheries (i.e., someone participating in a fully competitive sablefish fishery who landed no halibut would not have to meet any IPHC requirements, but would still have to use snap line gear by tribal regulation).

In 2004, tribal sablefish longline fisheries were allocated 10% of the total catch OY (751 mt) and then were discounted 3% of that allocation for discard mortality, for a landed catch allocation of 728.5 mt. For the commercial harvest of black rockfish off Washington State, the treaty tribes have a harvest guideline of: 20,000 lb (9,072 kg) north of Cape Alava (48˚09'30" N. lat.) and 10,000 lb (4,536 kg) between Destruction Island (47˚40'00" N. lat.) and Leadbetter Point (46˚38'10" N. lat.).

In addition to these hook-and-line fisheries, the Makah tribe annually harvests a whiting allocation using midwater trawl gear. Since 1996, a portion of the U.S. whiting OY has been allocated to the Pacific Coast treaty tribes. The tribal allocation is subtracted from the whiting OY before allocation to the non-tribal sectors. Since 1999, the tribal allocation has been based on a sliding scale related to the U.S. whiting OY. To date, only the Makah tribe has fished on the tribal whiting allocation.

In 1999 and 2000, 32,500 mt of whiting was set aside for treaty Indian tribes on the coast of Washington state, resulting in a commercial OY of 199,500 mt for 2000. In 2001 and 2002, the landed catch OY declined to 190,400 mt and 129,600 mt, respectively, and the tribal allocations for those years were also reduced to 27,500 mt and 22,680 mt, respectively. In 2003 the landed catch OY of 148,000 mt resulted in a tribal allocation of 25,000 mt. In 2004 the landed catch OY was 250,000 mt with a tribal allocation of 32,500 mt.

Makah non-whiting vessels fit with mid-water trawl gear have also been targeting yellowtail rockfish in recent years. Tribal regulations specify the monthly limit of yellowtail, based on the number of vessels participating, as well as limits for widow rockfish (not to exceed 10% of yellowtail landings in a given period), canary rockfish (300-pounds per trip), and minor nearshore, shelf, and slope rockfish (300-pounds per trip combined). This fishery is managed by both time and area to stay within projected impacts on overfished rockfish, primarily widow and canary, taken incidentally with yellowtail. Short test tows are taken in areas previously identified as having low bycatch rates before that area is open to fishing. If vessels in the fishery approach the limits established by tribal regulation, the area is closed to further fishing until it can be shown to have reduced bycatch rates. An observer program is in place to verify bycatch levels in the fishery, and assigned vessels must carry an observer to participate.

In 2005 and 2006 the tribes are proposing increased targeting of lingcod primarily with hook and line gear (i.e., either trolled dinglebar or jig) as well as bottom trawl pending the results of a test fishery in 2004. The tribes would not propose increased targeting on lingcod unless bycatch rates were shown to be low enough to stay within current projected levels. Trip limits for incidental landings in all other tribal fisheries would likewise be increased to account for higher abundances reflected in the increasing OY as a result of rebuilding.

Table 4.3-11 shows recorded landings of groundfish species by treaty tribes from 1995 to 2003. Since 1996, Pacific whiting have comprised the vast bulk of tribal landings, even though in 2000 and 2001 whiting landings were relatively low due to reduced availability of Pacific whiting in the U&A.

Bycatch in the Tribal Groundfish Fisheries

Tribal directed groundfish fisheries are subject to full retention. For some rockfish species, where the tribes do not have formal allocations, trip limits proposed by the tribes are adopted by the Council to accommodate incidental catch in directed fisheries for Pacific halibut, sablefish, and yellowtail rockfish. These trip limits are intended to constrain direct catches while allowing for small incidental catches. Trip limits of 300 lbs each exist for combined longspine and shortspine thornyheads, canary rockfish, minor shelf rockfish, and minor slope rockfish. Yelloweye rockfish are subject to a 100 lbs per trip limit. For all other species, limited entry trip limits apply. Rockfish trip limits do not apply during fully competitive fisheries for Pacific halibut, nor in the tribal Pacific whiting fishery (where all rockfish are retained and forfeited to the tribe for charitable contribution). Groundfish bycatch in the Pacific whiting fishery is estimated by NMFS observers. Trip limit overages in all other fisheries are forfeited to the tribes. In 2002, the midwater yellowtail fishery accounted for all of the rockfish trip limit overages (443 lbs of canary rockfish, 713 lbs of darkblotched rockfish, and 212 lbs of widow rockfish). The only trip limit overage in 2003 was also from the midwater yellowtail fishery (3,889 lbs of yellowtail rockfish). The Makah Tribe has an observer program in place to verify bycatch levels. Table 4.3-12 compares bycatch of overfished species in observed versus unobserved trips. There was no observed discard of target species in 2003. Observed trips comprise 16% of all trips (5 of 34). These rates, from the first year of the observer program, are based on fairly small sample sizes and thus are not yet used for statistical comparison.

Estimated groundfish bycatch in Makah trawl and troll fisheries in recent years is depicted in Table 4.3-13. Among the overfished species, the table shows some bycatch of widow rockfish and canary rockfish in midwater and bottom trawl, and lingcod bycatch in bottom trawl and salmon troll fisheries. Estimated bycatch in tribal longline fisheries in recent years is shown in Table 4.3-14. The table shows some bycatch of lingcod, canary rockfish and yelloweye rockfish in tribal halibut and sablefish fisheries. Table 4.3-12 shows observed versus unobserved bycatch of overfished species in the Makah Tribe's bottom trawl fishery. Target species discard composed of small and unmarketable sole and arrowtooth flounder comprised 8.1% of total flatfish catch. Observed trips comprise 13% of all trips (23 of 175). As with the midwater observer program, these rates are based on small sample sizes and are not used for statistical comparison.

Discard and Retention in Tribal Sablefish Fisheries

The tribal sablefish allocation is 10% of the OY for the area north of 36° N. lat.. This amount is reduced by about 2.3% to account for discard mortality. The tribal sablefish fishery is primarily a longline fishery. The discard mortality is calculated as the difference in market size category ratios in the competitive portion (approximately 1/3 of the tribal allocation) compared to noncompetitive (approximately 2/3 of the tribal allocation) tribal longline fisheries averaged over the past three years (Table 4.3-15). This calculation does not account for the increase in larger fish closer to shore as the season progresses, which would overestimate actual discard and mortality. A small portion of the tribal sablefish allocation is also taken in the Makah bottom trawl fishery as an allowance to prevent discarding in the directed flatfish and Pacific cod fisheries. That portion of the tribal sablefish fishery that is taken by bottom trawl, estimated to be 60,000 lbs. (dressed weight) in 2004, is subject to full retention. At the end of the season most trawl vessels make one to two directed sablefish tows to take the remainder of their allowance. All overages are forfeited to the tribe. In 2002 these forfeitures accounted for 1,634 lbs in four landings (one per vessel). There were no forfeitures in 2003 when the tribal allocation of sablefish was not fully taken. The lack of discard in the tribal trawl fishery does not significantly affect the overall rate of 2.3% applied to tribal sablefish fisheries.

2005-2006 Management Measures

For 2005-2006, the tribal fisheries for sablefish, black rockfish, and Pacific whiting are separate fisheries, and are regulated by the tribes so as not to exceed their allocations. The tribal allocation for black rockfish is the same in 2005-2006 as in 2004 (30,000 lb harvest guideline). Also similar to 2004, the tribal sablefish allocation is 10 percent of the total catch OY specified for the Monterey, Eureka, Columbia, and U.S./Vancouver INPFC areas under the proposed action (748.6 mt in 2005 and 736.3 mt in 2006), less 2.3% for estimated discard mortality, or 731.4 mt in 2005 and 719.4 mt in 2006.

From 1999 through 2004, the tribal allocation of Pacific whiting has been based on a methodology originally proposed by the Makah Tribe in 1998. The methodology is an abundance-based sliding scale that determines the tribal allocation based on the level of the overall U.S. OY, up to a maximum 17.5% tribal harvest ceiling at OY levels below 145,000 mt. The tribes have proposed using the same methodology in 2005-2006. The Pacific whiting U.S. OY specification is expected to be decided at March 2005 Council meeting.

4.3.2.5 Washington Recreational

Estimation of Recreational Groundfish Impacts in Washington

The Washington Ocean Sampling Program (OSP) generates catch and effort estimates for the recreational boat-based groundfish fishery which are provided to Pacific States Marine Fisheries Commission (PSMFC) and incorporated directly into RecFIN. The OSP provides catch in total numbers of fish, and also collects biological information on average fish size which is provided to RecFIN to enable conversion of numbers of fish to total weight of catch. Boat egress from the Washington coast is essentially limited to four major ports, which enables a sampling approach to strategically address fishing effort from these ports. Effort estimates are generated from exit-entrance counts of boats leaving coastal ports while catch per effort is generated from angler intercepts at the conclusion of their fishing trip. The goal of the program is to provide information to RecFIN on a monthly basis with a one-month delay to allow for inseason estimates. For example, estimates for the month of May would be provided at the end of June. Some specifics of the program are:

Exit/entrance count - boats are counted either leaving the port (4:30 AM - end of the day) or entering the port (approximately 8:00 AM through end of the day) to give a total count of sport boats for the day.

Interview - boats are encountered systematically as they return to port; anglers are interviewed for target species, number of anglers, area fished, released catch data and depth of fishing (non-fishing trips are recorded as such and included in the effort expansion). The OSP only collects information on released catch and does not collect information on the condition of the released fish. Therefore, released catches must be post-stratified as live or dead based upon an assumed discard mortality rated. Onboard observers are deployed throughout the sampling season primarily to observe hatchery salmon mark rates but also collect rockfish discard information for halibut charter trips.

Examination of catch - catch is counted and speciated by the sampler. Salmon are electronically checked for coded wire tags and biodata is collected from other species.

Sampling Rates - vary by port and boat type. Generally, at boat counts less than 30, the goal is 100%

coverage. The sampling rate goal decreases as boat counts increase (e.g., at an exit count of 100, sample rate goal is 30%; over 300, sample rate goal is 20%). Overall sampling rates average approximately 50% coastwide through March-October season.

Sampling Schedules - due to differences in effort patterns, weekdays/weekend days are stratified. Usually, both weekend days and a random 3 of 5 weekdays are sampled.

Personnel - OSP sampling staff include two permanent biologists coordinating data collection, approximately twenty-two port samplers, four on-board observers and one data keypuncher.

Volume of data - Between 20,000 and 30,000 boat interviews completed per season coastwide.

Data Expansion:
Algorithm for expanding sampled days:

____Exit Count___ * Ps sampled = Pt
Total boats sampled

where Ps = any parameter (anglers, fish retained, fish released) withing a stratum,
and Pt = total of any parameter with stratum for the sample day

Algorithm for expanding for non-sampled days:

Total Weekday Catch = (Pt) on sampled weekdays* no. of weekdays in stratum
number weekdays sampled

Total Weekend Catch = (Pt) on sampled weekend days* no. weekend days in stratum
number weekend days sampled

Total weekend catch + total weekday catch = total catch in stratum

Notes on Data Expansion:
Salmon and halibut catches are stratified by week; all other species are stratified by month. All expansions are stratified by boat type (charter or private), port, area and target species trip type (e.g., salmon, halibut, groundfish, albacore)

Washington Recreational Fishery Impact Modeling

Projected impacts for Washington's recreational fishery are essentially based upon the previous season's harvest estimated by the OSP and incorporated in RecFIN. This is especially true if recreational regulations remain consistent. When bag limit changes are proposed, traditional bag limit analyses are performed by setting individual bags that exceed the proposed bag in the raw data down to the level of the proposed bag and then recalculating total catch. As expected, this often results in fairly minor changes, especially if only a small portion of the total catch is represented by catch taken in near limit bags. Also, when bag limits become extremely small, it is difficult to differentiate between targeted retained catch and truly incidental catches that are retained. For example, in 2004 the canary bag limit was reduced from 1 to 0 to remove any possible incentive to target this species. Additionally, WDFW has used the 0 bag limit as an element in a public information campaign encouraging anglers to change fishing behavior to avoid areas where overfished rockfish such as yelloweye and canary might be expected to be taken. It is difficult to determine from existing data what portion of fish taken under a 1-fish bag limit were an intended, targeted catch, or a truly incidental catch. Therefore, WDFW did not quantify a mortality savings in the scorecard impact as a result of this change, but rather assumed there would be some catch saved due to reduced targeting and this could subsequently be measured through the angler interview program which collects information on discarded catch.

Modeling impacts due to area (depth) restrictions are even more problematic than bag limits, since there is little information in historical recreational catch data with respect to depth. Therefore, there is an unavoidable qualitative aspect to modeling impacts due to depth restrictions that have largely been based upon the distribution of the fish in question rather than information in the catch database. However, in 2002, the OSP program began collecting fishing depth as well as discard information. This information will be keypunched and analyzed with respect to depth of catch for species of concern. Since the WA recreational management measures include prohibiting fishing deeper 30 fm if certain catch targets are approached, the depth analysis will be structured to determine fishing activity and catch relative to this depth.

Inseason catch projections are based upon the most recent OSP estimates to date with subsequent months extrapolated from the previous season. This includes producing inseason reports of discard information for prohibited species such as yelloweye and canary. Plans for 2004 and beyond include a monthly iteration of this report incorporating catches to date with projections for the remainder of the season. However, it should be noted that the precision of recreational groundfish catch estimates based upon previous seasons will continue to be influenced by factors such as the length and success of salmon and halibut seasons, weather and other unforseen factors.

Analysis of Alternatives

All the action alternatives, as well as the No Action alternative, are the same for Washington recreational management measures. The principal management strategy is to closely monitor the recreational fishery and close all or part of fishery inseason if harvest guidelines are projected to be exceeded. As in 2004, Washington managers will consider closing all or part of the fishery outside the 30 fm management line in response to harvest guideline attainment. It is noted that the 2003 catch of yelloweye is about 4 mt (Table 4.3-16). This is approximately 0.5 mt higher than the GMT-recommended Washington recreational harvest guideline. While Washington managers suspect the 2003 RecFIN yelloweye total mortality estimate of 4.0 mt is too high because of an implausibly high average weight of landed and discarded yelloweye in this fishery (~10 lbs according to B. Culver, personal communication), they remain committed to using 3.5 mt as a Washington recreational yelloweye harvest guideline in 2005 and 2006.

4.3.2.6 Oregon Recreational

Estimation of Recreational Groundfish Impacts in Oregon

Modeling of expected 2005-06 Oregon recreational fishery impacts of selected groundfish species was based on landings in recent years. For the ocean boat fishery, the data source was the Oregon Department of Fish and Wildlife Ocean Recreational Boat Survey (ORBS). For the shore and estuary fishery, the data source was the Marine Recreational Fishery Statistical Survey (MRFSS). Analyzed species included black, blue, brown, canary, china, copper, grass, quillback, widow, and yelloweye rockfishes; as well as kelp greenling, cabezon and lingcod. Base level landings for the ocean boat fishery (in numbers of fish) were based on 2003 landings because these data reflect regulations most similar to those expected in 2005-06 (i.e., bag limits, effort shifts to avoid overfished species, etc.). Base level landings for the shore and estuary fishery (in weight, kg) are largely unaffected by management of overfished species and reflect the most recent 5-year average, 1998-2002, because the MRFSS program is designed to more accurately

capture trends rather than annual values. Average weights for only greenling and cabezon were adjusted for minimum length changes.
The expected average weight per fish was based on the 2002-2003 average for the ocean boat fishery. A two year average was used because of small annual sample sizes for the more infrequently observed species.

The expected reduction in catch due to offshore closures was based on the data from the 2003 at-sea observer study on Oregon charter vessels (91 observations which represent 3 percent of total charter groundfish trips). Available observer data from 2001 (105 observations) were not used because they are not representative of the current and projected fishery in 2005 and 2006. For example, in 2001 approximately 44 percent of the canary rockfish were taken in waters deeper than 40-fm compared to approximately 9 percent in 2003 because much of the fleet had moved from fishing offshore waters to avoid overfished species. The observer study was not conducted in 2002. The following percent reduction rates (for numbers of fish) were applied to appropriate months (June - September) expected to be closed outside of 40 fm: canary rockfish = 9.2; yelloweye rockfish = 27.8; lingcod = 13.8; and widow rockfish = 69.2 (Table 4.3-17).

Annual angler effort in 2005 and 2006 for ocean, shore and estuary areas is assumed to be similar to 2003 and 2004. Angler groundfish effort in 2003 for the ocean boat fishery was 57,000 angler trips. Groundfish angler trips in the shore and estuary fishery are not available, only total trips. During offshore closures outside of 40-fm, effort and catch were projected to be shifted from the offshore closure areas to open nearshore areas. The estimated increase in effort in nearshore waters is 5 percent, because approximately 5% of the total effort in 2003 was in offshore waters. Most of the offshore effort occurs in the charter fleet.

Closure of Stonewall Banks provided an additional reduction in impacts on offshore species, beyond that due to the 5% effort shift based on charter vessel observations. Most angler effort at Stonewall Banks is from private boats and not charter boats, and therefore, the effects of closure at Stonewall Banks could not be estimated from the observer data. Stonewall Banks is one of the few Oregon areas between 38 and 50 fm that is fished for recreational groundfish. To estimate the impacts on canary and yelloweye rockfishes, the 2002-2003 average weights for canary and yelloweye rockfishes were applied to 2003 landings in the directed groundfish fishery on Stonewall Banks. It was estimated that 70% of this catch occurred during the June-September period based on the 2003 monthly profile for the entire Oregon recreational groundfish fishery.

The catch of lingcod has increased steadily in recent years, likely due to rebuilding. Based on this trend, a 17% annual increase in catch is expected over 2003 levels.

No bag limit or minimum length changes are proposed for 2005-06; thus the same procedure as reported in the 2004 EIS (PFMC 2004b) was used to analyze the impacts of regulations. In 2004, minimum length changes were adopted for greenling (none in 2003 to 10-inches) and cabezon (15 inches in 2003 to 16 inches). The effect of adopting a minimum length of 10 inches for greenling is assumed to be zero for the ocean boat fishery because greenling caught in this fishery are generally larger than 12 inches. The estimated greenling reduction of 24% in the shore and estuary fisheries is based on MRFSS weight by length profiles.

Discards of overfished groundfish species (canary and yelloweye rockfishes and lingcod) were analyzed for proposed 2005-06 fisheries. For lingcod, an estimated 95% of released fish are estimated to survive (personal communication with the GMT). Estimates of discard impacts were made for canary rockfish and yelloweye rockfish due to non-retention. This was based on using 2003 catch, 2002-2003 average weight, and appropriate catch scalars for offshore closures (see above). A 100% mortality rate was assumed for canary rockfish released in waters over 20 fm, a 50% mortality rate was assumed for canary rockfish released in waters over 10 fm but less than 20 fm, and 15.9% mortality rate was assumed for canary rockfish released in waters 10 fm or less (maximum of range of likely mortality from Albin and Karpov (1995)). Canary rockfish releases by depth (10-fm increments) were derived from the 2003 at-sea observations and result in 66 percent mortality with no depth closures and 63 percent mortality during depth closures (Table 4.3-18). For yelloweye rockfish, 100% mortality at all depths was assumed because observations were too few to stratify by 10-fm increments.

Discard impacts were also estimated for released canary rockfish and yelloweye rockfish due to angler preferences (small size) and regulatory-induced release during 2003 (bag limits). Addressing releases due to bag limits is necessary because the base year for estimating catch of these species in 2005-2006 was 2003 when bag limits of 1 canary rockfish and 1 yelloweye rockfish were in effect. For 2005-2006 the bag limits are zero (non-retention) for these two species. The discard rate, based on the 2003 at-sea observation program, was 44% of canary rockfish retained (239 observations) and 6% of yelloweye rockfish retained (18 observations). The same mortality rates discussed in the above paragraph were used. The modeling assumed that canary rockfish discarded are 42% of average 2002-2003 retained size based on at-sea observations in 2003 (38 fish observed with an average size of 0.4 kg compared to the average size from dockside sampling of 0.96 kg). For yelloweye rockfish, similar average size of landed fish was assumed since there were too few observations taken at-sea.

During the 2005-2006 all-depth Pacific halibut fisheries, the canary rockfish and yelloweye rockfish impact due to non-retention was based on the creel survey of the 2003 fishery. This fishery was open May through October on authorized days under non-retention for these two species of rockfish. The 2002-2003 average weight was used to estimate impacts in metric tons.

Tables 4.3-19 and 4.3-20 detail the estimated distribution of recreational catch in Oregon by season for important species and species groups under the 2005 and 2006 management alternatives, respectively.

4.3.2.7 California Recreational

The CDFG developed an impact projection model which was reviewed by the GMT at their May 2004 meeting. The GMT recommends this model for use in projecting impacts of groundfish species in 2004-2006 in California recreational fisheries. This model is described below and is used in impact analyses in this preliminary DEIS.

CDFG/California Recreational Groundfish Model Assumptions for Projecting 2005-06 Catch

The model incorporates a number of parameters and assumptions, all of which are either risk-neutral or risk-adverse (precautionary). Model output predicts expected catch under any combination of season and depth fishing restrictions by region.

- Effort shift inshore - The model includes a 48.7% increase in expected landings for open depth strata at strata less than 30 fm to account for an effort shift into shallow water when fishing outside 30 fm is closed. This is the upper quartile value from the 2002 CDFG effort shift analysis.

- Discard mortality estimates are assumed to be 100% for prohibited species (canary, cowcod, and yelloweye rockfish) in all depth strata open to fishing. Note that catch by depth and depth-based discard mortality rates are available (Albin and Karpov 1995), however, they are not incorporated into the model at this time to account for unquantifiable illegal retention in addition to bycatch mortality.

- California scorpionfish and lingcod hooking mortality rate is assumed to be 5%.

- Historical percentages by wave - Estimates of historical percent of total catch by wave were calculated for each region based on RecFIN data (weight of A+B1) from 1993-1999, which was a time period when seasons and depths were unconstrained. Data availability for the Northern region (California-Oregon border to 40°10' N. lat.) was limited, so similar estimates from Oregon were obtained from RecFIN and used to obtain a seasonal pattern of catch by wave (per discussion with D. Bodenmiller, ODFW).

- Expanded 2003 base-year methodology - With respect to creating a 2003 base year expanded to represent potential catch in an unconstrained season, a more conservative approach is used in the current model to generate estimates than that used for the 2004 inseason calculations in early April 2004.

- Under the current approach, the full year expanded catch builds up from unadjusted RecFIN data (i.e., no adjustment for "derby effect" applied) to what might be expected if that level of effort and catch rates were applied to a complete year (back-calculating and applying % by wave).

- The method used at the April 2004 Council meeting, instead, created an "adjusted 2003" data set by spreading 2003 effort between waves based on moderating any "derby effect" in wave 4, and using proxy 2002 catches from waves closed in 2003, adjusted by increased effort and catch rates that year.

- Minimum size and bag limits - The estimates of landings for each year were not standardized to reflect the same minimum size and bag limits. For instance, lingcod catches have not been standardized to a single size limit and thus the output reflects the following:
    - 2 fish at 24" for 1999, 2002, 2003
    - 2 fish at 26" for 2000, 2001

- It is assumed that the impact of this non-standardization is minimal under the current model.

- Bocaccio adjustment for fully-recruited 1999 year class effect - The adjustment present in last year's model that doubled bocaccio is not in the current version of the model. The 2002 and 2003 catches presumably reflect the full recruitment of the 1999 year class into the fishery, so additional adjustments are not needed.

Application of a Decay Function Methodology to Weight Historical Catch Data for Use in Predicting Future Catches

Background:
At the March 2003 Council meeting, the SSC met with Dr. Jim Hastie to discuss how to most appropriately weight each of the years of observer data in the bycatch model, and how to incorporate future observer data years. The SSC discussion resulted in a recommendation to apply a decay function to each year back in succession to give greatest significance to the most recent year of data, and give decreasing significance to earlier years. The CDFG believes that this methodology is appropriate for application to California's catch history in predicting future behavior of the recreational fishing fleet.

Preferred Approach:
CDFG analysts recommend the use of a 0.7 weighting factor equation for application to the California recreational fisheries data, as an alternative to more arbitrary approaches that give equal weight to each year in a pre-selected set of input years (Table 4.3-21). Under the recommended decay function approach, each successively older year is given a weight of 0.7 times the more recent year that it preceded. Given the extant 18-year RecFIN catch history, the most recent year (2003) accounts for 30.0% of the catch information in the "base year" calculation. The 2000-03 period contributes 76.1%, the 1990-99 period contributes 22.1%, and the 1983-89 period contributes the remaining 1.8%.

Selection of 0.7 Weighting Factor in Decay Function Model

A Decay Function model was selected to model 2005-2006 landings, because this method:

- Provides more weight to recent years thus giving greater significance to the most recent years and less significance to earlier years;
- Was recommended by the SSC as a methodology for weighting years of observer data in the bycatch model.

The 0.7 weighting factor was selected for use in the Decay Function model because of the following:

- The primary contribution comes from 2000-03 (76.1%; 2003 alone contributes 30%);
- Includes a contribution from the 1990s (22.1%) and a small contribution from the 1980's (1.8%);

o Inclusion of 1980's in the model was considered appropriate because, unlike other sections of the west coast, a large portion of the California rockfish catches during the 1980's was taken by recreational anglers (see figure below).

o Inclusion of the 1980s and 1990s in the model, along with 2000-2003, was not considered a deficit in the predictive abilities of the model. This is because differences in regulations between the past two decades relative to more recent years were to a large extent accounted for through expansions of the recent catches for closed months and closed depths (i.e., catches from more recent years now reflect an expanded full fishing season within all depths for purposes of projection).

Estimates of recreational catch from 2003 alone were not used because:

Actual catch information was only available for part of the year in most of the state due to the 6-month closure from January - June, and closure of depths outside 20 or 30 fm during open fishing months;

o One of the premises of the projection model is to look at a full season without depth restrictions. To use 2003 in the model, the 2003 catches have to be expanded based on assumptions of take of fish in January-June and take of fish within closed depths. The resulting expanded catch includes a higher proportion than other years of "estimated" take which introduces a higher level of uncertainty than earlier years.

- Concerns still linger about the accuracy of the 2003 July-August (Wave 4) catch estimates, particularly since observations in the field do not support the extremely high estimate of private/rental anglers generated through the Random Digit Dialing (phone) survey for effort.

While the reasons provided above make 2003 a poor choice for a base year, it is still appropriate to include the 2003 information within the model because it provides the most recent information on catches under the current regulations, stock abundance, and angler fishing behavior. For inclusion in the model, however, it was important to expand the catch information, as mentioned above, to a full season.

Inputs and Key Parameters for the Model

1. BASE YEAR CATCH: Caught and retained (MRFSS "A" catch) plus filleted/caught and released dead (MRFSS "B1" catch) in WEIGHT of fish. Assumed to be estimates for an unrestricted fishing year with no months closed and no depths closed. Most of the years were without season and depth constraints; however 2000 to 2003 had some restrictions. For now, the two month closures in 2000 and 2001 have been unaccounted for. For 2002 and 2003, a back calculation method was used to add a catch estimate for what the catch would have been (based on percent caught in waves and depths in prior years), if all months and all depths had been open.

2. MORTALITY: 100% mortality factor for prohibited species: 100% mortality of canary, cowcod, and yelloweye rockfish caught incidental to fishing for other species is built into the model.

3. INCIDENTAL MORTALITY FOR CALIFORNIA SCORPIONFISH: to account for incidental catch while fishing for other species during a California scorpionfish closure. For the 2004 model, it was 18% and, for 2004 inseason and for 2005-2006, it was changed to 5% from CDFG research data.

4. EFFORT SHIFT: Accounted for when fishing is restricted to shallow waters (i.e., inside 30 fm or inside 20 fm) by applying a 48.7% increase to catch (a 14.7% effort shift was used for the 2004 model).

Post Model Adjustment Possibilities

- Currently, no adjustments for increased stock abundance are in place. Species to consider stock increases for are bocaccio and lingcod.

- Currently, no savings of increased size limit or decreased bag limit are accounted for, such as recent regulatory changes for lingcod.

- Currently, discarded fish weight estimate uses the same average weight as retained fish, and is likely an overestimate of weight.

Rockfish-Cabezon-Greenling (RCG) Bag Limits

If the harvest guideline or harvest target for any nearshore rockfish species within the RCG complex is projected to be exceeded, state action may be taken to reduce the bag limit from 10 fish (status quo) to a number less than 10 fish (Figure 4.3-5). The proposed reduction in bag limit may apply specifically to the private boat, shore-based, and diving modes, resulting in a differential bag limit for these modes and the CPFV mode due to economical implications for CPFVs when a bag limit is reduced below 10 fish. A separate option is to include CPFVs in a bag limit reduction. This management response may be particularly effective for nearshore rockfish species such as black rockfish, where limiting depth may not be the most effective tool.

Lingcod Bag and Minimum Size

CDFG is proposing alternatives to fishery closure as an inseason management response to projected over-harvest of lingcod. If the CDFG determines that more restrictive management measures are necessary to slow the harvest of lingcod, an increase in the minimum size limit, or a reduction in the bag limit from 2 to 1, may be implemented. Projected harvest for each upcoming month can be multiplied according to the coefficients for size and/or bag limit to identify the management response necessary to keep projected catch within the recreational HG.

Coefficients to modify projected catch of lingcod from a 2-fish bag limit to 1, or from 24” to a larger minimum size:

Size	size coefficient	bag limit coefficient
24	0	0.214
25	0.169	0.18
26	0.304	0.15
27	0.43	0.12
28	0.521	0.1
29	0.581	0.07
30	0.641	0.039
31	0.685	0.025
32	0.723	0.011

Estimation of Impacts

The CDFG is proposing the same seasons outlined in section 2.2.4.7 and figures 2.2-1, 2.2-2, and 2.2-3 for all the action alternatives. The estimated impact on select groundfish species in 2005 and 2006 California recreational fisheries by region are shown in Table 4.3-22. While the estimated impacts on lingcod, cabezon, and greenling under each action alternative have yet to be provided (bag and minimum size limits for these species vary by alternative), these analyses and model outputs are anticipated to be available to the GMT, GAP, and Council in June before a final decision is made.

TABLE 4.3-1. Commercial landings (mt) of currently unassessed flatfish species, 1981-2003. (Page 1 of 1)

	Better Sampled by Survey				Less Well Sampled by Survey							
			Rex Sole + Sanddab									
Year	Sanddab	Rex Sole	mt	% of all	Curlfin Sole	Starry Flounder	Butter Sole	Rock Sole	Sand Sole	Other/ Unspecified Flatfish	All Non-Assessed Flatfish	Sum of Other Species
1981	569	1,551	2,119	58%	2	575	22	19	598	337	3,673	1,553
1982	723	1,741	2,464	63%	4	431	23	47	694	254	3,917	3,917
1983	503	1,454	1,957	65%	4	292	8	17	462	250	2,990	1,033
1984	530	1,273	1,803	68%	3	346	3	11	327	157	2,650	847
1985	629	1,423	2,052	59%	2	726	5	16	451	199	3,451	1,399
1986	615	1,208	1,823	66%	2	295	18	12	491	116	2,757	934
1987	769	1,190	1,960	68%	4	281	20	8	520	108	2,900	941
1988	651	1,266	1,917	70%	3	373	5	14	308	104	2,724	807
1989	730	1,145	1,875	63%	2	530	3	17	407	130	2,965	1,090
1990	878	878	1,756	70%	0	328	1	12	353	50	2,500	744
1991	882	1,170	2,052	63%	1	698	1	15	409	58	3,235	1,183
1992	605	875	1,480	73%	0	154	0	10	294	76	2,015	535
1993	639	786	1,425	74%	1	135	1	16	303	55	1,937	512
1994	1,205	842	2,047	84%	3	86	1	11	252	36	2,435	389
1995	1,364	929	2,293	90%	1	62	0	8	138	57	2,559	267
1996	894	850	1,744	87%	2	53	1	10	138	52	2,000	256
1997	1,171	812	1,983	86%	3	105	3	34	139	43	2,309	326
1998	777	637	1,414	83%	8	99	5	30	86	58	1,698	284
1999	1,212	590	1,802	89%	3	57	1	11	107	45	2,024	223
2000	878	542	1,420	89%	1	46	1	14	75	44	1,600	181
2001	903	559	1,462	85%	5	49	1	15	124	56	1,711	249
2002	821	595	1,416	83%	4	48	1	24	181	30	1,703	287
2003	724	614	1,338	83%	1	47	0	24	150	43	1,603	265

TABLE 4.3-2. Comparison of AFSC triennial trawl survey catch per unit effort (CPUE), commercial landed catch (mt), and a ratio of the two values, for selected flatfish species, 1977-2001. (Page 1 of 1)

	1977	1980	1983	1986	1989	1992	1995	1998	2001
AFSC Triennial Trawl Survey CPUE									
Assessed species									
Petrale sole	0.410	0.450	0.602	0.616	0.993	0.495	0.602	0.845	0.940
English sole	0.466	0.893	1.849	2.836	3.240	2.889	2.468	3.833	4.084
Arrowtooth	5.598	3.380	3.666	6.330	12.136	2.845	6.462	6.118	7.517
Unassessed species									
Sanddab	0.278	0.593	2.504	3.505	7.768	4.760	9.114	6.095	11.173
Rex sole	2.088	1.329	3.375	3.253	4.228	3.865	5.429	8.285	9.689
Curlfin sole	0.001	0.007	0.008	0.048	0.041	0.038	0.056	0.063	0.075
Starry flounder	0.000	0.018	0.055	0.004	0.029	0.024	0.003	0.025	0.032
Butter sole	0.000	0.005	0.000	0.003	0.003	0.010	0.000	0.002	0.007
Rock sole	0.018	0.032	0.086	0.082	0.172	0.164	0.151	0.000	0.000
3-year Average Commercial Landings, Around Survey Year									
Assessed species									
Petrale sole			2,184	1,929	2,022	1,661	1,640	1,635	1,830
English sole			2,284	2,146	2,138	1,804	1,138	1,185	963
Arrowtooth			2,267	2,575	3,773	3,744	2,626	3,597	2,607
Unassessed species									
Sanddab			585	671	753	709	1,154	1,053	867
Rex sole			1,489	1,274	1,097	944	873	680	565
Ratio of Survey CPUE to Average Landings[a/]									
Assessed species									
Petrale sole			0.6	0.6	1.0	0.6	0.7	1.0	1.0
English sole			1.6	2.6	3.0	3.2	4.3	6.5	8.5
Arrowtooth			3.2	4.9	6.4	1.5	4.9	3.4	5.8
Unassessed species									
Sanddab			8.6	10.4	20.6	13.4	15.8	11.6	25.8
Rex sole			4.5	5.1	7.7	8.2	12.4	24.4	34.3

a/ Higher values suggest lower relative exploitation, provided that survey CPUE is proportional to stock biomass.

TABLE 4.3-3. GMT calculations of recommended ABC and OY specifications for the Other Flatfish complex using historical catch data.

	Rex Sole	Sanddabs	Rex Sole + Sanddabs	Remaining "Other Flatfish" Species	Total Other Flatfish
Commercial Landed Catch (mt)[a/]	1,741	1,364		304	
(Year)	(1982)	(1995)		(1994-98)	
Discard Rate From:					
Pikitch	40%				
Edcp		57%		60%	
Total Catch (ABC)	2,902	3,172	6,074	707	6,781
Precautionary Reduction			25%	50%	
OY Recommendation (Catch)			4,555	353	4,909
Percent Contribution to Total Catch			93%	7%	
Approximate Expected Discard			28%	28%	28%
Approximate Potential Landed Catch (mt)			3280	255	3,534
1999 - 2003 Average Landed Catch (mt)					
Annual Average			1,487	241	1,728
Largest Single Year			1,802	287	

a/ Landed catches for rex sole and sanddabs reflect the largest annual landings during 1981-2003. For the remaining "Other Flatfish" species, the landed catch reflects the annual average for the identified five-year period.

TABLE 4.3-4. Bycatch ratios [species catch (lb) / target species catch (lb)] for rebuilding species calculated using weighted sums[a/] of catch and discard poundage from the first and second years of NMFS-observed bottom trawling, by area, depth strata, and various temporal strata. (Page 1 of 2)

			Bycatch ratios							
Area	Depth	Bi-monthly Periods	Canary	Lingcod	Widow	Bocaccio	POP	Dark-blotched	Yelloweye	Cowcod
North of 40°10'										
	<=50 fm									
		1,2,6	0.073%	0.558%	0.005%	0.000%	0.000%	0.000%	0.000%	0.000%
		3,4,5	0.060%	2.091%	0.000%	0.000%	0.002%	0.000%	0.005%	0.000%
	<=60 fm									
		1,2,6	0.138%	1.613%	0.008%	0.000%	0.000%	0.018%	0.000%	0.000%
		3,4,5	0.130%	4.673%	0.033%	0.000%	0.004%	0.022%	0.004%	0.000%
	<=75 fm									
		1,2,6	0.503%	3.318%	0.016%	0.000%	0.004%	0.096%	0.005%	0.000%
		3,4,5	0.439%	4.467%	0.029%	0.000%	0.019%	0.175%	0.005%	0.000%
	<=100 fm									
		1,2,6	0.980%	5.179%	0.038%	0.000%	0.025%	0.275%	0.015%	0.000%
		3,4,5	0.441%	4.039%	0.030%	0.000%	0.083%	0.260%	0.005%	0.000%
South of 40°10'										
	<=50 fm									
		1,2,6	0.027%	2.849%	0.000%	0.308%	0.000%	0.000%	0.000%	0.000%
		3,4,5	0.000%	0.487%	0.000%	0.000%	0.000%	0.000%	0.034%	0.000%
	<=60 fm									
		1,2,6	0.034%	2.300%	0.001%	0.716%	0.000%	0.002%	0.000%	0.034%
		3,4,5	0.024%	3.126%	0.000%	0.060%	0.000%	0.000%	0.019%	0.002%
	<=75 fm									
		1,2,6	0.014%	2.354%	0.000%	0.541%	0.000%	0.002%	0.000%	0.034%
		3,4,5	0.104%	3.289%	0.000%	0.304%	0.000%	0.000%	0.019%	0.002%
	<=100 fm									
		1,2,6	0.026%	2.942%	0.002%	1.137%	0.000%	0.005%	0.000%	0.044%
		3,4,5	0.087%	3.790%	0.000%	1.299%	0.000%	0.026%	0.019%	0.038%
North of 40°10'										
	>150 fm	1,6	0.007%	0.162%	0.020%	0.000%	1.341%	0.808%	0.000%	0.000%
		2,5	0.012%	0.058%	0.004%	0.000%	1.084%	0.623%	0.000%	0.000%
		3,4	0.006%	0.028%	0.026%	0.000%	0.275%	0.291%	0.000%	0.000%
	>180 fm	1,6	0.007%	0.159%	0.014%	0.000%	1.182%	1.021%	0.000%	0.000%
		2,5	0.012%	0.055%	0.003%	0.000%	0.906%	0.606%	0.000%	0.000%
		3,4	0.003%	0.017%	0.024%	0.000%	0.182%	0.175%	0.000%	0.000%
	>200 fm	1,6	0.000%	0.128%	0.005%	0.000%	1.078%	0.920%	0.000%	0.000%
		2,5	0.000%	0.035%	0.004%	0.000%	0.768%	0.604%	0.000%	0.000%
		3,4	0.000%	0.018%	0.024%	0.000%	0.163%	0.149%	0.000%	0.000%
	>250 fm	1,6	0.000%	0.000%	0.000%	0.000%	0.000%	0.000%	0.000%	0.000%
		2,5	0.000%	0.000%	0.000%	0.000%	0.000%	0.000%	0.000%	0.000%
		3,4	0.000%	0.000%	0.000%	0.000%	0.000%	0.000%	0.000%	0.000%
38° - 40°10'										
	>150 fm	1,6	0.000%	1.243%	0.002%	0.398%	0.000%	0.808%	0.000%	0.008%
		2,5	0.000%	0.024%	0.000%	0.000%	0.000%	0.623%	0.000%	0.000%
		3,4	0.000%	0.171%	0.005%	0.042%	0.000%	0.291%	0.000%	0.000%
	>180 fm	1,6	0.000%	0.926%	0.001%	0.201%	0.000%	1.021%	0.000%	0.002%
		2,5	0.000%	0.024%	0.000%	0.000%	0.000%	0.606%	0.000%	0.000%
		3,4	0.000%	0.116%	0.001%	0.035%	0.000%	0.175%	0.000%	0.000%
	>200 fm	1,6	0.000%	0.112%	0.000%	0.000%	0.000%	0.920%	0.000%	0.000%
		2,5	0.000%	0.022%	0.000%	0.000%	0.000%	0.604%	0.000%	0.000%
		3,4	0.000%	0.079%	0.000%	0.000%	0.000%	0.149%	0.000%	0.000%
	>250 fm	1,6	0.000%	0.017%	0.000%	0.000%	0.000%	0.000%	0.000%	0.000%
		2,5	0.000%	0.016%	0.000%	0.000%	0.000%	0.000%	0.000%	0.000%
		3,4	0.000%	0.001%	0.000%	0.000%	0.000%	0.000%	0.000%	0.000%

TABLE 4.3-4. Bycatch ratios [species catch (lb) / target species catch (lb)] for rebuilding species calculated using weighted sums[a/] of catch and discard poundage from the first and second years of NMFS-observed bottom trawling, by area, depth strata, and various temporal strata. (Page 2 of 2)

			Bycatch ratios							
Area	Depth	Bi-monthly Periods	Canary	Lingcod	Widow	Bocaccio	POP	Dark-blotched	Yelloweye	Cowcod
South of 38°										
	>150 fm	1,6	0.000%	1.243%	0.002%	0.398%	0.000%	0.029%	0.000%	0.008%
		2,5	0.000%	0.024%	0.000%	0.000%	0.000%	0.016%	0.000%	0.000%
		3,4	0.000%	0.171%	0.005%	0.042%	0.000%	0.006%	0.000%	0.000%
	>180 fm	1,6	0.000%	0.926%	0.001%	0.201%	0.000%	0.027%	0.000%	0.002%
		2,5	0.000%	0.024%	0.000%	0.000%	0.000%	0.016%	0.000%	0.000%
		3,4	0.000%	0.116%	0.001%	0.035%	0.000%	0.006%	0.000%	0.000%
	>200 fm	1,6	0.000%	0.112%	0.000%	0.000%	0.000%	0.002%	0.000%	0.000%
		2,5	0.000%	0.022%	0.000%	0.000%	0.000%	0.017%	0.000%	0.000%
		3,4	0.000%	0.079%	0.000%	0.000%	0.000%	0.005%	0.000%	0.000%
	>250 fm	1,6	0.000%	0.017%	0.000%	0.000%	0.000%	0.000%	0.000%	0.000%
		2,5	0.000%	0.016%	0.000%	0.000%	0.000%	0.000%	0.000%	0.000%
		3,4	0.000%	0.001%	0.000%	0.000%	0.000%	0.000%	0.000%	0.000%

[a/] Catch and discard poundage from the first year was weighted by 0.33 and poundage from the second year was weighted by 0.67.

TABLE 4.3-5. Bycatch (mortality) ratios [species mortality (lb) / species catch (lb)] for target species, calculated using weighted sums[a/] of catch and discard poundage from the first and second years of NMFS-observed bottom trawling, by area, depth strata, and various temporal strata. (Page 1 of 2)

Area	Depth	Bi-monthly Periods	Sablefish	Longspine	Shortspine	Dover Sole	Petrale Sole	Arrowtooth	Other Flatfish	Lingcod	Slope Rockfish
North of 40°10'											
	<=50 fm	1,2,6	25.0%	0.0%	0.0%	87.4%	10.8%	36.2%	21.0%	99.4%	0.0%
		3,4,5	29.9%	0.0%	0.0%	22.3%	9.8%	86.6%	19.5%	73.0%	0.1%
	<=60 fm	1,2,6	53.9%	0.0%	0.0%	33.5%	5.4%	63.9%	21.2%	75.4%	13.0%
		3,4,5	50.0%	0.0%	0.0%	11.9%	15.0%	75.0%	21.4%	81.5%	73.7%
	<=75 fm	1,2,6	71.3%	0.0%	0.0%	39.5%	14.5%	58.8%	24.0%	64.8%	68.4%
		3,4,5	58.3%	0.0%	0.0%	12.1%	15.1%	69.6%	22.5%	77.5%	65.4%
	<=100	1,2,6	52.1%	100.0%	0.0%	34.3%	12.2%	59.3%	28.3%	75.6%	79.4%
		3,4,5	51.3%	0.0%	0.0%	14.3%	15.5%	67.0%	24.3%	76.9%	65.5%
	>150 fm	1,6	43.5%	20.0%	38.0%	8.7%	0.4%	49.0%	26.5%	59.0%	65.4%
		2,5	18.3%	17.7%	47.9%	11.6%	4.8%	41.6%	28.3%	65.4%	43.4%
		3,4	23.1%	18.5%	35.0%	11.0%	0.8%	19.5%	40.6%	83.7%	48.5%
	>180 fm	1,6	41.8%	19.8%	37.4%	8.0%	0.4%	48.4%	26.1%	57.2%	61.3%
		2,5	22.2%	18.5%	34.6%	10.9%	1.0%	18.6%	42.8%	90.6%	41.7%
		3,4	18.2%	17.5%	47.9%	11.5%	4.2%	41.8%	28.8%	55.8%	38.7%
	>200 fm	1,6	38.3%	19.5%	36.1%	7.0%	0.7%	43.2%	29.6%	49.7%	61.4%
		2,5	21.8%	18.5%	34.5%	10.4%	1.2%	17.6%	43.9%	91.0%	40.4%
		3,4	17.3%	17.0%	45.8%	11.9%	7.0%	43.9%	30.5%	46.3%	31.6%
	>250 fm	1,6	32.4%	19.4%	34.8%	7.1%	3.3%	28.9%	29.8%	23.0%	18.0%
		2,5	19.4%	18.2%	34.2%	11.9%	7.3%	15.9%	50.1%	100.0%	8.4%
		3,4	14.9%	16.1%	43.0%	15.2%	1.6%	55.0%	42.7%	0.0%	14.5%
South of 40°10'											
	<=50 fm	1,2,6	13.5%	0.0%	0.0%	85.0%	26.0%	0.0%	34.5%	62.4%	0.0%
		3,4,5	90.9%	0.0%	0.0%	29.8%	6.1%	0.0%	12.0%	86.9%	0.0%
	<=60 fm	1,2,6	85.4%	0.0%	0.0%	99.2%	2.1%	0.0%	24.0%	54.0%	6.1%
		3,4,5	90.7%	0.0%	0.0%	90.7%	4.1%	3.2%	23.4%	63.9%	0.0%
	<=75 fm	1,2,6	81.4%	0.0%	0.0%	99.5%	4.8%	0.0%	23.5%	53.6%	7.6%
		3,4,5	64.4%	0.0%	0.0%	90.7%	4.0%	36.2%	20.9%	60.2%	0.0%
	<=100	1,2,6	89.6%	0.0%	0.0%	85.4%	3.3%	33.0%	24.5%	57.9%	8.2%
		3,4,5	80.1%	0.0%	0.0%	67.8%	5.2%	36.2%	23.2%	70.7%	18.4%
	>150 fm	1,6	35.7%	19.2%	35.8%	22.5%	0.5%	96.3%	28.3%	98.6%	25.1%
		2,5	29.3%	13.5%	31.0%	11.6%	10.4%	100.0%	35.7%	95.9%	16.7%
		3,4	15.9%	8.9%	23.5%	11.4%	2.6%	77.6%	32.6%	38.2%	4.5%
	>180 fm	1,6	33.9%	19.2%	35.5%	22.3%	0.3%	91.7%	28.2%	96.3%	17.1%
		2,5	27.8%	13.4%	30.9%	11.0%	10.3%	100.0%	42.5%	99.3%	17.7%
		3,4	15.9%	8.9%	23.6%	11.3%	3.0%	77.2%	33.5%	38.4%	4.2%
	>200 fm	1,6	32.2%	19.1%	35.2%	21.7%	0.3%	58.6%	27.0%	79.6%	12.4%
		2,5	28.0%	13.4%	31.0%	11.1%	0.8%	100.0%	43.6%	32.5%	19.3%
		3,4	15.9%	8.9%	23.5%	11.3%	3.2%	77.0%	33.9%	38.4%	4.1%

TABLE 4.3-5. Bycatch (mortality) ratios [species mortality (lb) / species catch (lb)] for target species, calculated using weighted sums[a/] of catch and discard poundage from the first and second years of NMFS-observed bottom trawling, by area, depth strata, and various temporal strata. (Page 2 of 2)

Area	Depth	Bi-monthly Periods	Sablefish	Longspine	Shortspine	Dover Sole	Petrale Sole	Arrowtooth	Other Flatfish	Lingcod	Slope Rockfish
	>250 fm	1,6	31.2%	19.1%	34.7%	22.3%	0.7%	58.8%	29.4%	3.2%	10.0%
		2,5	26.5%	13.3%	30.6%	12.7%	0.0%	100.0%	54.9%	0.0%	14.4%
		3,4	13.2%	8.9%	23.3%	12.6%	3.0%	87.4%	46.0%	39.8%	9.8%

a/ Catch and discard poundage from the first year was weighted by 0.33 and poundage from the second year was weighted by 0.67.

TABLE 4.3-6. Mortality and bi-monthly limits with select flatfish trawl under high OY. (Page 1 of 1)

		Mortality (mt)		
		North	South	Total
Rebuilding Species	Lingcod	88.9	24.8	113.7
	Canary	9.4	0.6	10.0
	POP	58.7	0.0	58.7
	Darkblotch	53.6	12.0	65.6
	Widow	1.3	0.1	1.4
	Bocaccio	0.0	35.9	35.9
	Yelloweye	0.4	0.1	0.5
	Cowcod	0.0	0.2	0.2
Target Species	Sablefish	2,699	602	3,301
	Longspine	584	285	869
	Shortspine	605	275	880
	Dover	4,721	2,002	6,723
	Arrowtooth	1,507	211	1,717
	Petrale	2,186	234	2,420
	Other Flat	4,431	1,309	5,740
	Slope Rock	203	388	592

		RCA Boundaries		Bimonthly Cumulative Limits							
Subarea	Period	Inline	Outline	Sablefish	Longspine	Shortspine	Dover	Other Flat	Petrale Sublimit	Arrowtooth	Slope Rock
N. 40°10	1	75	150	9,500	15,000	3,500	62,000	120,000	No Limit	No Limit	8,000
	2	75	150	9,500	15,000	3,500	62,000	120,000	60,000	150,000	8,000
	3	75	150	19,000	23,000	4,900	32,000	120,000	60,000	150,000	8,000
	4	75	150	19,000	23,000	4,900	32,000	120,000	60,000	150,000	8,000
	5	75	150	19,000	23,000	4,900	32,000	120,000	60,000	150,000	8,000
	6	75	150	9,500	15,000	3,500	62,000	120,000	No Limit	No Limit	8,000
North Selective Flatfish Trawl Limits	1	75	150	3,000	1,000	1,000	10,000	90,000	15,000	6,000	
	2	75	150	4,500	1,000	1,000	10,000	80,000	25,000	8,000	
	3	75	150	8,000	1,000	3,000	25,000	100,000	25,000	11,000	
	4	75	150	8,000	1,000	3,000	25,000	100,000	25,000	11,000	
	5	75	150	8,000	1,000	3,000	25,000	100,000	17,000	11,000	
	6	75	150	3,000	1,000	1,000	10,000	90,000	15,000	8,000	
S. of 40°10	1	75	150	14,200	19,000	4,200	47,000	120,000	No Limit	No Limit	40,000
	2	75	150	14,200	19,000	4,200	47,000	120,000	60,000	10,000	40,000
	3	75	150	14,200	19,000	4,200	47,000	120,000	60,000	10,000	40,000
	4	75	150	14,200	19,000	4,200	47,000	120,000	60,000	10,000	40,000
	5	75	150	14,200	19,000	4,200	47,000	120,000	60,000	10,000	40,000
	6	75	150	14,200	19,000	4,200	47,000	120,000	No Limit	No Limit	40,000

TABLE 4.3-7. Mortality and bi-monthly limits with select flatfish trawl under low OY. (Page 1 of 1)

		Mortality (mt)		
		North	South	Total
Rebuilding Species	Lingcod	80.3	18.4	98.7
	Canary	9.2	0.4	9.6
	POP	53.6	0.0	53.6
	Darkblotch	48.7	11.1	59.8
	Widow	1.2	0.1	1.3
	Bocaccio	0.0	32.8	32.8
	Yelloweye	0.4	0.1	0.4
	Cowcod	0.0	0.2	0.2
Target Species	Sablefish	2,148	467	2,614
	Longspine	585	285	869
	Shortspine	606	275	881
	Dover	4,654	1,959	6,614
	Arrowtooth	1,522	211	1,732
	Petrale	2,202	234	2,436
	Other Flat	2,613	778	3,391
	Slope Rock	203	388	592

		RCA Boundaries		Bimonthly Cumulative Limits							
Subarea	Period	Inline	Outline	Sablefish	Longspine	Shortspine	Dover	Other Flatfish	Petrale Sublimit	Arrowtth	Slope Rock
N. 40°10	1	100	150	6,200	15,000	3,500	60,000	71,000	No Limit	No Limit	8,000
	2	75	150	6,500	15,000	3,500	60,000	71,000	60,000	150,000	8,000
	3	75	150	16,000	23,000	4,900	32,000	71,000	60,000	150,000	8,000
	4	75	150	16,000	23,000	4,900	32,000	71,000	60,000	150,000	8,000
	5	75	150	16,000	23,000	4,900	32,000	71,000	60,000	150,000	8,000
	6	100	150	6,200	15,000	3,500	60,000	71,000	No Limit	No Limit	8,000
North Selective Flatfish Trawl Limit	1	100	150	2,000	1,000	1,000	10,000	40,000	20,000	6,000	
	2	75	150	5,500	1,000	1,000	10,000	50,000	25,000	8,000	
	3	75	150	6,500	1,000	3,000	25,000	60,000	25,000	11,000	
	4	75	150	6,500	1,000	3,000	25,000	60,000	25,000	11,000	
	5	75	150	6,500	1,000	3,000	25,000	60,000	20,000	11,000	
	6	100	150	3,000	1,000	1,000	10,000	40,000	15,000	8,000	
S. of 40°10	1	75	150	11,000	19,000	4,200	46,000	71,000	No Limit	No Limit	40,000
	2	75	150	11,000	19,000	4,200	46,000	71,000	60,000	10,000	40,000
	3	75	150	11,000	19,000	4,200	46,000	71,000	60,000	10,000	40,000
	4	75	150	11,000	19,000	4,200	46,000	71,000	60,000	10,000	40,000
	5	75	150	11,000	19,000	4,200	46,000	71,000	60,000	10,000	40,000
	6	75	150	11,000	19,000	4,200	46,000	71,000	No Limit	No Limit	40,000

TABLE 4.3-8. Trip limits, the seasonal RCA configuration, and estimated impacts to target and overfished species under Action Alternative 3 using selective flatfish trawl bycatch rates for the entire year. (Page 1 of 1)

		Mortality (mt)		
		North	South	Total
Rebuilding Species	Lingcod	89.9	26.7	116.6
Species	Canary	7.6	0.6	8.1
	POP	57.4	0.0	57.4
	Darkblotched	54.6	11.9	66.4
	Widow	1.3	0.1	1.4
	Bocaccio	0.0	44.0	44.0
	Yelloweye	0.4	0.1	0.5
	Cowcod	0.0	0.3	0.3
Target Species	Sablefish	2,692	620	3,312
Species	Longspine	544	285	829
	Shortspine	596	275	871
	Dover	4,691	1,968	6,659
	Arrowt'th	1,607	211	1,818
	Petrale	2,258	246	2,504
	Other Flat + Eng. Sole	4,498	1,338	5,837
	Slope Rock	203	388	592

	RCA Boundaries		Bimonthly Trip Limits							
Period	Inline	Outline	Sablefish	Longspine	Shortspine	Dover	Other Flat	Petrale sublimit	Arrowtooth	Slope Rock
1	75	150	9,000	15,000	3,500	60,000	120,000	No Limit	No Limit	8,000
2	75	150	9,000	15,000	3,500	60,000	120,000	100,000	150,000	8,000
3	100	150	18,000	23,000	4,900	32,000	120,000	100,000	150,000	8,000
4	100	150	18,000	23,000	4,900	32,000	120,000	100,000	150,000	8,000
5	100	150	18,000	23,000	4,900	32,000	120,000	100,000	150,000	8,000
6	75	150	9,000	15,000	3,500	60,000	120,000	No Limit	No Limit	8,000
1	75	150	2,000	1,000	1,000	12,000	75,000	20,000	6,000	
2	75	150	2,000	1,000	1,000	12,000	75,000	20,000	6,000	
3	100	150	10,000	1,000	3,000	18,000	85,000	25,000	11,000	
4	100	150	10,000	1,000	3,000	18,000	85,000	25,000	11,000	
5	100	150	10,000	1,000	3,000	18,000	85,000	25,000	11,000	
6	75	150	5,000	1,000	1,000	12,000	75,000	20,000	8,000	
1	75	150	13,500	19,000	4,200	46,000	120,000	No Limit	No Limit	40,000
2	75	150	13,500	19,000	4,200	46,000	120,000	100,000	10,000	40,000
3	100	150	13,500	19,000	4,200	46,000	120,000	100,000	10,000	40,000
4	100	150	13,500	19,000	4,200	46,000	120,000	100,000	10,000	40,000
5	75	150	13,500	19,000	4,200	46,000	120,000	100,000	10,000	40,000
6	75	150	13,500	19,000	4,200	46,000	120,000	No Limit	No Limit	40,000

TABLE 4.3-9. Catch (lbs) of overfished groundfish species and Pacific whiting observed in 1999-2003 whiting fisheries by year, sector, and species.

Year	Sector	Canary	Darkblotched	Lingcod	POP	Widow	Yelloweye	Pacific Hake
1999	Catcher Proc.	2,268	15,301	46	21,413	223,225	58	149,206,239
	Tribal	9,898	1	422	2,841	100,386		75,422,139
	Mothership	488	10,660	86	9,825	113,804		112,728,410
	Shoreside	1,345	926	1,345	16,469	423,287	44	183,583,117
2000	Catcher Proc.	1,899	8,390	347	14,490	154,248	9,062	149,505,480
	Tribal	2,060		136	74	21,628		13,781,245
	Mothership	1,236	11,350	553	6,690	332,125		103,265,104
	Shoreside	1,146	2,668	1,830	485	167,551	0	188,830,112
2001	Catcher Proc.	1,441	25,350	386	43,413	308,016		129,251,616
	Tribal	5,390		775	1,601	7,231		13,404,002
	Mothership	2,102	1,248	1,064	116	64,360		78,976,106
	Shoreside	992	1,786	1,676	88	92,594	0	161,655,966
2002	Catcher Proc.	3,515	4,832	346	3,191	253,747		80,119,007
	Tribal	6,232	162	513	470	42,029		48,045,527
	Mothership	1,790	2,061	239	4,789	45,190		58,628,095
	Shoreside	467	2	476	487	11,726	0	99,816,375
2003	Catcher Proc.	384	9,271	882	11,122	25,482	11	90,862,066
	Tribal	1,510	49	118	2,602	4,844		51,706,192
	Mothership	185	225	205	250	1,523		57,367,288
	Shoreside	268	571	892	878	19,856	7	121,349,889

TABLE 4.3-10. Estimated mortality (mt) of overfished species in the directed whiting fishery by sector and 2005 whiting OY alternative.

		Predicted Mortality Using Weighted Average Rates[a/]						
OY Alternative	Sector	Bocaccio	Canary	Darkblotched	Lingcod	POP	Widow	Yelloweye
LOW OY	Shoreside	0.0	0.3	0.4	0.5	0.3	19.7	0.0
	Tribal	0.0	4.1	0.0	0.5	1.6	15.8	0.0
	Mothership	0.0	0.6	2.7	0.2	3.6	46.2	0.1
	Catcher Processor	0.0	0.9	3.8	0.3	5.1	65.5	0.2
	Total	0.0	5.9	6.9	1.5	10.5	147.3	0.3
MED OY	Shoreside	0.0	0.6	0.8	1.0	0.6	42.2	0.0
	Tribal	0.0	5.2	0.1	0.6	2.1	20.1	0.0
	Mothership	0.0	1.4	5.8	0.5	7.7	99.2	0.3
	Catcher Processor	0.0	2.0	8.2	0.7	10.9	140.5	0.4
	Total	0.0	9.1	14.8	2.8	21.2	302.1	0.7
HIGH OY	Shoreside	0.0	1.2	1.6	2.2	1.2	89.3	0.0
	Tribal	0.0	5.2	0.1	0.6	2.1	20.1	0.0
	Mothership	0.0	2.9	12.2	1.0	16.2	209.6	0.6
	Catcher Processor	0.0	4.1	17.3	1.4	23.0	297.0	0.8
	Total	0.0	13.5	31.2	5.2	42.5	616.0	1.5

a/ The weighting scheme uses an incidental catch rate estimate based on: (.4*2003)+(.3*2002)+(.2*2001)+(.1*2000).

TABLE 4.3-11. Historical West Coast groundfish catch in ocean areas by tribal fleet: 1995 through 2003 (round weight-pounds). (Page 1 of 1)

Species	1995	1996	1997	1998	1999	2000	2001	2002	2003
Arrowtooth Flounder	240	3		255	13,195	331	961	7,137	
Dover Sole	1,764	2,441	1,268	4,509	11,594	2,030	4,619	35,417	
English Sole		4	118	1,847	593	996	7,103	88,684	
Petrale Sole		5	12	3,249	545	80	1,954	45,479	
Rex Sole					26	151	1,358	6,632	
Rock Sole				2,396	16		22	5,833	
Unsp. Flatfish				38	775		437	8,406	
Unspecified Sanddab							1,599	19,655	
Sand Sole		12	40				269	2,748	
Starry Flounder		22	54				3	301	
Butter Sole								605	
Flatfish Total	**2,004**	**2,487**	**1,492**	**12,294**	**26,744**	**3,588**	**18,325**	**220,897**	
Bocaccio				2	38	145	449		
Nom. Canary Rockfish	59	171	26	609	1,033	539	4,064	13,285	
Canary Rockfish				277	252	330	1,380		
Darkblotched Rockfish					36	76	226	3,074	
Greenstriped Rockfish				1	51	16			
Pacific Ocean Perch					110	20	16	529	
Redbanded Rockfish				1	128	492			
Redstripe Rockfish				1	63	131	1,510		
Rougheye Rockfish				1	80	76	1,529		
Rosethorn Rockfish									
Sharpchin Rockfish				1	9	10	85		
Silvergrey Rockfish					36	4	12		
Unsp. Pop Group		3			104				
Unsp. Rockfish	114,684	79,545	65,121	65,245	59,875	45,953			
Widow Rockfish				54	411	2,010	16,265		
Nom. Widow Rockfish					53	3	51	75,899	
Yelloweye Rockfish					68	3	2		
Nom. Yellowtail Rockfish	519	1,297	2,471	10,448	28,671	9,585	7,598	1,037,741	
Yellowtail Rockfish				3,263	6,498	68,463	210,006		
Unsp. Shelf Rockfish						3,099	20,503	19	
Unsp. Near-shore						10	58	116	
Unsp. Slope Rockfish						19,891	54,920	4,121	
Blackgill Rockfish							19		
Shortraker Rockfish							289		
Rockfish Total	**115,262**	**81,016**	**67,618**	**79,903**	**97,516**	**150,856**	**318,982**	**1,140,036**	
Spiny Dogfish		5,521			881	6,251		2,607	
Lingcod	2,873	2,732	1,648	5,247	7,051	6,817	9,429	24,854	
Pacific Cod	2,814	1,540	2,166	4,873	2,677	4,573	8,712	128,530	
Sablefish	1,696,098	1,881,702	1,775,108	980,719	1,566,260	1,555,808	1,451,522	959,982	
Unspecified Skate	2,517	1,689	1,017	2,031	2,169	1,920	1,407	18,635	
Nominal Shortspine Thornyhead	15,697	16,010	16,892	7,606	13,251	8,987	10,945	10,173	
Shortspine Thornyhead				471	240		27		
Nominal Longspine Thornyhead	1,305	538	139	28					
Other Groundfish Total	**1,721,304**	**1,909,732**	**1,796,970**	**1,000,975**	**1,592,529**	**1,584,356**	**1,482,042**	**1,145,107**	
Pacific Whiting		**33,039,64**	**54,713,65**	**53,984,58**	**56,768,06**	**13,781,25**	**13,404,00**	**45,867,38**	
All Groundfish Species	**1,838,570**	**35,032,88**	**56,579,73**	**55,077,75**	**58,484,85**	**15,520,05**	**15,223,35**	**47,901,85**	

TABLE 4.3-12. Bycatch ratios (lbs. of overfished species/lbs. of target species) of overfished groundfish species in observed and unobserved trips made by the Makah trawl fleet in 2003. (Page 1 of 1)

Observed Trips		Unobserved Trips	
Bottom Trawl[a/]			
lingcod/all flatfish	canary/all flatfish	lingcod/all flatfish	canary/all flatfish
0.066	0.002	0.063	0.001
lingcod/Pacific cod	canary/Pacific cod	lingcod/Pacific cod	canary/Pacific cod
0.049	0.001	0.068	0.001
lingcod/all target spp.	canary/all target spp.	lingcod/all target spp.	canary/all target spp.
0.028	0.001	0.033	0.001
Midwater Trawl[b/]			
widow/yellowtail	canary/yellowtail	widow/yellowtail	canary/yellowtail
0.051	0.003	0.042	0.001

a/ Bottom trawl 23 observed trips out of 175, or 13%.

b/ Midwater trawl 5 observed trips out of 34, or 16%.

TABLE 4.3-13. Estimated groundfish bycatch in Makah trawl and troll fisheries, 2000-2003. (Page 1 of 1)

2000		2001		2002		2003	
Species	lbs	Species	lbs	Species	lbs	Species	lbs
Midwater Trawl							
Black	0	Black	0	Black	0	Black	0
Lingcod	0	Lingcod	6	Lingcod	215	Lingcod	66
Canary	306	Canary	1,366	Canary	3,151	Canary	895
Yelloweye	0	Yelloweye	0	Yelloweye	53	Yelloweye	0
Widow	2,036	Widow	11,549	Widow	27,639	Widow	20,438
Yellowtail	67,872	Yellowtail	190,494	Yellowtail	577,510	Yellowtail	548,664
POP	0	POP	0	POP	0	POP	0
Darkblotched	0	Darkblotched	102	Darkblotched	2,898	Darkblotched	32
Ssp Thornyhead	0	Ssp Thornyhead	0	Ssp Thornyhead	0	Ssp Thornyhead	0
Bottom Trawl							
Black	0	Black	53	Black	0	Black	23
Lingcod	7	Lingcod	508	Lingcod	9,603	Lingcod	29,544
Canary	24	Canary	0	Canary	1,068	Canary	624
Yelloweye	0	Yelloweye	0	Yelloweye	0	Yelloweye	0
Widow	0	Widow	0	Widow	0	Widow	3
Yellowtail	563	Yellowtail	505	Yellowtail	5,909	Yellowtail	31,025
POP	0	POP	0	POP	0	POP	0
Darkblotched	0	Darkblotched	0	Darkblotched	0	Darkblotched	0
Ssp Thornyhead	0	Ssp Thornyhead	0	Ssp Thornyhead	283	Ssp Thornyhead	1,364
Troll							
Black	0	Black	0	Black	0	Black	84
Lingcod	1,958	Lingcod	773	Lingcod	2,006	Lingcod	1,935
Canary	381	Canary	607	Canary	1,189	Canary	753
Yelloweye	988	Yelloweye	43	Yelloweye	83	Yelloweye	0
Widow	0	Widow	32	Widow	0	Widow	5
Yellowtail	8,948	Yellowtail	7,060	Yellowtail	7,071	Yellowtail	17,994
POP	0	POP	0	POP	0	POP	0
Darkblotched	0	Darkblotched	0	Darkblotched	0	Darkblotched	0
Ssp Thornyhead	0	Ssp Thornyhead	0	Ssp Thornyhead	0	Ssp Thornyhead	0

TABLE 4.3-14. Tribal longline fisheries and associated bycatch by tribe and year, 2000-2003. (Page 1 of 2)

Target Species	Associated Bycatch	2000	2001	2002	2003
		Quinault[a/]			
Halibut		85,252	85,644	104,191	25,023
	Unspecified Rockfish	NA	49		
	Shelf	NA		19	0
	Lingcod	NA	0	0	225
	Canary	NA		4	0
	Yelloweye	NA		10	0
	Yellowtail	NA		4	0
Sablefish		309,762	288,511	114,269	253,412
	Rougheye	NA	7,964		
	Blackgill	NA	2,444		
	Shortraker	NA	3,710		
	Slope	NA		4,121	5,195
	Other (Probably Slope)	NA			1,317
	Ssp Thornyheads	NA	542	570	197
		Quileute			
Halibut		42,666	45,034	67,290	28,737
	Black	30	0	0	0
	Lingcod	144	1,599	1,074	119
	Canary	74	25	117	20
	Yelloweye	2,365	4,224	3,287	520
	Yellowtail	63	19	74	154
	Widow	0	0	0	0
	POP	0	0	0	0
	Darkblotched	0	0	0	0
	Ssp Thornyheads	0	0	0	0
Sablefish		164,016	143,591	92,438	76,352
	Black	0	0	0	0
	Lingcod	0	0	0	0
	Canary	0	0	0	0
	Yelloweye	0	0	0	0
	Yellowtail	0	0	0	0
	Widow	0	0	0	0
	POP	0	0	0	0
	Darkblotched	0	0	0	0
	Ssp Thornyheads	624	482	91	137

TABLE 4.3-14. Tribal longline fisheries and associated bycatch by tribe and year, 2000-2003. (Page 2 of 2)

Target Species	Associated Bycatch	2000	2001	2002	2003
	Makah				
Halibut		151,268	270,365	294,618	405,020
	Black	0	0	0	0
	Lingcod	3,434	6,138	10,793	5,963
	Canary	19,547	2,330	597	137
	Yelloweye	523	2,075	1,819	0
	Yellowtail	0	382	235	0
	Widow	3	19	0	0
	POP	0	0	0	0
	Darkblotched	0	0	0	0
	Ssp Thornyheads	0	0	0	3,365
Sablefish		490,229	464,723	227,740	493,616
	Black	0	0	0	0
	Lingcod	0	0	0	5,752
	Canary	0	0	0	794
	Yelloweye	0	0	0	0
	Yellowtail	0	0	0	690
	Widow	0	0	0	0
	POP	0	0	0	0
	Darkblotched	0	0	0	0
	Ssp Thornyheads	7,662	10,081	9,229	8,166

a/ No Black rockfish, Lingcod, POP, Widow, or Darkblotched caught for these fisheries (2000-2002) for Quinault.

TABLE 4.3-15. Calculation of sablefish discard mortality in tribal longline fisheries. (Page 1 of 1)

		Pounds of Sablefish by Market Category						
Year		"0-2"	"2-3"	"3-4"	"4-5"	"5-7"	7" up	Total
2001	B	22673	67786	79515	57836	36608	7829	272247
	A&C	18616	92475	111587	106734	115006	34788	479205.69
								751452.69
	B	22673	67786	90459	0.3322681			
				79515	57836	36608	7829	181788
	A&C	18616	92475	111091	0.2318232			
				111587	106734	115006	34788	368114.69
2002	B	28005	56255	52910	37824	26307	3710	205011
	A&C	16078	52816	60262	47543	56071	18206	250976
								455987
	B	28005	56255	84260	0.4110023			
				52910	37824	26307	3710	120751
	A&C	16078	52816	68894	0.2745043			
				60262	47543	56071	18206	182082
2003	B	51952	140467	49847	25420	25918	7857	301461
	A&C	36452	103777	81568	56473	70502	33588	382360
								683821
	B	51952	140467	192419	0.6382882			
				49847	25420	25918	7857	109042
	A&C	36452	103777	140229	0.366746			
				81568	56473	70502	33588	242131

Summary:

Year	Discard Rate	Mortality Rate
2001	0.0672981	0.0134596
2002	0.0914537	0.0182907
2003	0.1819333	0.0363867
Average	0.1135617	0.0227123

TABLE 4.3-16. Washington recreational total boat catch (mt) by species and year - ocean areas only. (Estimates for 2002 and 2003 include released catch. Lingcod discard mortality at 5% - others at 100%. Average weight for released fish is assumed to be equal to average weight of fish retained). (Page 1 of 1)

	Year							
Species	1996	1997	1998	1999	2000	2001	2002[a/]	2003 [a/]
Black Rockfish	229	180	222	150	143	171	176	176
Blue Rockfish	1	1	2	2	1	0	0	0
Bocaccio	0	0	0	0	0	1	1	0
Cabezon	3	1	4	2	3	3	6	5
Canary Rockfish	3	4	12	5	3	2	2	2
China Rockfish	1	0	1	1	1	1	1	1
Copper Rockfish	0	0	0	1	1	1	1	1
Kelp Greenling	1	0	0	1	1	1	2	1
Lingcod	52	49	27	34	28	32	41	52
Pacific Cod	0	0	1	0	0	0	5	13
Quillback Rockfish	0	0	2	2	2	0	2	1
Yelloweye Rockfish	3	5	14	18	10	14	3	4
Yellowtail Rockfish	4	6	29	6	8	4	2	7

a/ Catches currently in RecFIN reflect total mortality for all released fish, including lingcod.

TABLE 4.3-17. Percent reduction in contacts for select groundfish species under a closure outside of 40 fm in the Oregon recreational fishery. [a/]

	Canary	Yelloweye	Widow	Lingcod
Contacts outside of 40 fm	22	5	9	40
Total contacts	239	18	13	290
Percent of contacts outside of 40-fathoms	9.2%	27.8%	69.2%	13.8%

a/ Based on 2003 at-sea observations and prior to any effort shifts

TABLE 4.3-18. Estimated mortality rate for canary rockfish under non-retention with no offshore closures and closure outside of 40 fm in the Oregon recreational groundfish fishery. [a/]

No offshore closure Depth interval (fm)	Contacts	Effort Transfer	Revised Contacts	Percent	Mortality Factor	Percent Dead	Mortality Rate %
0-10	21	0	21	8.8	0.159	1.40	
>10<=20	126	0	126	52.7	0.5	26.36	
>20	92	0	92	38.5	1.0	38.49	
All depths	239	0	239	100.0		66.25	66
Closed outside of 40-fathoms							
0-10	21	1.05	22	9.7	0.159	1.54	
>10<=20	126	1.05	132	58.1	0.5	29.03	
>20<=40	70	1.05	74	32.3	1.0	32.26	
All depths <= 40 fm	217		228	100.0		62.83	63

a/ Based on a 2003 at-sea observation study.

TABLE 4.3-19. 2005 Oregon recreational fishery: Status quo including closure outside of 40-fathom line during June through September; 10 marine bag to include rockfish, greenling, cabezon and other species; 2 lingcod; no canary or yelloweye retention. Minimum length: lingcod (24"); cabezon (16"); greenling (10"). (Page 1 of 5)

						Minor Nearshore Rockfish								
Month	Yelloweye	Canary	Lingcod	Widow	Black	Blue	Brown	China	Copper	Grass	Quillback	Cabezon	Kelp Greenling	Rock Greenling
						Landed Number of Fish in 2003								
Jan	3	64	148	4	1,967	196		12	15		25	41	42	
Feb	20	155	635	15	4,211	658		47	48		57	142	126	
Mar	31	204	579	20	7,062	1,858		42	25		53	146	136	
Apr	82	381	1,092	270	15,876	2,676		66	99	2	107	207	167	
May	190	1,276	4,487	525	40,208	4,391		242	295		376	1,025	952	
June	155	1,253	3,376	143	39,983	3,095	46	218	152	5	357	775	771	3
July	238	2,100	5,416	165	64,942	4,126	4	513	240	6	598	1,342	1,511	15
August	323	2,514	5,428	148	71,702	5,840	7	754	433	4	868	1,546	1,613	36
September	199	866	2,244	107	25,401	5,093	4	199	178		380	459	746	
October	101	341	983	183	10,786	3,717	2	85	83		101	193	236	
November	9	113	282	94	3,677	391		33	31		48	31	33	
December	8	0	0	8	3,898	328		29	31		42	93	102	
Total	1,359	9,267	24,670	1,682	289,713	32,369	63	2,240	1,630	17	3,012	6,000	6,435	54
						Landed Number of Fish in 2002								
Jan	9	72	139	10	2,035	201		20	18		26	53	49	
Feb	21	157	552	22	4,121	425		41	39		57	134	127	
Mar	38	369	1,047	93	15,044	1,495	3	108	83		140	295	407	
Apr	82	660	1,882	65	22,223	1,699	6	162	170		151	609	753	
May	195	1,175	3,040	119	34,976	2,044	4	318	238		298	884	688	
June	261	885	2,408	46	45,424	2,533	6	350	205	2	338	1,039	820	6
July	180	1,154	2,552	241	44,728	2,622	5	366	549		485	1,126	919	6
August	582	3,033	4,345	500	42,595	5,731		723	745	3	1,206	1,433	1,316	2
September	161	958	1,653	84	22,193	3,066	2	356	329		414	682	841	2
October	106	572	913	45	9,014	3,285		168	91	5	137	428	459	
November	15	118	252	10	3,482	372		36	34		45	36	31	
December	23	137	294	15	3,911	358		40	37		46	114	113	
Total	1,673	9,290	19,077	1,250	249,746	23,831	26	2,688	2,538	10	3,343	6,833	6,523	16

TABLE 4.3-19. 2005 Oregon recreational fishery: Status quo including closure outside of 40-fathom line during June through September; 10 marine bag to include rockfish, greenling, cabezon and other species; 2 lingcod; no canary or yelloweye retention. Minimum length: lingcod (24"); cabezon (16"); greenling (10"). (Page 2 of 5)

						Minor Nearshore Rockfish								
Month	Yelloweye	Canary	Lingcod	Widow	Black	Blue	Brown	China	Copper	Grass	Quillback	Cabezon	Kelp Greenling	Rock Greenling
						Landed Number of Fish in 2001								
Jan	13	86	124	14	1,737	733		17	13		16	27	34	
Feb	51	438	561	34	5,418	2,441		64	29		121	121	142	
Mar	62	742	1,166	81	17,046	5,588		122	90	2	172	312	228	
Apr	68	454	979	11	24,461	3,844		161	102		120	460	276	
May	518	1,464	3,083	42	37,865	4,255		329	282	5	371	807	827	3
June	331	1,776	2,194	520	43,738	4,543	807	458	304	2	533	909	876	3
July	415	2,059	2,190	697	48,376	5,934	71	543	271	11	602	925	1,013	
August	624	2,358	3,045	1,702	68,332	16,255	4	674	263	3	758	1,223	1,501	5
September	253	922	884	271	18,826	5,150		219	136	1	283	402	615	
October	40	111	309	564	7,760	3,117		80	45		32	160	176	
November	19	131	196	34	4,226	885	13	40	23		39	31	30	
December	26	147	219	41	4,340	785	9	45	23		43	89	103	
Total	2,420	10,688	14,950	4,011	282,125	53,530	904	2,752	1,581	24	3,090	5,466	5,821	11
						Landed Number of Fish in 2000								
Jan	22	153	130	18	1,910	1,006	61	21	21		21	74	111	
Feb	141	522	533	36	4,461	2,298		106	91		91	182	223	
Mar	91	671	554	151	12,761	5,363		70	78		116	228	346	
Apr	286	998	1,158	260	26,715	5,810		255	169	2	100	499	546	1
May	1,409	2,667	2,874	314	38,110	9,853		458	560		510	963	917	7
June	574	2,872	2,788	609	49,476	8,985	4	749	544	4	705	1,456	1,780	36
July	670	2,843	2,304	879	74,798	6,120		795	461		511	1,602	1,457	36
August	1,168	6,844	2,676	1,450	76,045	14,842		1,064	788		1,093	1,597	1,904	57
September	506	1,804	1,334	670	36,526	5,194		409	257	2	263	541	752	9
October	54	513	431	68	12,632	2,825		145	46		84	178	246	7
November	39	160	237	14	5,610	3,012		67	38		51	59	63	6
December	60	320	333	35	4,992	2,168		61	50		40	135	156	6
Total	5,020	20,367	15,352	4,504	344,036	67,476	65	4,200	3,103	8	3,585	7,514	8,501	165

TABLE 4.3-19. 2005 Oregon recreational fishery: Status quo including closure outside of 40-fathom line during June through September; 10 marine bag to include rockfish, greenling, cabezon and other species; 2 lingcod; no canary or yelloweye retention. Minimum length: lingcod (24"); cabezon (16"); greenling (10"). (Page 3 of 5)

						Minor Nearshore Rockfish							
Month	Yelloweye	Canary	Lingcod	Widow	Black	Blue	Brown	China	Copper	Grass	Quillback	Cabezon	Kelp Greenling	Rock Greenling
Landed Number of Fish (2002-2003 Average)														
Jan	6	68	144	7	2,001	199	0	16	17	0	26	47	46	0
Feb	21	156	594	19	4,166	542	0	44	44	0	57	138	127	0
Mar	35	287	813	57	11,053	1,677	2	75	54	0	97	221	272	0
Apr	82	521	1,487	168	19,050	2,188	3	114	135	1	129	408	460	0
May	193	1,226	3,764	322	37,592	3,218	2	280	267	0	337	955	820	0
June	208	1,069	2,892	95	42,704	2,814	26	284	179	4	348	907	796	5
July	209	1,627	3,984	203	54,835	3,374	5	440	395	3	542	1,234	1,215	11
August	453	2,774	4,887	324	57,149	5,786	4	739	589	4	1,037	1,490	1,465	19
September	180	912	1,949	96	23,797	4,080	3	278	254	0	397	571	794	1
October	104	457	948	114	9,900	3,501	1	127	87	3	119	311	348	0
November	12	116	267	52	3,580	382	0	35	33	0	47	34	32	0
December	16	69	147	12	3,905	343	0	35	34	0	44	104	108	0
Total	1,516	9,279	21,874	1,466	269,730	28,100	45	2,464	2,084	14	3,178	6,417	6,479	35
Scaling Factors for Offshore Closures with Retention														
Jan	0.00	0.00	1.37	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00
Feb	0.00	0.00	1.37	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00
Mar	0.00	0.00	1.37	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00
Apr	0.00	0.00	1.37	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00
May	0.00	0.00	1.37	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00
June	0.00	0.00	1.18	0.32	1.05	1.05	1.05	1.05	1.05	1.05	1.05	1.05	1.05	1.05
July	0.00	0.00	1.18	0.32	1.05	1.05	1.05	1.05	1.05	1.05	1.05	1.05	1.05	1.05
August	0.00	0.00	1.18	0.32	1.05	1.05	1.05	1.05	1.05	1.05	1.05	1.05	1.05	1.05
September	0.00	0.00	1.18	0.32	1.05	1.05	1.05	1.05	1.05	1.05	1.05	1.05	1.05	1.05
October	0.00	0.00	1.37	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00
November	0.00	0.00	1.37	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00
December	0.00	0.00	1.37	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00

TABLE 4.3-19. 2005 Oregon recreational fishery: Status quo including closure outside of 40-fathom line during June through September; 10 marine bag to include rockfish, greenling, cabezon and other species; 2 lingcod; no canary or yelloweye retention. Minimum length: lingcod (24"); cabezon (16"); greenling (10"). (Page 4 of 5)

						Minor Nearshore Rockfish								
Month	Yelloweye	Canary	Lingcod	Widow	Black	Blue	Brown	China	Copper	Grass	Quillback	Cabezon	Kelp Greenling	Rock Greenling
Estimated Number of Landed Fish in 2005-2006														0
Jan	0	0	203	4	1,967	196	0	12	15	0	25	41	42	0
Feb	0	0	869	15	4,211	658	0	47	48	0	57	142	126	0
Mar	0	0	793	20	7,062	1,858	0	42	25	0	53	146	136	0
Apr	0	0	1,495	270	15,876	2,676	0	66	99	2	107	207	167	0
May	0	0	6,142	525	40,208	4,391	0	242	295	0	376	1,025	952	0
June	0	0	3,984	46	41,982	3,250	48	229	160	5	375	814	810	3
July	0	0	6,391	53	68,189	4,332	4	539	252	6	628	1,409	1,587	16
August	0	0	6,405	48	75,287	6,132	7	792	455	4	911	1,623	1,694	38
September	0	0	2,648	35	26,671	5,348	4	209	187	0	399	482	783	0
October	0	0	1,346	183	10,786	3,717	2	85	83	0	101	193	236	0
November	0	0	386	94	3,677	391	0	33	31	0	48	31	33	0
December	0	0	0	8	3,898	328	0	29	31	0	42	93	102	0
Total	0	0	30,661	1,301	299,814	33,277	66	2,324	1,680	18	3,122	6,206	6,667	57

TABLE 4.3-19. 2005 Oregon recreational fishery: Status quo including closure outside of 40-fathom line during June through September; 10 marine bag to include rockfish, greenling, cabezon and other species; 2 lingcod; no canary or yelloweye retention. Minimum length: lingcod (24"); cabezon (16"); greenling (10"). (Page 5 of 5)

						Minor Nearshore Rockfish								
Month	Yelloweye	Canary	Lingcod	Widow	Black	Blue	Brown	China	Copper	Grass	Quillback	Cabezon	Kelp Greenling	Rock Greenling
						Landed Weight (kg)								
02-03 avg	2.12	0.96	3.98	0.96	1.15	0.72	1.18	0.99	1.47	1.76	1.11	2.71	0.69	0.69
Jan	0	0	805	4	2,252	141	0	12	22	0	28	111	29	0
Feb	0	0	3,455	14	4,822	474	0	46	71	0	63	385	86	0
Mar	0	0	3,151	19	8,086	1,338	0	41	37	0	59	396	93	0
Apr	0	0	5,942	258	18,178	1,927	0	65	146	4	119	561	114	0
May	0	0	24,415	501	46,038	3,162	0	238	434	0	417	2,778	652	0
June	0	0	15,835	44	48,070	2,340	57	225	235	9	416	2,205	555	2
July	0	0	25,404	51	78,077	3,119	5	531	370	11	697	3,819	1,087	11
August	0	0	25,460	46	86,204	4,415	9	780	668	7	1,012	4,399	1,160	26
September	0	0	10,525	33	30,538	3,850	5	206	275	0	443	1,306	537	0
October	0	0	5,349	175	12,350	2,676	2	84	122	0	112	523	162	0
November	0	0	1,534	90	4,210	282	0	33	46	0	53	84	23	0
December	0	0	0	8	4,463	236	0	29	46	0	47	252	70	0
Ocean Boat Total	0	0	121,876	1,243	343,288	23,959	78	2,289	2,470	31	3,466	16,819	4,567	39
Inside and Shore	0	0	9,829	0	13,440	1,020	0	0	1,660	1,280	0	914	13,726	2,060
Total	0	0	131,705	1,243	356,728	24,979	78	2,289	4,130	1,311	3,466	17,733	18,293	2,099
additional reduction from rockpile														
	121	128				minor nearshore rk total=					36,253			
Discard mortality due to non-retention (halibut fishery)														
	495	182				minor nearshore rk ocean boat total=					32,293			
Discard mortality due to non-retention (ground fishery)														
	2,406	5,488				minor nearshore rk ocean boat excluding blue rk total=					8,334			
Other discard mortality (angler pref. & bag limit)														
	144	1,014	3,232			black rk and blue rk ocean boat total =					367,247			
Total Impacts	2,924	6,557	157,326											

1) Data source: Oregon Recreational Ocean Boat Survey (ORBS) and MRFSS for shore and estuary
2) Based on 2003 ocean boat catch for all stocks
3) For ocean boat catch average weight data is from 2002-2003 avg. except cabezon 2003 (min. size impl.)
4) Inside and shore estimates are based on MRFSS using 2000-2002 avg.
5) Discard mortality is based on 2003 observer study for discard rate and avg size and includes impacts from halibut fishery (mortality rate using CA study= assumes 15.9% mortality for 0-10fm depth fish; 50% for >10<=20fm depth fish; 100%>20fm depth fish)
6) Reductions from offshore closures are based on the 2003 observer study
7) 5% effort and catch increase in open areas during months closed outside of 40-fathoms; 17% annual increase in lingcod catch (all months with adjustments for offshore closures)based on recent WA/OR trend (stock is rebuilding)

TABLE 4.3-20. 2006 Oregon recreational fishery: Status quo including closure outside of 40-fathom line during June through September; 10 marine bag to include rockfish, greenling, cabezon and other species; 2 lingcod; no canary or yelloweye retention. Minimum length: lingcod (24"); cabezon (16"); greenling (10"). (Page 1 of 5)

						Minor Nearshore Rockfish								
Month	Yelloweye	Canary	Lingcod	Widow	Black	Blue	Brown	China	Copper	Grass	Quillback	Cabezon	Kelp Greenling	Rock Greenling
						Landed Number of Fish in 2003								
Jan	3	64	148	4	1,967	196		12	15		25	41	42	
Feb	20	155	635	15	4,211	658		47	48		57	142	126	
Mar	31	204	579	20	7,062	1,858		42	25		53	146	136	
Apr	82	381	1,092	270	15,876	2,676		66	99	2	107	207	167	
May	190	1,276	4,487	525	40,208	4,391		242	295		376	1,025	952	
June	155	1,253	3,376	143	39,983	3,095	46	218	152	5	357	775	771	3
July	238	2,100	5,416	165	64,942	4,126	4	513	240	6	598	1,342	1,511	15
August	323	2,514	5,428	148	71,702	5,840	7	754	433	4	868	1,546	1,613	36
September	199	866	2,244	107	25,401	5,093	4	199	178		380	459	746	
October	101	341	983	183	10,786	3,717	2	85	83		101	193	236	
November	9	113	282	94	3,677	391		33	31		48	31	33	
December	8	0	0	8	3,898	328		29	31		42	93	102	
Total	1,359	9,267	24,670	1,682	289,713	32,369	63	2,240	1,630	17	3,012	6,000	6,435	54
						Landed Number of Fish in 2002								
Jan	9	72	139	10	2,035	201		20	18		26	53	49	
Feb	21	157	552	22	4,121	425		41	39		57	134	127	
Mar	38	369	1,047	93	15,044	1,495	3	108	83		140	295	407	
Apr	82	660	1,882	65	22,223	1,699	6	162	170		151	609	753	
May	195	1,175	3,040	119	34,976	2,044	4	318	238		298	884	688	
June	261	885	2,408	46	45,424	2,533	6	350	205	2	338	1,039	820	6
July	180	1,154	2,552	241	44,728	2,622	5	366	549		485	1,126	919	6
August	582	3,033	4,345	500	42,595	5,731		723	745	3	1,206	1,433	1,316	2
September	161	958	1,653	84	22,193	3,066	2	356	329		414	682	841	2
October	106	572	913	45	9,014	3,285		168	91	5	137	428	459	
November	15	118	252	10	3,482	372		36	34		45	36	31	
December	23	137	294	15	3,911	358		40	37		46	114	113	
Total	1,673	9,290	19,077	1,250	249,746	23,831	26	2,688	2,538	10	3,343	6,833	6,523	16

TABLE 4.3-20. 2006 Oregon recreational fishery: Status quo including closure outside of 40-fathom line during June through September; 10 marine bag to include rockfish, greenling, cabezon and other species; 2 lingcod; no canary or yelloweye retention. Minimum length: lingcod (24"); cabezon (16"); greenling (10"). (Page 2 of 5)

						Minor Nearshore Rockfish								
Month	Yelloweye	Canary	Lingcod	Widow	Black	Blue	Brown	China	Copper	Grass	Quillback	Cabezon	Kelp Greenling	Rock Greenling
						Landed Number of Fish in 2001								
Jan	13	86	124	14	1,737	733		17	13		16	27	34	
Feb	51	438	561	34	5,418	2,441		64	29		121	121	142	
Mar	62	742	1,166	81	17,046	5,588		122	90	2	172	312	228	
Apr	68	454	979	11	24,461	3,844		161	102		120	460	276	
May	518	1,464	3,083	42	37,865	4,255		329	282	5	371	807	827	3
June	331	1,776	2,194	520	43,738	4,543	807	458	304	2	533	909	876	3
July	415	2,059	2,190	697	48,376	5,934	71	543	271	11	602	925	1,013	
August	624	2,358	3,045	1,702	68,332	16,255	4	674	263	3	758	1,223	1,501	5
September	253	922	884	271	18,826	5,150		219	136	1	283	402	615	
October	40	111	309	564	7,760	3,117		80	45		32	160	176	
November	19	131	196	34	4,226	885	13	40	23		39	31	30	
December	26	147	219	41	4,340	785	9	45	23		43	89	103	
Total	2,420	10,688	14,950	4,011	282,125	53,530	904	2,752	1,581	24	3,090	5,466	5,821	11
						Landed Number of Fish in 2000								
Jan	22	153	130	18	1,910	1,006	61	21	21		21	74	111	
Feb	141	522	533	36	4,461	2,298		106	91		91	182	223	
Mar	91	671	554	151	12,761	5,363		70	78		116	228	346	
Apr	286	998	1,158	260	26,715	5,810		255	169	2	100	499	546	1
May	1,409	2,667	2,874	314	38,110	9,853		458	560		510	963	917	7
June	574	2,872	2,788	609	49,476	8,985	4	749	544	4	705	1,456	1,780	36
July	670	2,843	2,304	879	74,798	6,120		795	461		511	1,602	1,457	36
August	1,168	6,844	2,676	1,450	76,045	14,842		1,064	788		1,093	1,597	1,904	57
September	506	1,804	1,334	670	36,526	5,194		409	257	2	263	541	752	9
October	54	513	431	68	12,632	2,825		145	46		84	178	246	7
November	39	160	237	14	5,610	3,012		67	38		51	59	63	6
December	60	320	333	35	4,992	2,168		61	50		40	135	156	6
Total	5,020	20,367	15,352	4,504	344,036	67,476	65	4,200	3,103	8	3,585	7,514	8,501	165

TABLE 4.3-20. 2006 Oregon recreational fishery: Status quo including closure outside of 40-fathom line during June through September; 10 marine bag to include rockfish, greenling, cabezon and other species; 2 lingcod; no canary or yelloweye retention. Minimum length: lingcod (24"); cabezon (16"); greenling (10"). (Page 3 of 5)

						Minor Nearshore Rockfish							
Month	Yelloweye	Canary	Lingcod	Widow	Black	Blue	Brown	China	Copper	Grass	Quillback	Cabezon	Kelp Greenling	Rock Greenling
Landed Number of Fish (2002-2003 Average)														
Jan	6	68	144	7	2,001	199	0	16	17	0	26	47	46	0
Feb	21	156	594	19	4,166	542	0	44	44	0	57	138	127	0
Mar	35	287	813	57	11,053	1,677	2	75	54	0	97	221	272	0
Apr	82	521	1,487	168	19,050	2,188	3	114	135	1	129	408	460	0
May	193	1,226	3,764	322	37,592	3,218	2	280	267	0	337	955	820	0
June	208	1,069	2,892	95	42,704	2,814	26	284	179	4	348	907	796	5
July	209	1,627	3,984	203	54,835	3,374	5	440	395	3	542	1,234	1,215	11
August	453	2,774	4,887	324	57,149	5,786	4	739	589	4	1,037	1,490	1,465	19
September	180	912	1,949	96	23,797	4,080	3	278	254	0	397	571	794	1
October	104	457	948	114	9,900	3,501	1	127	87	3	119	311	348	0
November	12	116	267	52	3,580	382	0	35	33	0	47	34	32	0
December	16	69	147	12	3,905	343	0	35	34	0	44	104	108	0
Total	1,516	9,279	21,874	1,466	269,730	28,100	45	2,464	2,084	14	3,178	6,417	6,479	35
Scaling Factors for Offshore Closures with Retention														
Jan	0.00	0.00	1.60	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00
Feb	0.00	0.00	1.60	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00
Mar	0.00	0.00	1.60	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00
Apr	0.00	0.00	1.60	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00
May	0.00	0.00	1.60	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00
June	0.00	0.00	1.38	0.32	1.05	1.05	1.05	1.05	1.05	1.05	1.05	1.05	1.05	1.05
July	0.00	0.00	1.38	0.32	1.05	1.05	1.05	1.05	1.05	1.05	1.05	1.05	1.05	1.05
August	0.00	0.00	1.38	0.32	1.05	1.05	1.05	1.05	1.05	1.05	1.05	1.05	1.05	1.05
September	0.00	0.00	1.38	0.32	1.05	1.05	1.05	1.05	1.05	1.05	1.05	1.05	1.05	1.05
October	0.00	0.00	1.60	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00
November	0.00	0.00	1.60	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00
December	0.00	0.00	1.60	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00

TABLE 4.3-20. 2006 Oregon recreational fishery: Status quo including closure outside of 40-fathom line during June through September; 10 marine bag to include rockfish, greenling, cabezon and other species; 2 lingcod; no canary or yelloweye retention. Minimum length: lingcod (24"); cabezon (16"); greenling (10"). (Page 4 of 5)

						Minor Nearshore Rockfish								
Month	Yelloweye	Canary	Lingcod	Widow	Black	Blue	Brown	China	Copper	Grass	Quillback	Cabezon	Kelp Greenling	Rock Greenling
Estimated Number of Landed Fish in 2005-2006														
Jan	0	0	237	4	1,967	196	0	12	15	0	25	41	42	0
Feb	0	0	1,017	15	4,211	658	0	47	48	0	57	142	126	0
Mar	0	0	927	20	7,062	1,858	0	42	25	0	53	146	136	0
Apr	0	0	1,749	270	15,876	2,676	0	66	99	2	107	207	167	0
May	0	0	7,186	525	40,208	4,391	0	242	295	0	376	1,025	952	0
June	0	0	4,661	46	41,982	3,250	48	229	160	5	375	814	810	3
July	0	0	7,477	53	68,189	4,332	4	539	252	6	628	1,409	1,587	16
August	0	0	7,494	48	75,287	6,132	7	792	455	4	911	1,623	1,694	38
September	0	0	3,098	35	26,671	5,348	4	209	187	0	399	482	783	0
October	0	0	1,574	183	10,786	3,717	2	85	83	0	101	193	236	0
November	0	0	452	94	3,677	391	0	33	31	0	48	31	33	0
December	0	0	0	8	3,898	328	0	29	31	0	42	93	102	0
Total	0	0	35,873	1,301	299,814	33,277	66	2,324	1,680	18	3,122	6,206	6,667	57

TABLE 4.3-20. 2006 Oregon recreational fishery: Status quo including closure outside of 40-fathom line during June through September; 10 marine bag to include rockfish, greenling, cabezon and other species; 2 lingcod; no canary or yelloweye retention. Minimum length: lingcod (24"); cabezon (16"); greenling (10"). (Page 5 of 5)

						Minor Nearshore Rockfish								
Month	Yelloweye	Canary	Lingcod	Widow	Black	Blue	Brown	China	Copper	Grass	Quillback	Cabezon	Kelp Greenling	Rock Greenling
						Landed Weight (kg)								
02-03 avg	2.12	0.96	3.98	0.96	1.15	0.72	1.18	0.99	1.47	1.76	1.11	2.71	0.69	0.69
Jan	0	0	942	4	2,252	141	0	12	22	0	28	111	29	0
Feb	0	0	4,043	14	4,822	474	0	46	71	0	63	385	86	0
Mar	0	0	3,686	19	8,086	1,338	0	41	37	0	59	396	93	0
Apr	0	0	6,952	258	18,178	1,927	0	65	146	4	119	561	114	0
May	0	0	28,566	501	46,038	3,162	0	238	434	0	417	2,778	652	0
June	0	0	18,527	44	48,070	2,340	57	225	235	9	416	2,205	555	2
July	0	0	29,722	51	78,077	3,119	5	531	370	11	697	3,819	1,087	11
August	0	0	29,788	46	86,204	4,415	9	780	668	7	1,012	4,399	1,160	26
September	0	0	12,315	33	30,538	3,850	5	206	275	0	443	1,306	537	0
October	0	0	6,258	175	12,350	2,676	2	84	122	0	112	523	162	0
November	0	0	1,795	90	4,210	282	0	33	46	0	53	84	23	0
December	0	0	0	8	4,463	236	0	29	46	0	47	252	70	0
Ocean Boat Total	0	0	142,595	1,243	343,287	23,959	78	2,289	2,470	31	3,466	13,455	4,567	39
Inside and Shore	0	0	11,500	0	13,440	1,020	0	0	1,660	1,280	0	914	13,726	2,060
Total	0	0	154,094	1,243	356,727	24,979	78	2,289	4,130	1,311	3,466	14,369	18,293	2,099
additional reduction from rockpile														
	121	128				minor nearshore rk total=					36,253			
Discard mortality due to non-retention (halibut fishery)														
	495	182				minor nearshore rk ocean boat total=					32,293			
Discard mortality due to non-retention (ground fishery)														
	2,406	5,488				minor nearshore rk ocean boat excluding blue rk total=					8,334			
Other discard mortality (angler pref. & bag limit)														
	144	1,014	3,232			black rk and blue rk ocean boat total =					367,247			
Total Impacts	2,924	6,557	157,326											

1) Data source: Oregon Recreational Ocean Boat Survey (ORBS) and MRFSS for shore and estuary
2) Based on 2003 ocean boat catch for all stocks
3) For ocean boat catch average weight data is from 2002-2003 avg. except cabezon 2003 (min. size impl.)
4) Inside and shore estimates are based on MRFSS using 2000-2002 avg.
5) Discard mortality is based on 2003 observer study for discard rate and avg size and includes impacts from halibut fishery (mortality rate using CA study= assumes 15.9% mortality for 0-10fm depth fish; 50% for >10<=20fm depth fish; 100%>20fm depth fish)
6) Reductions from offshore closures are based on the 2003 observer study
7) 5% effort and catch increase in open areas during months closed outside of 40-fathoms; 17% annual increase in lingcod catch (all months with adjustments for offshore closures)based on recent WA/OR trend (stock is rebuilding)

TABLE 4.3-21. A summary of the contribution from each year to the "base year" calculation under the 0.7 approach decay function used to weight the annual recreational catch estimates in the California recreational impact projection model. (Page 1 of 1)

Year	0.7 weighting factor	Percent Contribution	Cumulative Contribution
2003	100.0	30.0%	30.0%
2002	70.0	21.0%	51.1%
2001	49.0	14.7%	65.8%
2000	34.3	10.3%	76.1%
1999	24.0	7.2%	83.3%
1998	16.8	5.1%	88.4%
1997	11.8	3.5%	91.9%
1996	8.2	2.5%	94.4%
1995	5.8	1.7%	96.1%
1994	4.0	1.2%	97.3%
1990	2.8	0.8%	98.2%
1989	2.0	0.6%	98.8%
1988	1.4	0.4%	99.2%
1987	1.0	0.3%	99.5%
1986	0.7	0.2%	99.7%
1985	0.5	0.1%	99.8%
1984	0.3	0.1%	99.9%
1983	0.2	0.1%	100.0%
Sum	332.8	100.0%	

TABLE 4.3-22. Summary of expected 2005 and 2006 California recreational total annual catch (mt) of selected groundfish species and species complexes by region under the proposed regulations. (Page 1 of 2)

Species/Management Region	Total Mortality (mt)	
Bocaccio		
40°10' N. lat to Pigeon Point (37°11' N. lat)	0.7	
Pigeon Pt. (37°11' N. lat) to Pt. Conception (34°27' N. lat)	1.0	
Pt. Conception (34°27' N. lat) to U.S.-Mexico Border	50.1	
Total Catch		**51.8**
Canary		
CA-OR Border to 40°10' N. lat (near Cape Mendocino)	0.5	
40°10' N. lat to Pigeon Point (37°11' N. lat)	5.4	
Pigeon Pt. (37°11' N. lat) to Pt. Conception (34°27' N. lat)	2.8	
Pt. Conception (34°27' N. lat) to U.S.-Mexico Border	0.0	
Total Catch		**8.7**
Cowcod		
CA-OR Border to 40°10' N. lat (near Cape Mendocino)	0.0	
40°10' N. lat to Pigeon Point (37°11' N. lat)	0.2	
Pigeon Pt. (37°11' N. lat) to Pt. Conception (34°27' N. lat)	0.2	
Pt. Conception (34°27' N. lat) to U.S.-Mexico Border	0.0	
Total Catch		**0.4**
Lingcod		
CA-OR Border to 40°10' N. lat (near Cape Mendocino)	36.0	
40°10' N. lat to Pigeon Point (37°11' N. lat)	150.9	
Pigeon Pt. (37°11' N. lat) to Pt. Conception (34°27' N. lat)	108.5	
Pt. Conception (34°27' N. lat) to U.S.-Mexico Border	38.8	
Total Catch		**334.3**
Shallow Nearshore Rockfish		
CA-OR Border to 40°10' N. lat (near Cape Mendocino)	---	
40°10' N. lat to Pigeon Point (37°11' N. lat)	22.0	
Pigeon Pt. (37°11' N. lat) to Pt. Conception (34°27' N. lat)	57.4	
Pt. Conception (34°27' N. lat) to U.S.-Mexico Border	10.4	
Total Catch		**89.8**
Deeper Nearshore Rockfish		
CA-OR Border to 40°10' N. lat (near Cape Mendocino)	---	
40°10' N. lat to Pigeon Point (37°11' N. lat)	180.0	
Pigeon Pt. (37°11' N. lat) to Pt. Conception (34°27' N. lat)	134.8	
Pt. Conception (34°27' N. lat) to U.S.-Mexico Border	31.2	
Total Catch		**345.9**
Scorpionfish		
Pigeon Pt. (37°11' N. lat) to Pt. Conception (34°27' N. lat)	0.0	
Pt. Conception (34°27' N. lat) to U.S.-Mexico Border	43.0	
Total Catch	**43.0**	
Black Rockfish		
CA-OR Border to 40°10' N. lat (near Cape Mendocino)	95.5	
40°10' N. lat to Pigeon Point (37°11' N. lat)	39.6	
Pigeon Pt. (37°11' N. lat) to Pt. Conception (34°27' N. lat)	29.6	
Pt. Conception (34°27' N. lat) to U.S.-Mexico Border	6.9	
Total Catch		**171.6**

TABLE 4.3-22. Summary of expected 2005 and 2006 California recreational total annual catch (mt) of selected groundfish species and species complexes by region under the proposed regulations. (Page 2 of 2)

Species/Management Region	Total Mortality (mt)	
Widow		
CA-OR Border to 40°10' N. lat (near Cape Mendocino)	0.0	
40°10' N. lat to Pigeon Point (37°11' N. lat)	0.2	
Pigeon Pt. (37°11' N. lat) to Pt. Conception (34°27' N. lat)	0.1	
Pt. Conception (34°27' N. lat) to U.S.-Mexico Border	0.0	
Total Catch		**0.3**
Yelloweye		
CA-OR Border to 40°10' N. lat (near Cape Mendocino)	0.1	
40°10' N. lat to Pigeon Point (37°11' N. lat)	1.2	
Pigeon Pt. (37°11' N. lat) to Pt. Conception (34°27' N. lat)	0.2	
Pt. Conception (34°27' N. lat) to U.S.-Mexico Border	0.0	
Total Catch		**1.5**

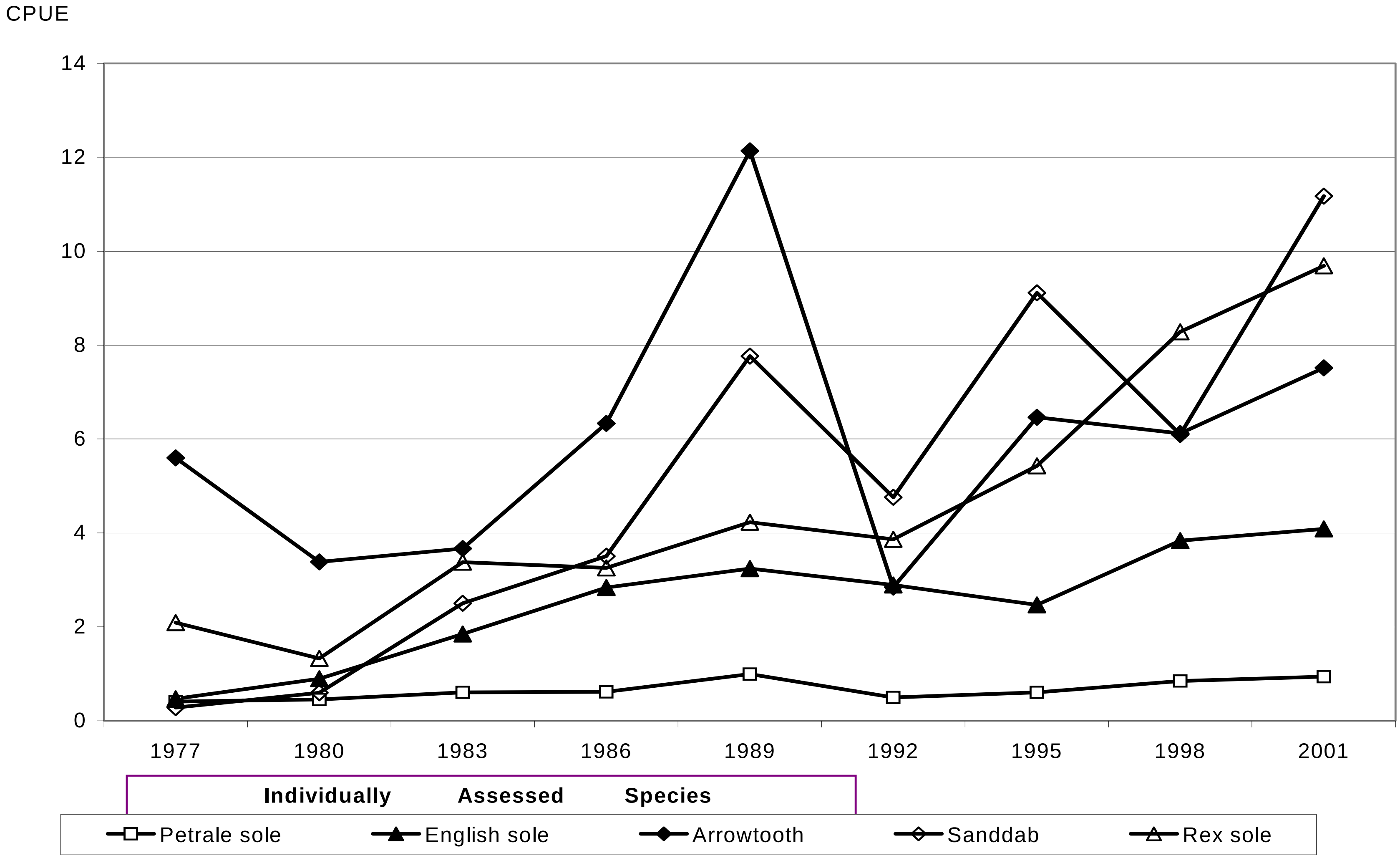

FIGURE 4.3-1. Catches per unit of effort of major flatfish species in triennial surveys, 1977-2001.

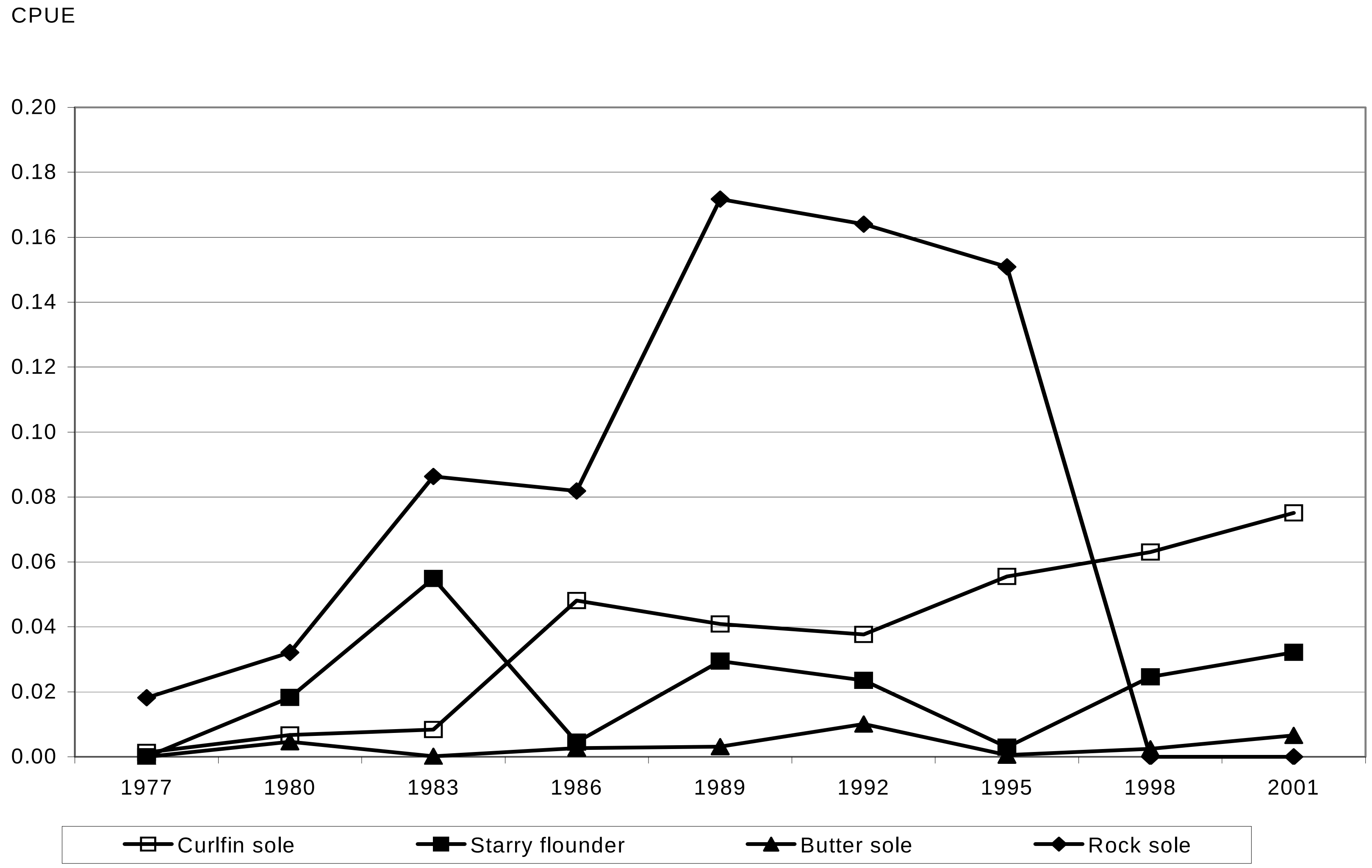

FIGURE 4.3-2. Catches per unit of effort of major flatfish species in triennial surveys, 1977-2001.

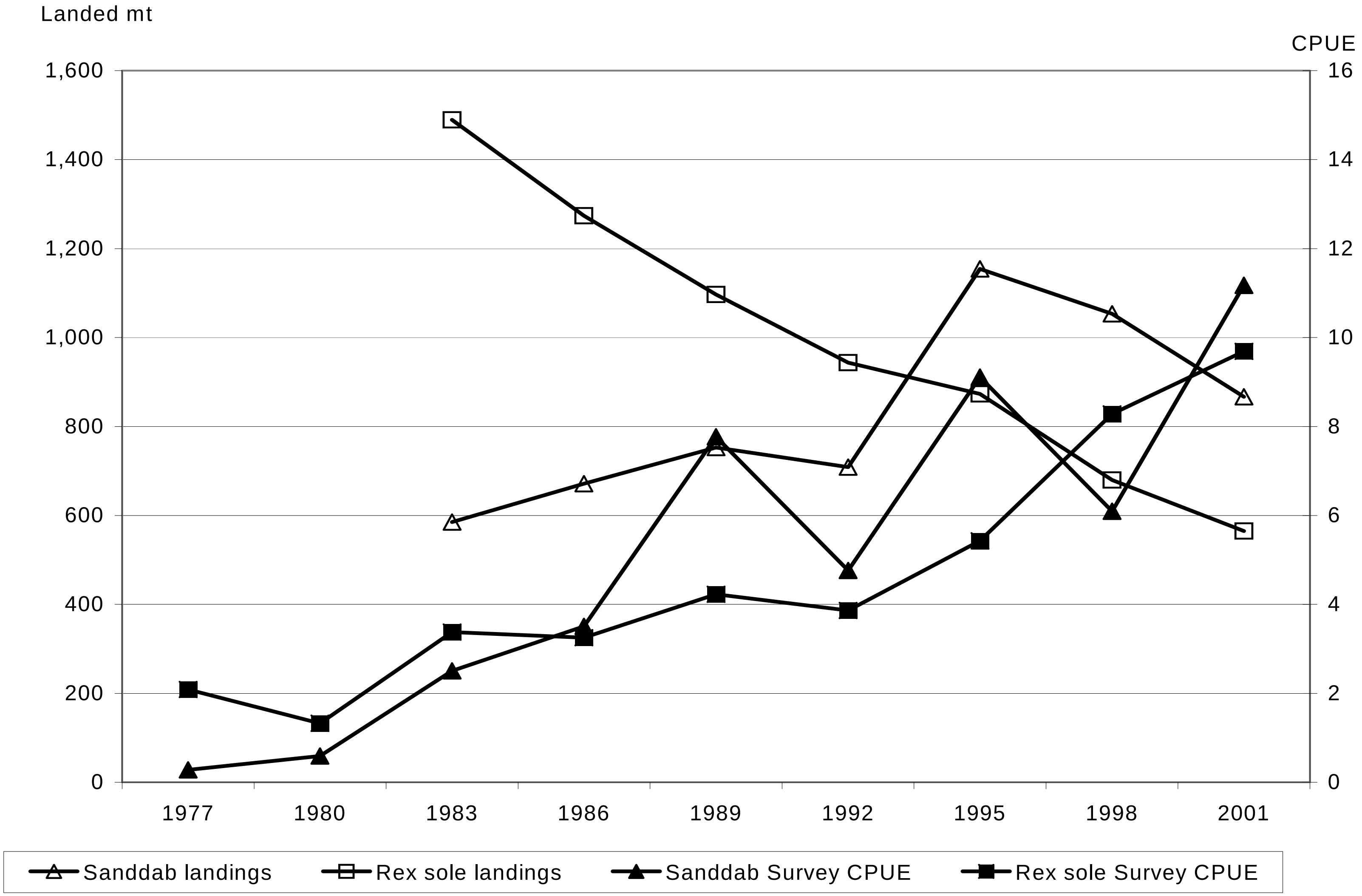

FIGURE 4.3-3. Catches per unit-effort in AFSC triennial surveys, 1977-2001, and 3-year average commercial landings of sanddab and rex sole around survey years, 1983-2001.

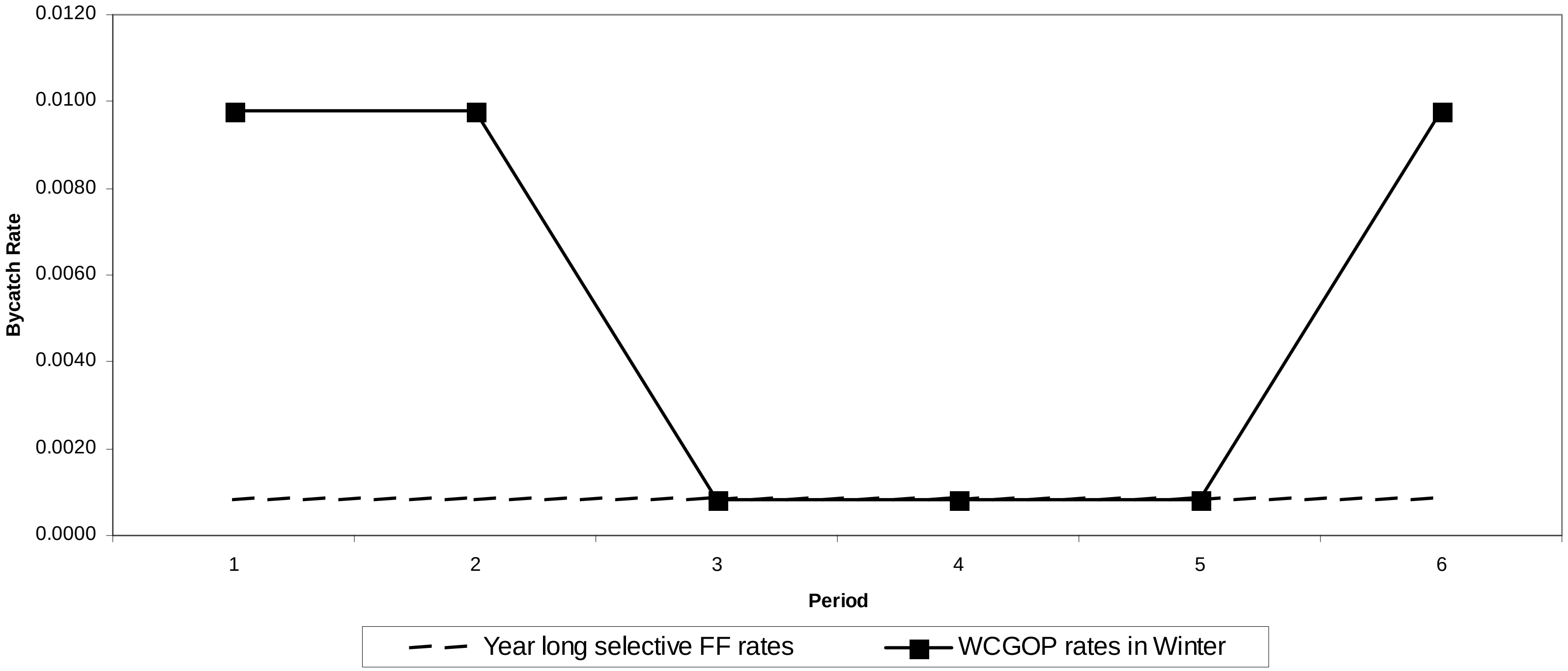

FIGURE 4.3-4. Canary rockfish bycatch rates by bimonthly period for the selective flatfish trawl strategy inside 100 fm in the north using two alternative approaches to modeling impacts. The first approach uses selective flatfish trawl bycatch rates derived from the ODFW EFP study year-round and the second approach uses selective flatfish trawl rates only in periods 3, 4, and 5 with West Coast Groundfish Observer Program (WCGOP) rates applied in periods 1, 2, and 6.

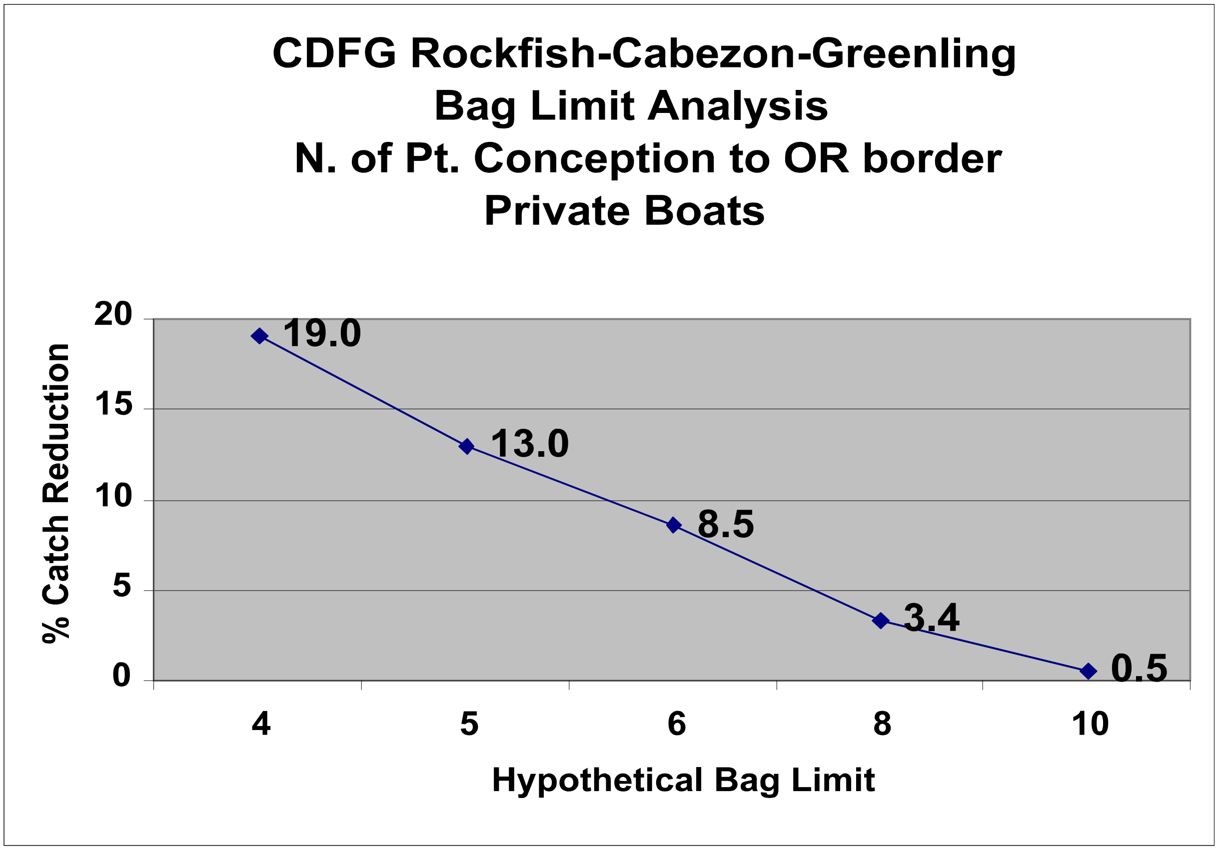

FIGURE 4.3-5. A description of the CDFG Rockfish-Cabezon-Greenling bag limit analysis for private boat anglers north of Pt. Conception to the California-Oregon border.

5.0 NONGROUNDFISH SPECIES

Nongroundfish species and fisheries targeting them often need to be considered in groundfish management for two reasons. First, they may be caught incidentally in fisheries targeting groundfish. Thus, management measures that change total fishing effort in groundfish fisheries could increase or decrease fishing mortality on incidentally-caught species. Second, those fisheries targeting nongroundfish species may be affected by management measures intended to reduce or eliminate incidental catches of overfished groundfish species in these fisheries. This section describes these species and associated fisheries.

5.1 Affected Environment: Nongroundfish Species

The principle species that either co-occur with groundfish species or have fisheries directed on them which incidentally take groundfish are summarized in the table below.

Principle Species Co-occurring with Groundfish	
California halibut (*Paralichthys californicus*)	Pacific halibut (*Hippoglossus stenolepis*)
California sheephead (*Semicossyphus pulcher*)	Ridgeback prawns (*Sicyonia ingentis*)
Costal Pelagic Species (CPS)	**Sea Cucumbers**
Northern anchovy (*Engraulis mordax*)	California sea cucumber (*Parastichopus californicus*)
Pacific sardine (*Sardinops sagax*)	Warty sea cucumber (*Parastuchopus parvimensis*)
Pacific (chub) mackerel (Scomber japonicus)	**Salmon**
Jack mackerel (*Trachurus symmetricus*),	Chinook (*Oncorhynchus tshawytscha*)
Market squid (Decapoda spp.)	Coho *(Oncorhynchus kisutch*)
Dungeness crab (*Cancer magister*)	Pink (*Oncorhynchus gorbuscha*)
Highly Migratory Species (HMS)	Spot prawn (*Pandalus platyceros*)
Tunas, Billfish, Dorado, Sharks	White seabass (*Atractoscion nobilis*)
Ocean whitefish (*Caulolatilus princeps)*	American shad (*Alosa sapidissima*)
Pacific pink shrimp (*Pandalus jordani*)	Walleye pollock (*Theragra chalcogramma*)

A complete description of nongroundfish species and nongroundfish fisheries potentially affected by the alternatives is available in Appendix 1, Chapter 3.

5.2 Criteria Used to Evaluate Impacts

The same criteria used to evaluate impacts to non-overfished groundfish stocks (Chapter 4) are used for those nongroundfish stocks affected by the proposed and alternative 2005-2006 actions.

5.3 Discussion of Direct and Indirect Impacts

5.3.1 Salmon

Groundfish catch is not a significant component in salmon troll fisheries, although some incidental groundfish catch is landed. None of the 2005-2006 alternatives are expected to affect salmon stocks, except in cases where diminished groundfish fishing opportunities might result in effort shifts into salmon fisheries. However, the result of this would potentially be earlier salmon quota attainment. Salmon vessels are subject to groundfish landing prohibitions when trolling within the non-trawl RCA. An exception exists under the No Action alternative for yellowtail rockfish north of 40°10' N. lat. None of the action alternatives at this time deviate from the yellowtail rockfish provisions specified in 2004.

5.3.2 Pacific Halibut

The Pacific halibut fishery is affected by depth restrictions. The proposed action to rebuild canary rockfish and yelloweye rockfish are anticipated to severely limit fishing effort on the continental shelf. These actions could substantially affect opportunity for Pacific halibut as commercial halibut fishing is prohibited within the nontrawl RCA. Action Alternative 1 would have the greatest impact as the seaward boundary specified at 150 fathoms coastwide, Action Alternative 2 would be intermediate with a seaward boundary at 125 fathoms, and least under Action Alternative 3 with a seaward boundary at 100 fathoms. Alternative 3 is the most similar to the No Action Alternative where the seaward boundary of the nontrawl RCA boundary is 100 fathoms north of 40°10' N. lat. and 150 fathoms south of 40°10' N. lat. The YRCA closure off northern Washington will also limit Pacific halibut catch; however, the alternatives analyzed do not vary the size of this closed area.

5.3.3 Coastal Pelagic Species

Coastal Pelagic Species are taken incidentally in the groundfish fishery. Incidental take is well documented in the at-sea and shore-based whiting fishery. Preliminary data for 2001 indicates that approximately 80 mt of squid was incidentally taken in the at-sea whiting fishery through October. There is little information on the incidental take of CPS by the other segments of the fishery; however, given that CPS are not associated with the ocean bottom, the interaction is expected to be minimal.

5.3.4 Highly Migratory Species

Highly migratory species (HMS), such as tunas and billfish, are largely pelagic, open-ocean species infrequently caught in groundfish-directed fisheries. None of the alternatives analyzed should affect HMS species.

5.3.5 Dungeness Crab

Dungeness crab, which are typically harvested using traps (crab pots), ring nets, by hand (scuba divers) or dip nets, are incidentally taken or harmed unintentionally by groundfish gears. Very little bycatch of rockfish and other overfished West Coast groundfish species has been noted in pot and trap fisheries, including those targeting Dungeness crab. It is not anticipated that this fishery would need to be constrained or modified to rebuild any of the overfished West Coast groundfish species of concern.

One effect of the large RCA under Action Alternative 1is that smaller vessels forced to fish shoreward of the RCA are limited to depths shallower than 75 fm year-round and shallower than 60 fm during the summer periods 3-5 (May-October) in the north. Forcing vessels to fish this shallow does impact Dungeness crab in the north which are molting during summer months.

5.3.6 Greenlings, Ocean Whitefish, and California Sheephead

Greenlings of the genus *Hexagrammos*, ocean whitefish, and California sheephead are managed by the state of California. Due to their co-occurrence with groundfish and their popularity as a target species by recreational groundfish areas, California often takes state regulatory action for these species when recreational fisheries for federal groundfish fisheries are closed or limited. This occurred in 2004 and is part of the No Action alternative for recreational groundfish fisheries in California.

5.3.7 Other Nongroundfish Species

Other nongroundfish species would not be significantly affected by changes in fisheries resulting from the alternatives.

6.0 PROTECTED SPECIES

6.1 Affected Environment: Protected Species

Protected species fall under three overlapping categories, reflecting four mandates: the Endangered Species Act of 1973 (ESA), the Marine Mammal Protection Act of 1972 (MMPA), the Migratory Bird Treaty Act (MBTA), and EO 13186. Chapter 5 in Appendix A describes species which occur off the West Coast and are protected under these mandates.

The ESA protects species in danger of extinction throughout all or a significant part of their range and mandates the conservation of the ecosystems on which they depend. “Species” is defined by the Act to mean a species, a subspecies, or—for vertebrates only—a distinct population. Under the ESA, a species is listed as “endangered” if it is in danger of extinction throughout a significant portion of its range and “threatened” if it is likely to become an endangered species within the foreseeable future throughout all, or a significant part, of its range. Bycatch of ESA-listed wild chinook salmon stocks by the whiting fishery is the most well-document impact of groundfish fisheries on protected species. Limits on chinook bycatch in the whiting fishery were established as result of the September 27, 1993, Biological Opinion issue pursuant to the ESA. This opinion established the bycatch rate of 0.05 chinook salmon/mt of whiting with an 11,000 fish threshold for the entire whiting fishery (at-sea and shore-base sectors combined). Re-initiation of the Biological Opinion is required if both the bycatch rate and bycatch limit are exceeded (NMFS 2003a). (Table 5-3 in Appendix A shows the incidental annual catch of chinook salmon for all sectors of the whiting fleet combined from 1991 to 2001.)

Other ESA-listed species that may interact with West Coast groundfish fisheries are sea turtles. Four of the six species found in U.S. waters have been sighted off the West Coast. These species include: Loggerhead *(Caretta caretta*), Green (*Chelonia mydas),* Leatherback (*Dermochelys coriacea*), and olive ridley (*Lepidochelys olivacea*). Little is known about the interactions between sea turtles and West Coast fisheries. Directed fishing for sea turtles in West Coast groundfish fisheries is prohibited because of their ESA listings; however, incidental take of sea turtles by longline or trawl gear may occur. (Green, leatherback, and olive ridely sea turtles are listed as endangered; loggerheads are listed as threatened.) The management and conservation of sea turtles is shared between NMFS and the U.S. Fish and Wildlife Service (FWS). Section 5.1.2 in Appendix A describes the range and occurrence of these species.

In addition to the ESA, the federal MMPA guides marine mammal species protection and conservation policy. Under the MMPA, on the West Coast NMFS is responsible for the management of cetaceans and pinnipeds, while the FWS manages sea otters. Stock assessment reports review new information every year for strategic stocks and every three years for non-strategic stocks. (Strategic stocks are those whose human-caused mortality and injury exceeds the potential biological removal [PBR].) Marine mammals, whose abundance falls below the optimum sustainable population (OSP), are listed as “depleted” according to the MMPA.

Fisheries that interact with species listed as depleted, threatened, or endangered may be subject to management restrictions under the MMPA and ESA. NMFS publishes an annual list of fisheries in the *Federal Register* separating commercial fisheries into one of three categories based on the level of serious injury and mortality of marine mammals occurring incidentally in that fishery. The categorization of a fishery in the list of fisheries determines whether participants in that fishery are subject to certain provisions of the MMPA, such as registration, observer coverage, and take reduction plan requirements. West Coast groundfish fisheries are in Category III, denoting a remote likelihood of, or no known, serious injuries or mortalities to marine mammals. Section 5.2 in Appendix A describes 25 marine mammal species known to occur of the West Coast. Of these, 16 may interact with groundfish fisheries. Three of these 16 species—the Guadalupe fur seal, Stellar sea lion and southern sea otter—are listed as threatened under the ESA (see Table 5-4 in Appendix A).

The FWS is the primary federal agency responsible for seabird conservation and management. Four species found off the West Coast are listed under the ESA. (See Table 5-5 in Appendix A.) In 2002, the FWS classified several seabird species that occur off the Pacific Coast as “Species of Conservation Concern.” These species include: black-footed albatross (*Phoebastria nigripes*), ashy storm-petrel (*Oceanodroma homochroa*), gull-billed tern (*Sterna nilotica*), elegant tern (*Sterna elegans*), arctic tern (*Sterna paradisaea*), black skimmer (*Rynchops niger*), and Xantus’s murrelet (*Synthliboramphus hypoleucus*).

The Migratory Bird Treaty Act (MBTA) implements various treaties and conventions between the U.S. and Canada, Japan, Mexico, and the former Soviet Union for the protection of migratory birds. Under the Act, taking, killing, or possessing migratory birds is unlawful. In addition to the MBTA, an Executive Order, Responsibilities of Federal Agencies to Protect Migratory Birds, (EO 13186) directs federal agencies to negotiate Memoranda of Understanding with the U.S. Fish and Wildlife Service (FWS) that would obligate agencies to evaluate the impact on migratory birds as part of any NEPA process. The FWS and NMFS are working on a Memorandum of Understanding concerning seabirds.

In February 2001, NMFS adopted a National Plan of Action (NPOA) to Reduce the Incidental Take of Seabirds in Longline Fisheries. This NPOA contains guidelines that are applicable to relevant groundfish fisheries and would require seabird incidental catch mitigation if a significant problem is found to exist. As part of NPOA implementation, NMFS assessed the incidental take of seabirds in longline fisheries. During the first year of the West Coast Groundfish Observer Program (September 2001–October 2002), observers did not document any incidental seabird takes by in the limited entry groundfish longline fleet. (During the assessment period, approximately 30% of landings by the limited entry fixed gear fleet had observer coverage.) Section 5.3 in Appendix A describes 60 seabird species occurring off the West Coast. Three of these species—the short-tailed albatross, California brown pelican, and California least tern—are listed as endangered under the ESA. One species, the marbled murrelet, is listed as threatened.

6.2 Criteria Used to Evaluate Impacts

Presumably, effects on protected species correlate with changes in the level of fishing effort. Increased fishing effort could lead to an increase in interactions between fishing vessels and protected species while a decrease in fishing effort would have the opposite effect. Thus, changes in fishing effort could be one way to evaluate the relative effects of the alternatives. However, as discussed in Chapter 3 in connection with habitat and ecosystem impacts, there are limited data available on the distribution, intensity, and duration of fishing effort associated with the groundfish fisheries. Furthermore, different gear types would affect protected species differently, so the relative level of fishing effort by gear type would have to be accounted for. Even if such data were available, this distribution and intensity level of fishing effort would have to be correlated with the distribution of protected species. Finally, the effects of resulting interactions (aside from observed mortality) need to be better understood. Given these limitations, the different alternatives, which represent different harvest levels, are used as proxies for fishing effort in order to assess the relative potential effects of the alternatives on protected species.

When an agency is evaluating reasonably foreseeable significant adverse effects, there is incomplete or unavailable information, and the costs of obtaining it are exorbitant or the means unknown, the agency must: (1) so state, (2) describe the importance of the unavailable information to the assessment, (3) summarize any existing scientific information, and (4) evaluate impacts based on generally accepted scientific principals (40 CFR Part 1502.22), which may accord with the best professional judgement of agency staff. NMFS acknowledges that the information necessary to fully evaluate impacts to protected species, as described in the preceding paragraph, cannot be reasonably obtained at this time. Necessary information may become available at a future date. Beginning in 2004, NMFS implemented a vessel monitoring system (VMS) program for limited entry groundfish vessels, which will gather information on the location of vessels. This information may become available to resource managers, allowing a better assessment of the distribution of fishing effort. NMFS is also preparing an EIS addressing the identification and protection of essential fish habitat. A predictive risk assessment model is being developed for this project, which includes a fishing effort component (see Chapter 3). When completed, it may be possible to adapt this model to predict likely protected species interactions. The West Coast Groundfish Observer Program is currently gathering data on interactions with protected species. As more data are gathered, the spatial and temporal distribution of interactions will be better understood.

Given the available information and the requirements of NEPA regulations, the remainder of this section describes the available scientific information on interactions, and based on the best professional judgement of agency staff, qualitatively assesses the predicted environmental impacts of the proposed action and alternatives on protected species, based on the best professional judgement of NMFS and Council staff.

6.3 Discussion of Direct and Indirect Impacts

Increased fishing effort could result in an increase in interactions between groundfish fisheries and protected species. Adverse impacts of these interactions could include death due to capture by or entanglement in fishing gear, changes in the availability of prey species, and changes in behavior that reduce the fitness or reproductive capacity of a protected species. There is some information on gear-related mortality from fishery observers. There is insufficient information to determine what effect, if any, groundfish fisheries have on the availability of prey species and behavioral changes.

Incidental capture of ESA-listed wild salmon stocks is the best documented interaction between protected species and groundfish fisheries. The impacts of incidental catches in the whiting fishery are managed through the Biological Opinion mentioned above. Catch amounts and rates below the thresholds established in the BO indicate the impacts are minor. (See Section 5.1.1 in Appendix A for a discussion of these thresholds.) If they are consistently exceeded, consultations would be reinitiated and additional measures implemented to reduce impacts.

The groundfish bycatch mitigation draft programmatic EIS (DPEIS) {NMFS, 2004 #1022, pp. 4-147–4-160; NMFS, 2004 #1044} describes impacts to sea turtles, marine mammals, and seabirds by West Coast groundfish fisheries.

Although incidental capture of sea turtles in various fisheries is a significant source of mortality (see cumulative effects, below), the area of operation and gear types used in West Coast groundfish fisheries make it unlikely that sea turtles are incidentally caught. To date, incidental catch of sea turtles has not been documented in the Pacific Coast groundfish fishery.

The groundfish bycatch mitigation DPEIS enumerates fishery-related mortality estimates for marine mammals on the West Coast. Most observed mortality has occurred in set net, gillnet and trammel net fisheries, which are not groundfish FMP fisheries. Table 6-1 lists marine mammal interactions observed during the first year of the West Coast Groundfish Observer Program. Lethal interactions occurred in both the trawl and longline fisheries, although the highest mortality was of California sea lions taken by trawl gear, with seven individuals. Trawlers also took two Stellar sea lions and an unidentified sea lion. One unidentified pinniped was taken by a longline vessel. (Seals and sea lions are pinnipeds.) Because marine mammals are diving animals and strong swimmers, they are more likely to be taken by trawl gear than longline gear. They are generally too large to be taken in traps (pots). (Sea otters, which are smaller animals, are an exception in this respect.) Other marine mammals noted as having been taken in West Coast groundfish fisheries are the harbor seal, sea otter, Dall's porpoise, white-sided dolphin, and short-beaked dolphin.

In the North Pacific, where seabird interactions are better documented, seabirds are most commonly incidentally-caught by longline vessels (USFWS 2003). This typically occurs during gear deployment. Seabirds like to forage for discarded offal and bait thrown overboard during fishing operations; they are then attracted to the baited hooks as the line is shot from the vessel. If they become hooked, they can be dragged under the water and drown. Some mortality may occur in trawl fisheries when seabirds may become entangled in cables running from the vessel to sonar gear attached to the net, causing them to drown (USFWS 2003). Similar impacts could occur in West Coast groundfish trawl fisheries. To date, the West Coast Groundfish Observer Program has documented few seabird deaths. Table 6-2 shows observations from the first year of the program, September 2001 to October 2002. Approximately 10% of the coastwide limited entry trawl landed weight and 30% of the limited entry fixed gear landed weight was observed during this period. As shown in the table, five seabirds were taken and nine non-lethal interactions were documented. All the mortality was observed on a trawl vessel, which is unusual. Interactions also occurred on vessels using rod-and-reel, pot, and longline gear.

6.4 Discussion of Cumulative Impacts

The FEIS for the highly migratory species (HMS) FMP (PFMC 2003d) recently implemented by the Council discusses effects of those fisheries on the range of protected species discussed here, except for ESA-listed salmon. An EIS evaluating the Western Pacific region pelagic fisheries FMP (URS Corporation 2001) presents a comprehensive treatment of cumulative effects to many of the same categories of protected species. Sea turtle stocks affected by those fisheries are the same as potentially interact with West Coast groundfish fisheries. Many of the marine mammals and seabirds affected by Western Pacific pelagic fisheries are different than those occurring off the West Coast, but similar external factors would interact cumulatively with groundfish fisheries to affect protected species. These sources are used to describe cumulative impacts to protected species potentially interacting with West Coast groundfish fisheries.

6.5 Summary of Impacts

6.5.1 Cumulative Impacts–ESA-listed Salmon

The EA for 2003 West Coast ocean salmon fisheries (PFMC 2003c) describes cumulative impacts to salmon stocks. From the perspective of groundfish management, take in salmon fisheries themselves represents a factor contributing to cumulative impacts. Commercial and recreational salmon fisheries are managed to optimize harvest of hatchery-produced fish while keeping the take of wild, ESA-listed stocks within limits that will ensure their continued existence. Thus, in managing these stocks all sources of fishing mortality are estimated or accounted for, including incidental take in groundfish fisheries. In addition to factors affecting other fish species, such as fishing mortality and the effect of environmental conditions on stock productivity, salmon are vulnerable to human-caused degradation of freshwater habitat used for spawning. These effects are generally well known and diverse. They include physical barriers to migration (dams), changes in water flow and temperature (often a secondary effect of dams or water diversion projects), and degradation of spawning environments due to increased silt in the water due to adjacent land use. A very large proportion of the long-term, and often permanent, declines in salmon stocks is attributable to this class of impacts. For a detailed summary of non-fishing impacts to salmon habitat see Section 3.2.5 of the EFH Appendix in Amendment 14 to the Pacific Coast salmon FMP (PFMC 2000a).

6.5.2 Cumulative Impacts–Sea Turtles

The Western Pacific pelagic fisheries FMP FEIS referenced above identifies these external factors contributing to cumulative effects: (1) fisheries effects (marine and shoreline), (2) impacts on the nesting environment, (3) impacts on the marine environment, and (4) the current and future regulatory regime. This FEIS points out that fishery-related mortality has a particularly strong effect because older, more reproductively important age classes are removed from the population.

Sea turtle populations—particularly loggerheads and leatherbacks—overlap in the eastern and western Pacific, making them vulnerable to a variety of, mainly pelagic, fisheries. However, sea turtles' patchy distribution in time and space makes it difficult to predict which fisheries will most impact them. The Biological Opinion (BO) for the Oregon/California drift gillnet fishery (NMFS 2000) describes fisheries affecting sea turtles. These include longline and purse seine pelagic fisheries prosecuted by both U.S. and foreign vessels, North Pacific driftnet fisheries before 1993, and a range of commercial and artisanal fisheries off the Pacific coast of Latin America. Until recently sea turtle fisheries were legal in most Pacific coast Latin American countries. Illegal directed take of sea turtles along with incidental mortality in Baja California, Mexico, is a major source of mortality. West Coast fisheries known to take sea turtles include the California/Oregon drift gillnet fisheries (subject of the referenced BO), California set gillnet fisheries, the West-Coast-based pelagic longline fishery, and the albacore troll fishery. According to the Western Pacific pelagic longline FMP FEIS, shoreline recreational fisheries in Hawaii also affect primarily green sea turtles due to hook ingestion and line entanglement.

Sea turtles nest above the upper high tide mark on beaches, an area often heavily used by humans. They are vulnerable when nesting onshore because of directed take, habitat disturbance, and nest predation. A variety of effects can disturb the nesting environment: increased human presence, including vehicles; coastal construction and other development activities; artificial lighting; shoreline erosion and subsequent sand replenishment; and exotic vegetation. In the marine environment a variety of human activities and natural events can affect sea turtles. Marine debris are a major problem; sea turtles may become entangled and drown, or ingest material leading to intestinal blockage and starvation. Coastal and nearshore development activities such as oil exploration and development, marinas and docks, dredging, power plant cooling, construction blasting, and environmental contaminants, can lead to injury or death. Degradation of marine habitats important to sea turtles—sea grass beds and coral reefs, for example—can limit food sources or refugia. Natural disasters and climate events such as El Niño also harm sea turtles (URS Corporation 2001).

Regulatory regimes under U.S. law are intended to reduce the incidental take of sea turtles. The BO for the Oregon/California driftnet fishery mandated several measures to reduce leatherback and loggerhead take in this fishery. The Hawaii-based and West Coast-based longline fisheries have been subject to controversy over sea turtle take. Litigation (Center for Marine Conservation v NMFS (D. Haw.) Civ. No. 99-00152 DAE) and a subsequent BO imposed a range of measures (closed areas, gear restrictions, prohibitions) to limit sea turtle take in the Hawaii-based longline fishery.[1/] Shallow-set longline fishing,

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[1/] As a result of further litigation in Federal Court (HLA v. NMFS, Civ No. 01-765 slip op. at 51-62, August 31, 2003), that Biological Opinion and associated regulations were subsequently found unlawful and vacated by the Court. However, in a subsequent October 6, 2003, opinion, the Court ordered that the existing regulations stay in place until April 1, 2004, during which time NMFS needs to prepare a new BO and issue revised regulations.

which targets swordfish, has been the major source of sea turtle take, and regulations have focused on limiting or eliminating this fishery. In response to subsequent litigation, new regulations (along with an FMP amendment) are proposed for implementation by April 1, 2004 (see footnote). This new regime will substitute effort limitation, gear modifications (use of circle hooks and different bait), and sea turtle conservation measures for the area closures and shallow-set prohibitions currently in place for pelagic longline fisheries west of 150º W longitude (69 FR 4098, January 28, 2004). The new HMS FMP developed by the Council makes West Coast pelagic longline vessels subject to the sea turtle take reduction measures currently applicable to the Hawaii-based fishery, but does not prohibit shallow-set longlining east of 150º W longitude. However, NMFS disapproved this aspect of the FMP, based on a BO for West Coast HMS FMP fisheries (NMFS 2004a), so shallow-set swordfish targeting is prohibited east of 150º W longitude. (Under the HMS FMP, pelagic longlining is prohibited altogether in the West Coast EEZ.) West Coast pelagic longline fisheries also will be subject to the management regime currently in place west of 150º W longitude until the HMS FMP can be amended to make it consistent with ESA requirements in the aforementioned HMS FMP BO (NMFS 2004a).

Population viability is another issue related to cumulative impacts. As population declines, productivity may be reduced due to density dependent effects, including skewed sex ratios. There are also genetic risks; with a smaller gene pool a population may be less able to evolutionarily adapt to changing environmental conditions. Below a certain point—the minimum viable population—a small population may enter an “extinction spiral” from which recovery is not possible even if mortality is reduced (NMFS 2000).

6.5.3 Cumulative Impacts–Marine Mammals

Some of the same external factors affecting sea turtles are also relevant to marine mammals. The Western Pacific pelagic fisheries FMP FEIS (URS Corporation 2001) identifies fisheries incidental take, environmental fluctuations, ship traffic and anthropogenic noise, and marine debris as external factors cumulatively affecting marine mammals. According to available data (Table 6-1) it appears that California sea lions and Stellar sea lions are most likely to interact with groundfish gear. California sea lions are not listed under the ESA or listed as strategic under the MMPA. Total human-caused mortality is below the Potential Biological Removals threshold (see Section 5.2.2.1 in Appendix A). The eastern Stellar sea lion stock, which occurs in West Coast waters, is listed as threatened under the ESA, depleted under the MMPA, and is classified as a strategic stock. However, total take-related mortality to this stock is below the Potential Biological Removal threshold (see Section 5.2.2.6 in Appendix A). The Oregon/California drift gillnet BO (NMFS 2000) notes that this stock has been in decline. Although the causes are unknown, the BO suggests decreased prey availability due to fisheries and environmental factors may play large role. Fisheries interactions also may be a factor. The BO provides annual mortality estimates for the following fisheries: SE Alaska salmon drift gillnet, Alaska salmon troll, British Columbia aquaculture predator control program, Northern Washington tribal setnet fishery, West Coast Pacific whiting trawl fishery, and the Oregon/California drift gillnet fishery, which is the subject of the BO. This gives an indication of the range of other fisheries, in addition to West Coast groundfish fisheries, that may be cumulatively affecting Stellar sea lions.

6.5.4 Cumulative Impacts–Seabirds

As noted in the description of direct and indirect impacts, fishery-related seabirds mortality is most commonly due to birds striking baited hooks as they are being deployed from longline vessels. The birds become snagged or ingest the hook, are dragged underwater, and drown. Both the Western Pacific pelagic fisheries FMP FEIS (URS Corporation 2001) and the West Coast HMS FMP FEIS (PFMC 2003d) identify three albatross species with interactions in the pelagic longline fisheries: the black-footed albatross (*Phoebastria nigripes*), the most common albatross in West Coast waters; the Laysan albatross (*P. immutabilis*), more common in the Central and Western Pacific; and the short-tailed albatross (*P. albatrus*) which is listed as endangered. The short-tailed albatross is of particular concern because they are severely depleted, with a population estimated at about 1,700 individuals and only two known breeding colonies on small islands off of Japan. These three albatross species have also been observed around West Coast groundfish vessels (Table 6-2). Albatrosses are wide-ranging in the Pacific, and the Western Pacific pelagic fisheries FMP FEIS (URS Corporation 2001) describes a range of foreign high seas longline fisheries that may contribute substantially to mortality of these species. In addition, the FWS has issued BOs addressing incidental take in both the Hawaii-based pelagic longline fishery (FWS 2000), and Alaska demersal longline fisheries and trawl fisheries (USFWS 2003). Section 5.3 in Appendix A describes many other seabird species occurring off the West Coast; five of those species are listed under the ESA (see Appendix A, Table 5.5). Many of these species may minimally or modestly interact with West Coast groundfish fisheries or other fisheries but are subject to other factors affecting them cumulatively. The Western Pacific pelagic fisheries FMP FEIS (URS Corporation 2001) identified fluctuations in the oceanic environment, extermination, loss of nesting habitat, marine debris and waste disposal, and air strikes as factors in addition to fisheries take affecting seabirds. Fluctuations in the oceanic environment, such as the PDO and El Niño (discussed in Chapter 3), affect many marine species, including West Coast groundfish. This FEIS describes past military development on Midway atoll in the Northwest Hawaiian Islands as basis for the extermination of seabird species nesting there. This kind of development also may result in the loss of nesting habitat. Short-tailed albatross nesting habitat, which is confined to two small Japanese islands, is threatened by natural events such as volcanic eruptions and mud slides. The marbled murrelet, listed as threatened, ranges from southern Alaska to Northern California and nests in old growth coniferous forest. Further loss of this habitat could affect the species' reproductive success. This species forages in coastal waters. Salmon gillnet fisheries interact with this species (NMFS 2000). The effects of groundfish fisheries on the marbled murrelet are unknown.

6.5.5 Potential Unintended Consequences

Because of their very nature, describing unintended consequences is speculative. However, this discussion provides the public with another perspective on cumulative interactions of the proposed action and other actions and events. Protected species interactions could increase if stock rebuilding measures change the distribution and intensity of fishing effort. Recovery of overfished stocks could result in an overall increase in fishing effort leading to more interactions. Changes in the distribution of fishing effort stemming from management measures needed to rebuild stocks could increase or decrease interactions with different protected species. Changes in the configuration of the RCA, for example, could concentrate fishing effort in nearshore or offshore areas, increasing the likelihood of interactions with protected species occurring in those zones. Effort could shift among fishery sectors as a consequence of allocation decisions made on the basis of differential bycatch rates among sectors. (In other words, the Council could preferentially allocate fishing opportunity to sectors with lower bycatch rates of overfished species.) Given that different gear types interact with various protected species in different ways, this could change the interaction rate for a given protected species. For example, if more fishing effort were to shift into fixed gear fisheries this could increase interactions with seabirds while a reduction in trawl fishing effort could decrease interactions with some marine mammal species.

6.6 Summary of Impacts

The impacts of the alternatives on protected species are evaluated in the same way as impacts on habitat and ecosystem. Because there are limited data describing interactions between the Pacific Coast groundfish fisheries and protected species, the intensity, duration, and distribution of fishing effort is used as a basis for predicting impacts on protected species. Therefore, for the purpose of this analysis, fishing effort is used as a proxy to evaluate the potential for interactions between the Pacific Coast groundfish fisheries and protected species. As more information about the spatial and temporal overlap of groundfish fisheries and protected species populations along the Pacific Coast is gathered, a more comprehensive understanding of protected species/fishery interactions is possible and additional management measures may be taken to mitigate the effects of Pacific Coast groundfish fisheries if necessary.

6.6.1 No Action Alternative

Under the No Action Alternative, harvest levels for 2005 - 2006 represent the mid-range of harvest levels proposed for 2005 - 2006. Using harvest levels as an estimate of fishing effort, the intensity and duration of fishing activities would represent the mid-range of fishing effort proposed for 2005 - 2006. The greater the intensity and duration of fishing activities during 2005 - 2006, the greater the likelihood of interactions between groundfish fisheries and protected species. The No Action Alternative also represents the mid-range of management measures proposed for 2005 - 2006. Gear specific rockfish conservation areas (RCAs), areas closed to fishing for groundfish, would be in place under the No Action Alternative. In areas and during seasons with RCAs, the potential for interactions between groundfish fisheries and protected species would be minimized. Under the No Action Alternative, differential trawl trip limits encourage a shift in trawling to areas seaward of the RCA. This effort shift should benefit protected species found in nearshore areas while increasing the likelihood of interactions between groundfish fisheries and protected species that occur in offshore areas. Under the No Action Alternative, fishing effort by the fixed gear and recreational fleets should be comparable to levels predicted under the Action Alternatives 2 and 3. The incidental take of salmon species in the Pacific whiting fishery is already regulated under a Biological Opinion; therefore, any increase in incidental salmon take would be dealt with through that process. There is no evidence that Pacific Coast groundfish fisheries interact with sea turtles. Additionally, there is no expectation that take limits established in other relevant BOs, or PBR thresholds under the MMPA would be exceeded as a result of the No Action Alternative.

6.6.2 The Action Alternatives

When evaluating the impacts of the Action Alternatives on protected species, Action Alternative 1 represents the most conservative combination of harvest levels and management measures for 2005 - 2006, followed by Action Alternative 2, and then Action Alternative 3.

The Action Alternative 1 constrains fishing effort and the distribution of fishing effort more than any other alternative. Fishing effort would be minimized to reduce the harvest of canary rockfish, an overfished species. RCAs would be most expansive under this alternative, which may encourage a shift in fishing effort to areas shoreward and seaward of the RCA. It is unknown whether large RCAs would decrease potential interactions between groundfish fisheries and protected species or simply increase interactions outside the boundaries of the RCAs. One substantial change from the No Action Alternative would be the trawl fleet’s use of selective flatfish gear in the area between the U.S./border with Canada and $40^0$10' N. latitude and shoreward of 100 fm. It is unknown how this gear will affect the bycatch of marine mammals or seabirds, but the 100% observer coverage on these vessels should help generate information on the interactions between the trawl fishery and protected species.

Because the harvest levels and management measures under Action Alternative 2 represent the mid-range of those proposed for 2005 - 2006, the potential interactions between groundfish fisheries and protected species under the Action Alternative 2 should be similar to those under the No Action Alternative. Under Action Alternative 2, the trawl fleet fishing in the area between the U.S./border with Canada and $40^0$10' N. latitude and shoreward of 100 fm would be required to use selective flatfish gear. It is unknown how this gear will affect the bycatch of marine mammals or seabirds, but with only 10% observer coverage less information about the interactions between the trawl fishery and protected species will be generated than under Action Alternative 1.

Harvest levels proposed for 2005 - 2006 are the highest under Action Alternative 3; similarly, management measures are generally less restrictive than under all other alternatives. Therefore, interactions between groundfish fisheries and protected species have the potential to be highest under this alternative. Much like Action Alternative 2, the use of selective flatfish gear will be required for those vessels trawling in the area between the U.S./border with Canada and 40^{0}10' N. latitude and shoreward of 100 fm and approximately 10% of vessel with observer coverage. In general, RCAs are less extensive under this alternative than under all other alternatives.

Based on data collected by the West Coast Observer Program, significant differences in the impacts on protected species between Action Alternatives proposed for 2005 - 2006 are not predicted. There is little information on interactions between recreational groundfish vessels and protected species; however, significant differences between recreational alternatives are not predicted. Under any of the Action Alternatives, there is no expectation that take limits established in relevant BOs, or PBR thresholds under the MMPA would be exceeded as a consequence of the proposed action.

TABLE 6-1. Interactions between marine mammals and the Pacific Coast groundfish fisheries documented by West Coast Groundfish Observers between September 2001 and October 2002.[a/]

Species	Gear Type	Type of Interaction
California Sea Lion (*Zalophus californianus*)	Trawl	7 Individuals Taken
Unidentified Pinniped	Longline	1 Individual Taken
Unidentified Sea Lion	Trawl	1 Individual Taken
Steller sea Lion *(Eumetopias jubatus*)	Trawl	2 Individuals Taken
California Sea Lion (*Zalophus californianus*)	Both Trawl and Longline	Feeding on Discard
Steller sea Lion *(Eumetopias jubatus*)	Both Trawl and Longline	Feeding on Discard
Pacific white-sided Dolphin (*Lagenorhynchus obliquidens*)	Trawl	Feeding on Discard

a/ Between September 2001 and October 2002, approximately 10% of the coastwide limited entry trawl landed weight and 30% of the limited entry fixed gear landed weight was observed.

TABLE 6-2. Interactions between seabirds and the Pacific Coast groundfish fisheries documented by West Coast Groundfish Observers between September 2001 and October 2002.[a/]

Species	Gear Type	Type of Interaction
Unidentified Gull (*Larus species)*	Trawl	1 Individual Taken
Unidentified Seabird	Trawl	4 Individuals Taken
Short-tailed Albatross (*Phoebastria albatrus*)	Longline and Trawl	Feeding on Discard
California Brown Pelican (*Pelecanus occidentalis californicus*)	Rod and Reel	Feeding on Discard
Marbled Murrelet (*Brachyramphus marmoratus*)	Trawl	Landed on Deck
Black-footed Albatross (*Phoebastria nigripes*)	Trawl, Longline, and Pot	Feeding on Discard
Leach's storm-petrel *(Oceanodroma leucorhoa*)	Trawl	Landed on Deck
Cassin's auklet *(Ptychoramphus aleuticus)*	Trawl	Landed on Deck
Pigeon guillemots *(Cepphus columba*)	Pot	Feeding on Discard
Laysan albatross *(Phoebastria immutabilis)*	Pot	Feeding on Discard
Unidentified Cormorant (*Phalacrocorax species)*	Rod and Reel	Feeding on Discard
Unidentified Storm Petrel (*Oceanodroma species*)	Longline	Landed on Deck
Unidentified Shearwater (*Puffinus species*)	Pot	Feeding on Deck

7.0 THE PUBLIC SECTOR AND FISHERIES MANAGEMENT REGIME

The public sector includes those entities directly affected by changes to the current management regime, but does not include participants in the fishery or the fishing communities of the West Coast (see Chapter 8 for a description of the socioeconomic environment). Therefore, the public sector, as defined in this EIS, represents the policy, science, and management entities that comprise the current management regime. The management regime is an important issue because it generates direct and indirect impacts. The regime is also itself affected by changes in law and policy, which can cumulatively affect the environment. This section discusses stock assessments, catch accounting, observer programs and research fisheries, all crucial components in the process of determining sustainable fishery yields; uncertainty, which underlies the range of alternatives evaluated in this EIS; and enforcement, which affects the efficacy of prescribed management measures. For additional information on the management cycle and legal authorities and jurisdictions, which also directly affect the management regime, see Appendix A, Chapter 1.

Uncertainty in fishery management and constraining OYs combine to create a potentially intensive inseason management burden on the management regime. As discussed in this chapter, ongoing research, existing observer programs, innovative area management concepts, and revised fishery sampling programs could provide a wealth of new information during the 2005-2006 management cycle. Entities and documents including the Pacific Coast groundfish FMP, the Council and its Ad Hoc Groundfish Information Policy Committee, and NEPA all provide rules and guidance on inseason use of new information.

7.1 Affected Environment

7.1.1 Management Data Systems

7.1.1.1 Catch Monitoring and Accounting

Various state/federal catch monitoring systems are used in West Coast groundfish management. These are coordinated through the Pacific States Marine Fisheries Commission (PSMFC). PacFIN (Pacific Fisheries Information Network) is the commercial catch monitoring database and RecFIN (Recreational Fishery Information Network) is the database for recreational fishery catch monitoring. There are two components to total catch, (1) catch landed in port, and (2) catch discarded at sea. Discards occur for regulatory reasons (i.e., catch in excess of trip and/or landing limits) and market reasons (i.e., catch of unmarketable species or size). A description of the relevant data systems used to monitor total catch and discards in commercial, recreational, and research fisheries follows.

Monitoring Commercial Landings

Sorting requirements are now in place for all overfished rockfish species. This requires accounting for the weight of landed overfished rockfish when catches are hailed at sea or landed. Limited entry groundfish trawl fishermen are also required to maintain logbooks that record the start location, time, and duration of trawl tows, as well as the total catch by species market category (i.e., those species and complexes with sorting requirements). Landings are recorded on state fish receiving tickets. Fishtickets are designed by the individual states, but there is an effort to coordinate record-keeping requirements with state and federal managers. Poundage by sorted species category, area of catch, vessel identification number, and other data elements are required on fishtickets. Landings are also sampled in port by state personnel to collect species composition data, otoliths for ageing, lengths, and other biological data. Sample rates vary between fishery and state, but there is an effort to sample about 20% of the landed catch. A suspension of at-sea sorting requirements and full retention of catch is allowed in the whiting fishery (by FMP Amendment 10 and an annual Exempted Fishing Permit [EFP] in the Shoreside Whiting sector). The at-sea whiting fishery has 100% on-board observer coverage, while the shoreside whiting sector brings 100% of their catch to port for sampling. Landings, logbook data, and state port sampling data are reported inseason to the PacFIN database managed by the PSMFC (www.psmfc.org/pacfin/index.html). The GMT and PSMFC manage the QSM dataset reported in PacFIN. All landings of groundfish stocks of concern (overfished stocks and stocks below B_{MSY}) and target stocks and stock complexes in West Coast fisheries are tracked in QSM reports of landed catch. The GMT recommends prescribed landing limits and other inseason management measures to the Council to attain, but not exceed, total catch OYs of QSM species. Stock and complex landing limits are modified inseason to control total fishing-related mortality; QSM reports and landed catch forecasts are used to control the landed catch component.

Monitoring Recreational Catch

Recreational catch is monitored by the states as it is landed in port. These data are compiled by the PSMFC in the RecFIN database. The types of data compiled in RecFIN include sampled biological data, estimates of landed catch plus discards, and economic data. These data are readily available to managers, assessment scientists, and the general public in prepared reports that can be accessed on the Internet at (http://www.psmfc.org/recfin/index.html).

The MRFSS is an integral part of the RecFIN program. Traditionally, there are two primary components of the survey; field intercept surveys (administered under supervision of PSMFC) and a random phone survey of coastal populations (administered by a third party contracted by NMFS). The field intercept surveys were used to estimate catch, and the phone survey was used to estimate effort. The results of these two efforts are combined in the RecFIN data system maintained by PSMFC, and estimates of total effort and fishing mortality are produced along with other data potentially useful for management and stock assessments. However, MRFSS was not designed to estimate catch and effort at the level of precision needed for management or assessment; it was designed to provide a broad picture look of national fisheries. Comparison with independent and more precise estimation procedures has shown wide variance in catch estimates. Inseason management of recreational fisheries using MRFSS has been compromised by huge inseason variance of catch estimates. In recent years, efforts have been made to improve MRFSS. For instance, in 2001 PSMFC, with support from NMFS, began a new survey to estimate party/charter boat (CPFV) fishing effort in California. This survey differed from the traditional MRFSS telephone survey of anglers to determine CPFV trips by two-month period. The survey sampled 10% of the active CPFV fleet each week to determine the number of trips taken and the anglers carried on each trip. This 10% sample is then expanded to make estimates of total angler trips for Southern California and Northern California. However, the requisite precision for managing for the low OYs of overfished species like canary rockfish and bocaccio was still lacking.

Washington and Oregon have used the MRFSS system as a supplement to their port sampling programs from which most of their recreational catch estimates are derived. California has had a greater dependence on MRFSS to estimate their recreational catch. One outcome of this dependence are highly uncertain catch estimates of California recreational catch. This has likely compromised efforts to control total mortality of recreational groundfish species in California such as bocaccio and canary rockfish. Another outcome is an observed lack of credibility in the MRFSS program on the West Coast, policy representatives from the West Coast recommended the development of a new program. In response, staff from CDFG and the PSMFC designed a new program for sampling California's recreational fisheries, incorporating both the comprehensive coverage of the MRFSS program and the high quality sampling (for the private vessel mode) of the Ocean Salmon Project. This new program, the California Recreational Fisheries Survey (CRFS), specifically includes the following:

- Integration of California's current marine recreational sampling programs into one program;
- Reporting of catch and effort at a finer geographical resolution;
- Estimation of private/rental (PR) vessel effort using an on-site approach;
- Estimation of beach/bank and private access angler effort using an angler license database with the frame built from one out of every 20 licenses;
- Continuation of the Commercial Passenger Fishing Vessel (CPFV) phone survey with effort;
- Augmentation of CPFV phone surveys with effort data collected directly from the landings and CPFV logbooks;
- Increased creel sampling for PR and CPFV vessels;
- Estimation of effort and catch on man-made structures using instantaneous angler counts, roving effort (pressure) surveys, and creel surveys;
- Reporting of effort and catch estimates for all modes at monthly intervals; and
- Sufficient sampling of PRs to meet ocean salmon management data requirements, including the collection of coded wire tags.

The primary goal of the program will be to produce in a timely manner marine recreational, fishery-based data needed to sustainably manage California's marine recreational fishery resources. The changes proposed in this plan should increase the timeliness and accuracy of recreational fisheries data so that they can be more effectively used for in-season monitoring, estimating take for species of concern, developing harvest guidelines, producing stock assessments, and providing other information critical to management decisions. The initial focus of the program will be to produce timely catch estimates with reasonable confidence limits for those groundfish stocks declared overfished by National Marine Fisheries Service and for those stocks with a directed harvest. The PSMFC and CDFG will fully implement the CRFS plan beginning in January 2004.

Management Response to Catch Monitoring

Management measures are normally imposed, adjusted, or removed at the beginning of the biennial fishing period, but may, if the Council determines it necessary, be imposed, adjusted, or removed at any time during the period. As described in Section 6.2 of the groundfish FMP, four different categories of management actions are authorized ranging from automatic actions initiated by NMFS to full rulemaking actions requiring a minimum of two Council meetings. Inseason adjustments typically fall under the category of notice actions that are routine (as defined by the FMP) in nature and usually require one Council meeting and one *Federal Register* notice.

California

The State has three possible courses of regulatory action for recreational fisheries when a harvest limit is reached.

1. Closure of recreational fisheries for any federal groundfish, greenlings (of the genus *Hexagrammos*), California sheephead, and ocean whitefish when a federal annual harvest limit for lingcod, rockfish,

cabezon, or a subgroup of rockfish, and/or California scorpionfish has been exceeded or is projected to be exceeded (Section 27.82 of Title 14, California Code of Regulations)

The CFGC has given CDFG the authority to close the following recreational fisheries when an annual harvest limit [optimum yield (OY) or harvest guideline] established in regulation by the NOAA Fisheries (National Marine Fisheries Service) for lingcod, rockfish, cabezon, or a subgroup of rockfish, and/or California scorpionfish has been exceeded or is projected to be exceeded: lingcod, rockfish, a subgroup of rockfish, California scorpionfish, cabezon, greenlings (of the genus *Hexagrammos*), California sheephead, ocean whitefish, and any federal groundfish.

The closure can encompass all state waters or specific areas, and the closure can be for all or part of the calendar year. The CDFG must provide the public with a notice of the closure (via press release) at least 10 days before the closure is to take effect.

2. Closure recreational fisheries for California sheephead, cabezon or greenlings (of the genus *Hexagrammos*) when a state-established total allowable catch (TAC) or allocation is reached or is projected to be reached (Section 52.10 of Title 14, California Code of Regulations)

   Statewide TACs are established in regulation for California sheephead, cabezon or greenlings (of the genus Hexagrammos). The regulation sets allocations for recreational and commercial fisheries. CFGC has given the CDFG the authority to close the recreational and commercial fisheries for these species when an allocation or TAC is reached or is projected to be reached prior to the end of the calendar year. For the closure of a recreational fishery, CDFG is required to provide the public with at least 10 days notice (via press release) prior to the closure.

3. Emergency action by CFGC (Section 240 of the Fish and Game Code).

   The California State Legislature has authorized CFGC to adopt or repeal regulations on an emergency basis provided that the action is necessary for (1) the immediate conservation, preservation, or protection of birds, mammals, reptiles, or fish, including, but not limited to, any nests or eggs thereof, or (2) the immediate preservation of the public peace, health and safety, or general welfare. CFGC may adopt emergency regulations for recreational fisheries and for those commercial fisheries that the Legislature has given CFGC the authority to regulate.

   The law requires that CFGC hold at least one hearing before taking emergency action, and the action is subject to the review of the Office of Administrative Law (OAL). Once CFGC takes action and submits the rulemaking file to OAL, OAL has 10 days to review the file and approve or disapprove the regulation. If OAL approves the regulation, then it is file with the Secretary of State and is in effect for 120 days (unless the regulation specifies a shorter time period).

   Emergency regulation lapses by operation of law unless CFGC files a completed rulemaking for a permanent regulation with OAL or OAL approves a re-adoption of the emergency regulation. The rulemaking for the permanent regulation must follow the normal rulemaking provisions of the Administrative Procedures Act. This includes a 45-day public notice.

Washington

The Washington State Legislature has granted the Washington Fish and Wildlife Commission (WFWC) the authority to adopt emergency regulations under the Revised Code of Washington (RCW) 77.04.090. The Fish and Wildlife Commission has delegated the authority to adopt emergency regulations to the Director of Washington Department of Fish and Wildlife. Emergency regulations may be considered for various reasons, including the achievement of quotas, optimum yields, harvest limits or harvest guidelines, and to conform with federal regulations. The parameters for approving emergency regulations are not specified in the authority language. Emergency regulations can be adopted, filed, and in effect within 24 hours of being drafted.

Once adopted, emergency regulations are in effect for 120 days. During this time, if the regulation needs to remain in place for a longer duration, then WDFW can consider adopting a permanent rule. Depending on the nature of the rule, it may have to go through the WFWC approval process. Once the permanent rule process has been initiated, a second emergency regulation can be filed to extend the time period. For example, an emergency regulation filed on March 1 that must remain in effect for the calendar year would expire on June 28. Provided that a permanent rule process has been initiated, a subsequent emergency regulation can be filed on June 29 that would remain in effect through October 26, in order to accommodate the time needed for the permanent rule process to be finalized.

Washington Administrative Code (WAC) 220-28-010 strengthens the ability to enforce emergency regulations, by stating, “It shall be unlawful to take, fish for or possess food fish or shellfish taken contrary to the provisions of any special season or emergency closed period prescribed in this chapter.” A note at the end of the rule language also clarifies, “The department of fish and wildlife frequently adopts emergency rules of limited duration that relate to seasons, closures, gear, and other special matters concerning the industry....”

Once filed, copies of the emergency regulation are faxed to all WDFW regional offices and enforcement staff. The Department also uses its Outreach and Education program to inform the public of emergency regulations. Typically, a Fishing Rule Change notice is distributed to local media and the Department’s sportfishing hotlines are updated within 24 hours of the rule adoption.

Oregon

The Oregon Fish and Wildlife Commission (OFWC) has similar authority to impose emergency regulations as those in Washington. The sampling program in place by ODFW, like WDFW, is able to track recreational fishery catch and effort closely and Oregon has the state regulatory processes and authority to close fisheries quickly in response to catch monitoring results.

7.1.1.2 Observer Programs

West Coast Groundfish Observer Program

Limiting discards (defined as bycatch in the MSA) to the extent practicable is an MSA mandate. Effective bycatch accounting and control mechanisms are also critical for staying within target total catch OYs. The first element in limiting bycatch is accurately measuring bycatch rates by time, area, depth, gear type, and fishing strategy. The West Coast Groundfish Observer Program (WCGOP) includes the Observer Team and collaborators from the PSMFC (Pacific States Marine Fisheries Commission) that direct the program, train new observers, and manage and analyze the bycatch data. On May 24, 2001, NOAA Fisheries (NMFS) established the WCGOP to implement the Pacific Coast Groundfish Fishery Management Plan (50 CFR Part 660). This regulation requires all vessels that participate in the groundfish fishery to carry an observer when notified to do so by NMFS or its designated agent. These observers monitor and record catch data, including species composition of retained and discarded catch. Observers also collect critical biological data such as fish length, sex, and weight. The program currently deploys observers coast wide on the permitted trawl and fixed-gear groundfish fleet, as well as on some vessels that are part of the open-access groundfish fleet. Observers improve our understanding of fishing activities and help provide accurate accounts of total catch, bycatch, and discard associated with different fisheries and fish stocks.

The WCGOP is designed to provide estimates of fleet-wide discards in commercial fisheries; fishtickets are the mandated landings accounting mechanism. Logbook data needs to be available to fully utilize observer data because observers initially record hail weights and logbook data for retained catch, and these values need to be adjusted by fishticket information to achieve total catch estimates. One difficulty is the need for a statistically significant number of observations of discard across all strata to determine representative bycatch rates for these strata. Implementation of depth-based management further exacerbated the data-sparseness of observations, since areas where many observations occurred in the first year of the Observer Program are now closed to fishing.

NMFS first implemented the West Coast Groundfish Fishery Observer Program in August 2001 to make direct observations of commercial groundfish discards. Observer coverage initially extended to about 10% of the West Coast limited entry fleet effort, but increased to about 20% by the summer of 2002 (Elizabeth Clarke, NMFS NWFSC, pers. comm.). Given the skewed distribution of bycatch in West Coast groundfish fisheries, many observations in each sampling strata (i.e. target effort by gear type by area) are needed to estimate representative bycatch rates of overfished groundfish species. The seasonality of bycatch is an important management consideration. Target opportunities for healthy flatfish and DTS species vary seasonally and geographically. It is reasonable to expect bycatch rates of overfished groundfish species to vary in accordance with the concurrence of target species and overfished species. In November 2001, the Council adopted the trawl bycatch model to use for bycatch accounting and control starting in 2002. In 2002, the bycatch rates used in the trawl bycatch model were restratified by depth (using tow start locations in 1999 trawl logbooks) in anticipation of the new depth-based management regime. Depth-based bycatch rates from the trawl bycatch model are applied to landed weight of the target species in the target fisheries to estimate seasonal bycatch of the overfished groundfish species subject to rebuilding plans evaluated in this EIS.

The Council decided in April 2003 to modify the trawl bycatch model by using bycatch rates derived from direct observations of trawl efforts in the WCGOP for 2003 inseason management decision-making. These data were filtered using starting and ending tow locations to emulate, to the extent possible, observations from areas that are outside currently closed trawl Rockfish Conservation Areas (RCAs). The data limitations required aggregation of observations to strata north and south of Cape Mendocino and deeper and shallower than the trawl RCA. Therefore, the seasonal and target strategy strata are collapsed in the trawl bycatch model, and only the trawl fishery is modeled for bycatch accountability.

In September, 2003, the trawl bycatch model was expanded to include observed discard rates for target species to complement the bycatch rates for overfished species already in the model. This new model configuration was used to evaluate the limited entry trawl management measure alternatives for 2004.

The second year of the WCGOP began in September 2002 and ended in August, 2004. The program continued to sample the trawl fleet at a rate of approximately 20% and continued to expand coverage of the limited entry fixed-gear and open access sectors. Scientist at the NOAA Northwest Fisheries Science Center
worked over the winter to analyze the second year of data and to update the trawl bycatch model. Perhaps the most significant result of incorporating the new data into the trawl model will be the development of seasonal bycatch rates. In modeling 2003 fisheries, the combination of limited observer data from the first year of the program and the need to evaluate bycatch on a depth-specific basis resulted in discontinued use of seasonal bycatch rates. Additionally, a new bycatch model for the fixed-gear fishery has been developed using data collected in the first two years of the WCGOP. Both trawl and the fixed-gear bycatch models were presented to the SSC at the Council meeting in March 2004. These

models were approved for use during the April Council meeting for inseason modeling of 2004 fisheries as well as developing management measures for fisheries in 2005 and 2006.

The first report on the WCGOP was released in January 2003, entitled “Northwest Fisheries Science Center West Coast Groundfish Observer Program Initial Data Report and Summary Analyses”. That report described the analysis of observer data for various species collected during the first year of the program. Preliminary reports and summary analyses of the second year of data were released in early 2004 and include results from both the limited entry trawl fishery as well as for sablefish-endorsed fixed gear permits. These reports and background materials on the WCGOP are available on the Northwest Fisheries Science Center website at:
http://www.nwfsc.noaa.gov/research/divisions/fram/observer/index.cfm.

At-Sea Pacific Whiting Observer Program

To increase the utilization of bycatch that is otherwise discarded as a result of trip limits, Amendment 13 to the groundfish FMP implements an increased utilization program on June 1, 2001, which allows catcher/processors and motherships in the whiting fishery to exceeded groundfish trip limits without penalty, providing specific conditions are met. These conditions include provisions for 100% observer coverage, non-retention of prohibited species, and donation of retained catch in excess of cumulative trip limits a bona fide hunger relief agency.

These provisions have not only given fishery managers the tools necessary to allow the At-Sea Pacific Whiting program to operate efficiently while meeting management goals, but have also provided scientists, through the observer coverage, extensive amount of information on bycatch species. This dataset has not only provided valuable information in the management of Pacific whiting, but has also been used as a data source for the assessment of widow rockfish. Widow rockfish and Pacific whiting are co-occurring species which can result in significant bycatch of widow rockfish in the midwater trawl nets used for Pacific whiting. However, like other fishery-dependent datasets, it is believed that changes to the management measures since 1999 have a greater influence than widow rockfish abundance on the widow rockfish CPUE in the at-sea Pacific whiting fishery (He *et al.* 2003b).

Shore-based Pacific Whiting Observer Program

The Shoreside Whiting Observation Program (SWOP) was established in 1992 to provide information for evaluating bycatch in the directed Pacific whiting fishery and for evaluating conservation measures adopted to limit the catch of salmon, other groundfish and prohibited species. Though instituted as an experimental monitoring program, it has been continued annually to account for all catch in targeted whiting trip landings, enumerate potential discards, and accommodate the landing and disposal of non-sorted catch from these trips. In 1995, the SWOP’s emphasis changed from a high observation rate (50% of landings), to a lower rate (10% of landings) and increased collection of biological information (e.g., otoliths, length, weight, sex, and maturity) from Pacific whiting and selected bycatch species (yellowtail rockfish, widow rockfish, sablefish, chub (Pacific) mackerel (*Scomber japonicus*), and jack mackerel (*Trachurus symmetricus*)). The required observation rate was decreased as studies indicated that fish tickets were a good representation of what was actually landed. Focus shifted again due to 1997 changes in the allocation of yellowtail rockfish and increases in yellowtail bycatch rates. Since then, yellowtail and widow bycatch in the shoreside whiting fishery has been dramatically reduced because of increased awareness by fishermen of the bycatch and allocation issues involved in the SWOP program.

The SWOP is a cooperative effort between the fishing industry and state and federal management agencies to observe and collect information on directed Pacific whiting landings at shoreside processing plants. Participating vessels apply for and carry two EFPs issued by NMFS. Permit terms require vessels to land unsorted catch at designated shoreside processing plants. Permitted vessels are not penalized for landing prohibited species (e.g., Pacific salmon, Pacific halibut, Dungeness crab), nor are they held liable for overages of groundfish trip limits. Participants in the SWOP are mid-water trawlers carrying EFPs, designated shoreside processing plants in California, Oregon, and Washington, the Council, the NMFS, PSMFC, ODFW), CDFG, and WDFW. (Excerpt from latest ODFW on the shore-based Pacific Whiting program review (Wiedoff and Parker 2002), for the complete report go to: http://hmsc.oregonstate.edu/odfw/reports/hake.html).

Since 1997, an EFP has been adopted annually that allow suspension of at-sea sorting requirements in the shore-based whiting fishery enabling full retention and subsequent port sampling of the entire catch. However, EFPs are intended to provide for limited testing of a fishing strategy, gear type, or monitoring program that may eventually be implemented on a larger fleet-wide scale and are not a permanent solution to the monitoring needs of the shore-based Pacific whiting fishery. Results of the shore-based Pacific whiting EFPs indicate that it is feasible to retain and appropriately monitor the incidental take of salmon and groundfish other than Pacific whiting in the shore-based Pacific whiting fishery. A permanent monitoring program for the shore-based Pacific whiting fleet is being developed because of the specification in the Pacific Coast salmon and groundfish fishery FMPs and the 1992 Biological Opinion analyzing the effects of the groundfish fishery on salmon stocks listed under the Endangered Species Act (ESA). The issue of salmon retention in the groundfish trawl fisheries was brought before the Council in 1996 in the form of Amendment 10 to the Pacific Coast Groundfish FMP and Amendment 12 to the Pacific Coast Salmon FMP. Based on an Environmental Assessment drafted to analyze these amendments, the Council recommended the exempted fishery permit (EFP) process be used temporarily until a permanent monitoring program could be developed and implemented in the shore-based Pacific whiting fishery.

The National Marine Fisheries Service (NMFS) is developing a preliminary draft Environmental Assessment which includes a range of alternative monitoring systems for the shore-based Pacific whiting fishery. The alternatives currently focus on three major issues: 1) staffing the monitoring program (i.e., federal observers, state monitors, video cameras, or a combination thereof); 2) tracking and disposition prohibited species and groundfish overages; and 3) funding of the monitoring program. It is anticipated that the permanent monitoring program will be implemented in 2005. NMFS and the GMT have expressed concerns about the current EFP program and its adequacy of ensuring full retention and therefore total catch accounting. This is particularly and concern in regards to the rebuilding of widow rockfish. NMFS is currently exploring the testing of onboard video cameras in the summer of 2004 as a means of verifying total retention.

Central California Marine Sport Fish Project

The Central California Marine Sport Fish Project has been collecting angler catch data from the Commercial Passenger Fishing Vessel (CPFV) industry intermittently for several decades in order to assess the status of the nearshore California recreational fishery. The project has focused on rockfish and lingcod angling and has not sampled salmon trips. Reports and analyses from the project document trends by port area in species composition, angler effort, catch, and, for selected species, catch per unit effort (CPUE), mean length and length frequency. In addition, total catch and effort estimates are made based on adjustments of logbook data by sampling information.

Before 1987, catch information was primarily obtained on a general port basis from dockside sampling of CPFVs, also called party boats. This did not allow documentation of specific areas of importance to recreational anglers and was not sufficient to assess the status of rockfish populations at specific locations.

CPFV operators are required by law to record total catch and location for all fishing trips in logbooks provided by the California Department of Fish and Game (CDFG). However, the required information is too general for use in assessing the status of the multi-species rockfish complex on a reef-by-reef basis. Rockfish catch data are not reported by species and information on location is only requested by block number (a block is an area of 100 square miles). Many rockfishes tend to be residential, underscoring the need for site-specific data. Thus, there is a strong need to collect catch information on board CPFVs at sea. However, locations of specific fishing sites are not revealed since that information is confidential.

In May 1987 the Central California Marine Sport Fish Project began on-board sampling of the CPFV fleet. Data collection continued until June 1990, when state budgetary constraints temporarily precluded further sampling, resumed in August 1991, and continued through 1994. The program depends on the voluntary cooperation of CPFV owners and operators. Angler catches on board central and northern California CPFVs were sampled from fourteen ports, ranging from Crescent City in the north to Port San Luis (Avila Beach) in the south. For additional information on this program, see the PSMFC web site at: (www.psmfc.org/recfin/ccmsp.htm).

Oregon Marine Recreational Observers Program

In response to overfished species declarations and increasing concerns about fishery interactions with these species, ODFW started this program to improve understanding of recreational impacts. There were three objectives to this project; (1) document the magnitude of canary rockfish discard in the Oregon recreational fishery; (2) improve the biological database for several rockfish and groundfish species; and (3) gather reef location information for future habitat mapping. Discussion A seasonal observer was stationed in each of the ports of Garibaldi, Newport and Charleston to ride recreational groundfish charter vessels coastwide in Oregon from July through September, 2001. The Garibaldi observer covered boats out of Garibaldi, the Newport observer covered both Newport and Depoe Bay, and the Charleston observer covered Charleston, Bandon, and Brookings charter vessels. During a typical day the observer would ride a 5 to 8 hour recreational groundfish charter trip and spend the remainder of the day gathering biological and genetic data dockside from several rockfish and groundfish species for which little is known mostly due to their infrequency in the catch. When allowed by the captain, the observer also obtained GPS locations of fishing sites for future use by the Habitat Mapping Project of the Oregon Department of Fish and Wildlife (ODFW) Marine Resources Program. Results from this program have been incorporated into recreational fishery modeling by ODFW. For more information on this program as well as other fishery research and survey programs see the ODFW Marine Program web site at: http://hmsc.oregonstate.edu/odfw/reports/finfish.html.

WDFW Groundfish At-Sea Data Collection Program

The WDFW At-Sea Data Collection Program was initiated in 2001 to allow fishery participants access to healthier groundfish stocks while meeting the rebuilding targets of overfished stocks, and to collect bycatch data through an at-sea observer program. The data collected in these programs could assist with future fishery management by producing valuable and accurate data on the amount, location and species composition of the bycatch of rockfish associated with these fisheries, rather than using calculated bycatch assumptions. These data could also allow the Pacific Council to establish trip limits in the future that maximize fishing opportunities on healthy stocks while meeting conservation goals for depleted stocks.

Over the past four years, WDFW has implemented its At-Sea Data Collection Program through the use of federal EFPs. In 2001, 2002, 2003 and 2004, WDFW sponsored and administered a trawl EFP for arrowtooth flounder and petrale sole, and in 2002, WDFW also sponsored a midwater trawl EFP for yellowtail rockfish. The primary objective for these experimental fisheries was to measure bycatch rates for overfished rockfish species associated with these trawl fisheries. Fishery participants were provided access to healthier groundfish stocks and were constrained by individual vessel bycatch caps. Observers were used to collect data on the amount of rockfish bycatch caught on a per tow basis and to ensure that the vessel complied with the bycatch cap; therefore, vessels participating in the EFP were required to have 100% observer coverage.

The costs associated with these observer programs were covered with federal Disaster Relief funds. The majority of those funds have been spent; however, WDFW has continued its At-Sea Data Collection Program in 2003 and 2004 with having the fishery participants share the costs of the observer program. The average costs associated with providing observer coverage (including salaries, safety equipment, sampling supplies) is approximately $4,000-4,500 per month observed. However, there are additional costs incurred by WDFW in providing staff time to administer, monitor, and oversee the observer program, as well as analyze the data that are collected.

Monitors were hired as temporary employees of the Washington Department of Fish and Wildlife and were assigned to a duty station based on the vessel's home port. WDFW monitors completed a two-week training course, consistent with the National Marine Fisheries Service's Observer Training Manual. Training exercises include U.S. Coast Guard safety training–including survival suit immersion test and vessel safety, and WDFW training on fish identification, random sampling theory, data collection methods, current groundfish management issues, and additional safety measures.

WDFW fishery managers and biologists were involved in hiring and training the observers as well as administering and monitoring the program. WDFW scientific technicians sampled the catch dockside, collected biological data, and entered the data into an electronic database. Research scientists have analyzed the preliminary data from the 2001, 2002, and 2003 EFPs, and have finalized summary reports.

WDFW Ocean Sampling Program

In addition to the At-Sea Data Collection Program, WDFW collects at-sea data through the Ocean Sampling Program. The at-sea portion is not intended to be an observer program for the purposes of enumerating the bycatch alone but is coupled with shore-based sampling of anglers to calculate an estimated discard weight. At-sea observers record biological information from discarded species. Shore-based creel surveys of anglers provide the estimate of total number of discards. Combining these two data sources yields estimates of the weight of total fishery discard by species.

Tribal Observer Program

Tribal directed groundfish fisheries are subject to full rockfish retention. For some rockfish species where the tribes do not have formal allocations, trip limits proposed by the tribes are adopted by the Council to accommodate incidental catch in directed fisheries (i.e. Pacific halibut, sablefish, and yellowtail rockfish). These trip limits are intended to constrain direct catches while allowing for small incidental catches. Incidental catch and discard of overfished species is minimized through the use of full rockfish retention, shore based sampling, observer coverage, and shared information throughout the fleets regarding areas of know interactions with species of concern. Makah trawl vessels often participate in paired tows in close proximity where one vessel has observer coverage. If landings on the observed vessel indicate higher than anticipated catches of overfished species the vessels relocate and inform the rest of the fleet of the results (Steve Joner, Makah Fisheries Management, pers. comm., February, 2004). Fleet communication in order to avoid overfished species is practiced by all tribal fleets.

7.1.1.3 Research Fisheries

The reduction in directed fisheries and overall landings has resulted in less information available to fishery managers compromising efforts to assess stock abundance and recovery. There is an increasing reliance on fishery-independent sources of information such as research fisheries and surveys. This is particularly true for overfished species such as widow rockfish, cowcod, bocaccio, and canary rockfish as fisheries are designed to avoid areas inhabited by these species. There is a relatively sparse amount of data available for widow rockfish as directed fisheries have been essentially eliminated and the Pacific whiting sectors have modified their behavior to avoid encounters with widow rockfish. The latest widow assessment (He *et al.* 2003b), highlighted the need for long-term datasets for this species and questioned the reliance on bottom trawl logbook data that has diminished with decreased fishing opportunities since 1999 and an index of juvenile rockfish abundance that surveys a small proportion of widow rockfish range. Additionally, future widow rockfish assessments may look to expand use of existing fishery-dependent data such as the observer data in the Pacific whiting fisheries (see Section 7.1.3.2). Assessment scientists will continue to rely on research fisheries as landings, age composition, and logbook catch rate data from many fishery sources decreases. A summary of long-term research fisheries and resource surveys can be found in Appendix A, Section 1.1.1.3.

7.1.1.4 The Stock Assessment Process

The Council process for setting groundfish harvest levels and other specifications depends on periodic assessments of the status of groundfish stocks, rebuilding analyses of those stocks that are overfished and managed under rebuilding constraints, and a report from an established assessment review body or a Stock Assessment Review (STAR) Panel. As appropriate, the Scientific and Statistical Committee (SSC) recommends the best available science for groundfish management decision-making in the Council process. The SSC reviews new assessments, rebuilding analyses, and STAR Panel reports and recommends the data and analyses that should be used to set groundfish harvest levels and other specifications for the following biennial management period.

New stock assessments for cabezon and lingcod and a new lingcod rebuilding analysis were prepared in 2004 for the 2005-2006 management cycle. These assessments were reviewed by a STAR Panel and were considered by the Council in November 2003 for use during the 2005-2006 management period. However, the SSC did not recommend adoption of these assessments until models were revised with additional input data and modified assumptions. Specifically, the Scientific and Statistical Committee (SSC) took issue with the specifications for a parameter in the lingcod model that set recruitment variability and the lack of available 1947-1959 California commercial passenger fishing vessel (CPFV) logbook data in the cabezon model. AT the March 2005 Council meeting, revised lingcod and cabezon stock assessments were adopted for use in 2005-2006 management decision making. The lingcod stock assessment indicates the coastwide population is more abundant than previously thought and near the maximum sustainable yield level that would remove the stock from the overfished designation (Jagielo *et al.* 2004). The cabezon stock assessment indicates the population is not overfished, but below the maximum sustainable yield level (in the precautionary zone) (Cope *et al.* 2004).

NMFS is currently planning the next round of stock assessments for completion and review in 2005 for use in developing management measures and harvest specifications for the 2007 - 2008 biennial management cycle. Rebuilding plans and stock assessments for overfished species are subject to review every two years. The list of species planned for updated assessments contains over 20 species. NMFS will also hold a series of workshops in 2004 focusing on data needs and available data sources for the ambitious list of stock assessments being considered for 2005. Additionally, the SSC is currently working on standards for the required review of rebuilding analyses. These reviews are required every two years for species under rebuilding plans. More information on the stock assessment process can be found in Appendix A, Section 1.1.1.1.

7.1.2 Enforcement

Enforcement of fishery regulations has become increasingly complex with the addition of large closed areas, smaller cumulative trip limits and bag limits, and depth-based closures for commercial and recreational fisheries. At the same time, decreased OYs and the need to rebuild overfished stocks has place additional importance on controlling and monitoring fishery related mortality. Enforcement agencies continue to utilize traditional methods to ensure compliance with groundfish fishery regulations including, dockside sampling, at-sea patrols, and air surveillance. Recent declines in enforcement agency budgets combined with increase regulatory complexity have stressed the ability to adequately monitor fisheries for regulatory compliance. In response, NMFS implemented a Vessel Monitoring System (VMS) which includes satellite tracking of vessel positions and a declaration system for those vessels legally fishing withing an RCA. VMS was implemented beginning on January 1, 2004 and is required on all vessels with a limited entry permit. Expansion of the program to other sectors is currently being considered. VMS dramatically enhances, rather than replaces, traditional enforcement techniques. A more detailed description of fishery monitoring and enforcement is included in Appendix A, Section 1.1.5.

7.1.3 Managing with Risk and Uncertainty

Uncertainty in fishery management exists for many reasons including imperfect sources of data from the past, inaccurate or inadequate monitoring of current fisheries, and unknown future environmental conditions. All of these factors contribute to the risks associated with the assessment of stock status, the estimation of impacts to fish stocks due to fishery management measures, and the projections of future stock health under varying long term management alternatives. A detailed discussion of short-term costs verses long-term risk can be found in Appendix A, Section 1.2.1. For more information on the assessment of risk in long-term stock population projections see Appendix A, Section 1.1.1.2.

7.1.4 License Limitation, Capacity Reduction, and Fleet Rationalization

Declining fishing opportunity and increased importance in stock rebuilding and sustainable fisheries since the late-1990s have created the need for smaller, more efficient fishing fleets and more responsive management tools and monitoring programs. A full discussion of these long-term management strategies is presented in Appendix A, Section 1.2.4.

7.2 Criteria Used to Evaluate Impacts

Effects on the public sector correlate with changes in the level of regulatory complexity. Regulatory complexity affects the public costs of implementing a management regime by increasing the burden of monitoring, enforcing, and adjusting fisheries to meet but not exceed intended impact levels. Thus, costs to governmental entities associated with increased regulatory complexity could be one way to evaluate the relative effects of the alternatives on the public sector. Intrinsic to the costs to the public sector is the assessment of risk to the resource. Management alternatives with a high degree of regulatory complexity or a substantial reliance on accurate and timely inseason fishery data not only increase the expense of enforcement and monitoring, they also increase the risk of non-compliance and overfishing. Managing fisheries in a cost-effective manner while balancing risks to the resource with socioeconomic benefits is often the objective of public agencies charged with fishery management and enforcement. Therefore, costs, enforcement feasibility, risk to the resource, and reliance on fishery data are the criteria used in the following qualitative evaluation of the impacts to the public sector.

7.3 Discussion of Direct and Indirect Impacts

7.3.1 Impacts to Fishery Management

7.3.1.1 Constraining OYs and Monitoring

The *No Action* alternative, as well as all of the action alternatives, include restrictive OYs for overfished species that have wide ranging constraining effects along the entire coast and across many fisheries. Alternatives with projected impacts that completely utilize or exceed the available OY are considered to be more costly from a fishery management perspective. State, federal, and tribal agencies charged with monitoring fishery-related impacts have increased responsibilities in terms of inseason catch accounting, bycatch projection, and timely reporting. This is particularly true when the amount of available OY is low and is attributable to bycatch rather than landed catch. Bycatch accounting often requires costly and time-consuming at-sea observation, shore-based sampling, and logbook programs. Incorporating new data sources into fishery management inseason involves costs to the management regime due to additional analytical requirements to understand how data can be used to improve management, additional regulatory burden of implementing and publishing the recommended inseason fishery adjustments, and additional enforcement challenges under revised regulatory requirements.

Alternatives with projected impacts which meet the available OY for constraining species, such as canary rockfish, require careful monitoring and frequent inseason management actions and have relatively high costs and risk when compared to alternatives with projected impacts below the OY. Alternatives that are not expected to meet the OYs for constraining species can utilize the remaining OY as a “buffer” against the cost of intensive inseason management and the risk of exceeding the OY. The effects of the alternatives to the public sector are evident in the expense of inseason fishery monitoring, as well as the risks associated with uncertainty.

Bycatch accounting and control has been one of the weaker elements in groundfish management. However, bycatch accounting in the commercial sectors is improving rapidly. With the advent of data from the WCGOP, it is anticipated that more accurate bycatch accounting data from the limited entry trawl, limited entry fixed gear, and directed open access sectors will soon be available for management. Additionally, staff from CDFG and the PSMFC designed the CRFS program for sampling California's recreational fisheries, incorporating both the comprehensive coverage of the MRFSS program and the high quality sampling of the Ocean Salmon Project. These new and evolving monitoring systems will allow much more accurate catch and bycatch estimation and will be progressively integrated into the models currently used to project total catch under alternative management measures.

The WCGOP has completed two years of at-sea observation of the limited entry trawl and fixed gear fisheries, and trawl logbooks have been in place for several years. Although valuable to resource management, these data require extensive analysis and are not designed for real-time, inseason tracking of impacts. Until the recent development of an observer program, it has been difficult to effectively monitor discards, confounding the ability to accurately estimate total catch. The first data report from the first year of the West Coast Groundfish Observer Program (September 2001 through August 2002) was used for 2003 inseason management, and analyses demonstrated higher-than-anticipated bycatch rates for overfished species(Hastie [2003]; NMFS 2003b). Application of the observer-based bycatch rates led the Council to adopt extensive inseason changes to commercial trawl fisheries, including modifying RCAs to increase the areas closed to trawl fishing, limiting nearshore open periods, and altering trip limits. Not without adverse socioeconomic effects, decreased fishing opportunity will result in decreased fishery-related mortality, and increased likelihood of rebuilding.

In addition to bycatch rates for overfished species, observer-based discard rates for trawl non-overfished, target species were incorporated from the first year of the program. Target species' discard rates were also higher for several species than what had been previously modeled. These new rates were incorporated into modeling preliminary trawl management measures for the 2004 annual specifications.

The second year's observer data (September 2002 through August 2003), was reviewed and incorporated into fishery management in March 2004. The West Coast Groundfish Observer Program was expanded considerably from the first year and is anticipated to include sufficient data to provide insight into bycatch in the limited entry fixed gear fleet in addition to adding another year of new information on the trawl fleet. About 10% of the limited entry trawl and fixed gear trips were observed in the first few months of the program. Observations increased to about 20% of limited entry trips and expanded to portions of the directed groundfish open access fleet. Accumulation of additional years of data and expanded sampling will further improve the accuracy of bycatch rates and estimates of total mortality.

There have been concerns about the orderly use of this new information for active fishery management decision making. To help gain a higher degree of order and stability in the use of new observer information, the Council has considered a proposed long-term schedule showing when new observer data will be available for decision-making during the first multi-year management cycle. Further, the Council requested the Ad Hoc Groundfish Information Policy Committee (GIPC) prepare a report on policy regarding the use of new information from the observer program (and other sources) for fisheries management. The Council approved the recommendations of the GIPC including the following schedule for incorporation of new data from the WCGOP into management. As occurred in 2003 and 2004, inseason adjustments in response to new data from the WCGOP are anticipated.

Proposed Observer Data and Bycatch Model Schedule for Multi-Year Management

Date	Fishing Year	Observer Data Period	Groundfish Bycatch Models	Actions
April 2004	2004	9/2002 - 8/2003	Limited Entry (LE) Trawl, LE Fixed Gear (new)	2004 inseason 2005-2006 preseason
April 2005	2005	9/2003 - 8/2004	Open Access (OA) (new)	2005 inseason
Nov. 2005	2006	1/2004 - 12/2004 [a/]	LE Trawl, LE Fixed Gear, OA	2005 inseason 2006 2nd season [b/] 2007-2008 preseason
Nov. 2006	2007	1/2005 - 12/2005	LE Trawl, LE Fixed Gear, OA	2006 inseason 2007 update [c/]
Nov. 2007	2008	1/2006 - 12/2006	LE Trawl, LE Fixed Gear, OA	2007 inseason 2008 2nd season 2009-2010 preseason
Nov. 2008	2009	1/2007 - 12/2007	LE Trawl, LE Fixed Gear, OA	2008 inseason 2009 update
Nov. 2009	2010	1/2008 - 12/2008	LE Trawl, LE Fixed Gear, OA	2009 inseason 2010 2nd season 2011-2012 preseason

Proposed Observer Data and Bycatch Model Schedule for Multi-Year Management

Date	Fishing Year	Observer Data Period	Groundfish Bycatch Models	Actions

a/ Note shift in observer data period.
b/ “2nd season” denotes the second year of a multi-year management cycle.
c/ “Update” denotes check and possible refinement of management measures after adoption of the multi-year management measures and harvest specifications, but prior to the first season of a multi-year management period.

Management strategies should always use the best available estimates of bycatch, and managers should always seek to improve bycatch accounting and control mechanisms. Data and resulting analyses from the West Coast Groundfish Observer Program have already demonstrated an ability to provide valuable knowledge where limited information and difficult assumptions have existed in the past. Improved understanding of bycatch rates and total mortality will improve fishery modeling by replacing assumptions and surrogate values with fishery-related mortality estimates from direct observation. Additionally, historic catch data could be adjusted to incorporate new methods of estimating bycatch. Stock assessments and rebuilding analyses will benefit from more accurate sources of data on total fishery removals over time. Reducing the uncertainty in stock status and rebuilding projections will more effectively support sound harvest policy and sustainable fishery resource management.

Such measures as full retention of bycatch and/or bycatch caps could significantly reduce fishing-related mortality of overfished groundfish species. The West Coast Groundfish Observer Program could be linked with a program of mandatory full retention of rockfish (or other overfished species that would otherwise be discarded dead at sea) during commercial fishing activities to increase accuracy in estimating total catch. This could ensure rebuilding total catch OYs are not exceeded while attempting to access harvestable groundfish species. Mandatory rockfish retention and observer coverage might allow greater flexibility for managers to consider fishing opportunities that might otherwise be considered risky. As long as total catch controls are reliable and responsive to rapid changes in the fishery, such explorations may be acceptably risk-averse. Full rockfish retention would incur a cost to the processing sector since unmarketable rockfish, due to size or condition, would need to be handled and disposed. Bycatch accounting of retained species that would otherwise be discarded at sea may be considered an additional marginal cost, since dockside sampling of landed catch occurs anyway. Sampling the fully retained catch would add to the time and effort involved in dockside sampling, but would not require the implementation of a new sampling system.

A management strategy of bycatch caps (the fishery is closed once landings plus bycatch reach a critical threshold, notably, the total catch OY) would probably entail the need for a significantly higher observer coverage rate, perhaps 100%, if the caps are imposed at the vessel and not the fleet-wide level[1/]. This is because the distribution of fishing efforts resulting in significant bycatch is skewed to a few efforts. Given the nature of highly variable bycatch by time, area, gear, and fishing strategy, the allocational aspects of a management system relying on bycatch caps creates potentially serious repercussions. Such a system might promote derby fisheries where fishermen would compete to get their fish first before a cap is attained. This creates safety risks, a poor supply and demand marketing situation, and a contracted stream of fishery-dependent data (landings and bycatch information) that might be difficult to assimilate and react to in a timely fashion. One mitigative measure to consider in rationalizing a management strategy that depends on bycatch caps may be to develop ITQs for the overfished groundfish species. An ITQ system could be used to buy and sell overfished species' OY, which could leverage more healthy target species landings while maintaining better accounting and control of overfished species' bycatch. The Congressional ITQ ban was lifted enabling the Council and NMFS to pursue such a strategy.

[1/] The current management regime essentially manages for the total catch OY and includes best estimates of landings and discard. This management strategy may be likened to a bycatch cap on a fleet-wide basis.

The CDFG anticipated that preliminary catch and effort estimates for January through July 2004 will be available for the September 2004 Council meeting and suggested this may be the opportunity to compare CRFS estimates to OYs and Harvest Guidelines for consideration of inseason adjustments. Beginning fall 2004, the new CRFS estimates of catch and effort will be compared with the previous MRFSS estimates with the goal of calibrating the existing MRFSS dataset. Inseason management adjustment considerations in 2005-2006 in response to new CRFS data are anticipated. If results from the CRFS data a substantially different from anticipated fishery impacts, it is possible that inseason adjustments, with their associated costs to the management regime, would be recommended by the Council and implemented by NMFS. These initial fishery adjustments in response to the first set of CRFS data would likely be followed by considerable analytical endeavors to calibrate the MRFSS dataset and revise modeling methodologies.

7.3.1.2 Data Collection

The availability of data is critical to the effective management of fishery resources. Fishery impact modeling, stock assessments, and socioeconomic analyses are not directly affected by the management alternatives, but rely on long-term data sources. Longstanding, fishery-dependent data sources are compromised as OYs decrease and directed groundfish fishing opportunities diminish. Loss of fishery-dependent data is a cost to fishery management agencies through increased uncertainty in resource analyses, such as stock assessments, and the added expense of developing new data collection methods and analytical tools. Fishery-independent data sources, such as the research fisheries, are anticipated to continue in 2005-2006 under all of the action alternatives.

7.3.1.3 Regional Management

The Council has discussed regional management for selected species based on results of stock assessments that indicate a biological difference between stocks or portions of a coastwide stock. In the case of black rockfish, genetic differences have been noted between the northern and southern stocks and lingcod has also demonstrated biological differences north and south. For both of these species, the Council has indicated a preference for managing two regions: black rockfish stocks are delineated at the Washington/Oregon border (46°16' N. lat.) and lingcod at the Oregon/California border (42° N. lat.). The rationale for managing these stocks on a regional basis is to allow differences in management measures, contingent upon the abundance or health of the stock within a particular area. With regard to lingcod, the northern portion of the stock is above B_{40}, indicating that it has been "rebuilt," under the definitions contained in the groundfish FMP. The southern portion, however, is still rebuilding and is estimated to reach B_{40} in 2009. Therefore, a regional management approach provides the opportunity to have different management objectives by area, depending on the health of the stock.

Black rockfish stocks are managed under separate OYs, with harvest guidelines specified for each state within the southern OY. These harvest guidelines apply to both commercial and recreational fisheries in the southern region. Lingcod are managed under a rebuilding plan on a coastwide basis; therefore, the Council has approved a coastwide OY for lingcod, with harvest guidelines north and south of border between Oregon and California. The lingcod harvest guidelines apply to the recreational fisheries only.

The Council has also indicated a preference for regional management of some stocks for which biological differences have not been demonstrated by region, specifically canary rockfish and yelloweye rockfish. The Council is proposing to manage the recreational fisheries for these species under harvest guidelines; commercial fisheries would continue to be managed on a coastwide basis. The purpose of regional management of these stocks is for each region to be responsible for managing their respective fisheries to ensure that harvest targets are not exceeded. Both of these species have very low OY alternatives in 2005 (<50 mt for canary rockfish, and 26 mt for yelloweye rockfish). The recreational portions of these OYs are about 18 mt for canary rockfish and 12 mt for yelloweye rockfish. Managing to such extremely low numbers is difficult, and without regional responsibility, one state could easily preempt another state's recreational fishery.

For canary rockfish, the Council has indicated a preference for having three separate state recreational harvest guidelines. Alternatives for regional management of lingcod and yelloweye rockfish include shared harvest guidelines between Oregon and Washington. One positive aspect of keeping Washington and Oregon together under one harvest guideline is that the states could rely on a joint pool of fish in the event that catch levels exceed projected targets. However, this will require extensive monitoring by each state and increased coordination between the states, which may be difficult. Absent separate harvest targets, the possibility of one state preempting the other state's recreational fishery exists.

California

The federal regulations allow National Marine Fisheries Service (NMFS) and the Council to modify certain regulations in-season to adjust harvest levels for any groundfish species projected to exceed allowable harvest (harvest guidelines, targets, or OYs). In addition, the California Fish and Game Commission has given the CDFG authority to close the recreational fishery for lingcod, rockfish, a subgroup of rockfish, cabezon, greenlings, California scorpionfish, California sheephead, ocean whitefish, and/or other federal groundfish species in all or part of a RLMA for all or part of the year when CDFG determines that a harvest limit (optimum yield or harvest guideline) for lingcod, rockfish, a subgroup of rockfish, cabezon, or California scorpionfish has been exceeded or is projected to be exceeded prior to the end of the year.

Species with harvest guidelines

If a harvest guideline for canary rockfish, yelloweye rockfish, lingcod, or black rockfish specified for California for 2005-06 is projected to be exceeded, the CDFG may take action to close all or part of the recreational fishery in all or part of the state regions in all or part of the remainder of the year as was described above (see exception for Northern RLMA below). However, in the northern RLMA (North of 40˚10' N. lat to the Oregon/California border), in the case of canary rockfish or yelloweye rockfish, the CDFG may take action to close all or part of the recreational fishery deeper than the 30-fm depth contour as specified in federal regulations.

CDFG is proposing that under specific conditions (triggers), inseason changes to size limits, retention allowances (bag limits), and fishing seasons, depths, or areas be made. When the projected catch is below a trigger, the fishing regulations could become less restrictive to allow access to stocks. When the projected catch is above a trigger, the fishing regulations could become more restrictive to lower the harvest rate. Responses to triggers may take place outside the Council process, with state action and subsequent conforming action by NMFS.

Rockfish-Cabezon-Greenling (RCG) Bag Limits

If the harvest guideline or harvest target for any nearshore rockfish species within the RCG complex is projected to be exceeded, state action may be taken to reduce the bag limit from 10 fish (status quo) to a number less than 10 fish according to analysis provided below (see Section 4.3.2.7). The proposed reduction in bag limit may apply specifically to the private boat, shore-based, and diving modes, resulting in a differential bag limit for these modes and the CPFV mode due to economical implications for CPFVs when a bag limit is reduced below 10 fish. A separate option is to include CPFVs in a bag limit reduction. This management response may be particularly effective for nearshore rockfish species such as black rockfish, where limiting depth may not be the most effective tool.

Lingcod Bag Limits and Minimum Size Limits

CDFG is proposing alternatives to fishery closure as an inseason management response to projected over-harvest of lingcod. If the CDFG determines that more restrictive management measures are necessary to slow the harvest of lingcod, an increase in the minimum size limit, or a reduction in the bag limit from 2 to 1, may be implemented. Projected harvest for each upcoming month can be multiplied according to the coefficients for size and/or bag limit to identify the management response necessary to keep projected catch within the recreational HG.

Coefficients to modify projected catch of lingcod from a 2-fish bag limit to 1, or from 24 inches to a larger minimum size:		
Size Limit	Size Coefficient	Bag Limit Coefficient
24	0.000	0.214
25	0.169	0.18
26	0.304	0.15
27	0.43	0.12
28	0.521	0.1
29	0.581	0.07
30	0.641	0.039
31	0.685	0.025
32	0.723	0.011

Process for Inseason Catch Evaluation and Criteria to Trigger Management Responses

CDFG intends to track recreational landings throughout the season with the intention of identifying conditions when inseason management response is necessary to stay within prescribed harvest allowances (OYs or HGs). A statewide projection of monthly recreational landings, and a statewide cumulative landings distribution built from this projection, may be generated for canary rockfish, yelloweye rockfish, lingcod, and black rockfish using the Council-adopted season and depth management structure for 2005-06. An example of the statewide cumulative landings distribution with zones for specific actions is provided in Figure 7-1.

This graph displays a line reflecting projected cumulative landings that is bracketed by a shaded zone of no action. Landings within this no-action zone are within the expected variability of the catch estimates and require no action at that time. The area above the no-action zone defines a precautionary zone. Catches within this dark-shaded zone may trigger posting a notice on the CDFG website informing the public that catches are running higher than expected, and may initiate a state preventative management response. If landings fall within the lighter shaded areas above the precautionary zone or below the no-action zone (i.e., the lighter shaded area on the graph), then either a preventative management response or a less restrictive management response may be triggered. The criteria used to determine whether landings fall inside or outside of this shaded area are as follows.

1. When estimated landings from the first open month of fishing become available, these landings and the projected landings for the second month (if available) may be evaluated for the above species to

determine whether the estimated landings from the first month or the cumulative total of the landings from the first month and the projected landings from the second month are 20% or more above the statewide cumulative landings distribution for those months. If these conditions are met for a species, then this may trigger the implementation of more restrictive management measures (as described above).

2. When estimated landings from each subsequent month become available, then these may be evaluated along with projected landings for the month following (if available) for the above species to determine whether the cumulative estimated landings from these months or the cumulative estimated landings plus the projected landings are 15% or more above the statewide cumulative landings distribution for those months. If these conditions are met for a species, then this may trigger the implementation of more restrictive management measures (as described above).

3. When the cumulative estimated landings for a month or cumulative estimated landings and the projected landings for the subsequent month (if available) reach 50% of the harvest target, these may be evaluated to determine whether they are:

    - 15% or more above the statewide cumulative landings distribution for those months. If these conditions are met for a species, then this may trigger the implementation of more restrictive management measures (as described above); or
    - 20% or more below statewide cumulative landings distribution for these months. If this condition is met for a species, then this may trigger the implementation of less restrictive management measures (as described below) with the following condition: less restrictive management measures shall not be implemented if they result in projected landings of the other species listed above exceeding their harvest limits.

4. Once cumulative estimated landings for a month or cumulative estimated landings plus the projected landings for the subsequent month (if available) reach 80% of the harvest target, then these may be evaluated for the above species to determine whether:

    - The cumulative estimated landings from these months or the cumulative estimated landings plus the projected landings are 10% or more above the statewide cumulative landings distribution for these months; or
    - The cumulative estimated landings from these months and the cumulative estimated landings plus the projected landings are 15% or more below statewide cumulative landings distribution for these months

If the first condition is met for a species, then the implementation of more restrictive management measures may be triggered (as described above). If the second condition is met, then this may trigger the implementation of less restrictive management measures (as described above) with the following condition: less restrictive management measures may not be implemented if they result in projected landings of the other species listed above exceeding their harvest limits.

5. If, in any evaluation period, 90% of the harvest target has been landed or is projected to be landed, CDFG may initiate action to close all or part of the fishery by the time the catch is projected to reach the HG or recreational target.

Oregon and Washington

Washington and Oregon have responsive monitoring programs and regulatory processes in place and have committed to tracking their respective recreational fisheries inseason. If projected impacts to canary rockfish or yelloweye rockfish are anticipated to be exceeded, these state agencies intend to close all or portions of the recreational fisheries in areas deeper than 30 fathoms.

7.3.2 Impacts to Fishery Enforcement

Prior to 2000, groundfish management mainly regulated the amount of landed fish, based on cumulative trip limits. This type of measure has the advantage that monitoring and enforcement can be shore-based because limits are based on landings. But this approach is problematic because discarded bycatch cannot be directly monitored from shore. Depth-based closed areas are part of the *No Action* alternative and are proposed in all of the action alternatives as a way to reduce bycatch by keeping vessels out of areas where overfished groundfish species occur. However, depth-based management introduces a new set of enforcement issues because compliance must occur at sea, requiring additional, more costly at-sea monitoring and enforcement methods. The efficacy of management measures hinges on the degree to which fishery participants comply with them. Environmental impacts associated with enforcement therefore mainly result from the degree to which catch levels are exceeded because of non-compliance. Furthermore, management of overfished groundfish relies on depth-based closures to minimize bycatch of these species. Illegal fishing activity in closed conservation areas could result in increased bycatch. The degree to which these catches in excess of limits or in closed areas remain unmonitored or under-reported is of crucial importance to effective management. While recognizing that most fishery participants comply with the rules, the overall level of compliance is influenced by the tradeoff between risk and reward. Fisheries enforcement generally seeks to deter fishery participants from violating the rules through severe penalties because the cost of constant and comprehensive monitoring using conventional means is high. This strategy relies on a sufficient level of monitoring and enforcement so that the tradeoff between the risk of being caught and severely penalized and the benefits from harvesting fish illegally is tipped in favor of compliance for the great majority of fishery participants.

7.3.2.1 Geographic Extent of Closed Areas

GCAs (which include the RCA, YRCA, and CCA) prevent vessels from operating in waters where overfished species are commonly found, reducing the overall incidental take of overfished species. If the integrity of the closed areas are not adequately maintained, harvest assumptions could be inaccurate resulting in indirect effects, such as unaccounted for removals. Incursions into the conservation areas and the use of prohibited gear types could result in higher than anticipated catch of overfished or target species and the OYs could unknowingly be exceeded

The geographic extent and the number of the GCAs can have a profound effect on regulatory complexity. Their boundaries are complex, involving hundreds of points of latitude and longitude to delineate nearshore and offshore fathom curves (Figure 7-2 and Figure 7-3). The areas are vast, extending along the entire West Coast from Canada to Mexico, and weather and sea conditions are frequently harsh. As a result, ensuring the integrity of conservation areas using traditional enforcement methods (such as aerial surveillance, boarding at sea via patrol boats, landing inspections, and documentary investigation) is difficult. The extent of the RCAs, the most extensive and complex of the closed areas, are similar between the No Action and Action Alternative 1 and are substantially smaller under Action Alternative 2 and Action Alternative 3 (Table 3-1). However, regulatory complexity and costs to the public sector due to the size of commercial closed areas and their distance offshore, are not anticipated to differ substantially between the alternatives because implementation of VMS has decreased enforcement reliance on at-sea patrols. Recreational fishery alternatives propose use of depth-based closed areas for 2005-2006 (see Chapter 2). One relatively new aspect of these recreational closures is the establishment of waypoints specified by latitude and longitude which define large closed area boundary lines. Previous depth-based closures in the recreational fisheries have only specified a depth contour as a boundary or had established waypoints for a relatively small geographic area (i.e., the YRCA). Although many recreational vessels carry the necessary electronic equipment to chart their location relative to the closed area, it is uncertain what effect expanding the use of specified boundary lines in recreational fisheries will have on recreational fishery compliance. Increased reliance on depth-based closed areas in recreational fisheries adds regulatory complexity and costs to the public sector.

Increased reliance on depth-based closed areas in recreational fisheries adds regulatory complexity and costs to the public sector. Development of closed areas requires significant analyses to determine historic fishing patterns and species distributions. Determination of specific latitude and longitude coordinates is often a public process that tries to balance the conservation needs of overfished species while preserving fishing opportunities for harvestable target stocks. Adoption and publication of hundreds of coordinates is a considerable regulatory task and efficient and accurate publication of coordinates involves the creation of written and electronic listings. Shore-based enforcement techniques are not sufficient and increased at-sea patrols are required to ensure angler compliance with closed areas.

VMS is a tool that is commonly used to monitor vessel activity in relationship to geographical defined management areas where fishing activity is restricted. VMS transceivers installed aboard vessels automatically determine the vessel's location and transmit that position to a processing center via a communication satellite. One of the major benefits of VMS is its deterrent effect. If fishing vessel operators know they are being monitored and a credible enforcement action will result, then the likelihood of a vessel using a prohibited gear in a conservation area is significantly diminished.

7.3.2.2 Development and Enforcement of New Trawl Gear Requirements

All of the Action Alternatives for the non-whiting limited entry trawl fisheries require all trawl fishing north of 40°10' N. lat. and shoreward of 100 fathoms to use a selective flatfish trawl to reduce bycatch of shelf rockfish. ODFW has worked closely with enforcement personnel to develop ways to identify the newly required gear type during at-sea patrols. Trawl gear tested in the selective flatfish EFP met the definition of legal small footrope bottom trawl gear but included specific design criteria not currently required by regulation (see Section 2.2.3.1). Provisions in the Action Alternatives would require increased regulatory specification and complexity to enforce the necessary gear modifications. Ensuring the use of selective flatfish trawl gear is imperative to realizing reduced bycatch of shelf rockfish and increased opportunity for target flatfish species adding an enforcement burden to the public sector.

7.4 Discussion of Cumulative Impacts

Cumulative impacts to the public sector result from the combination of past, present and future direct and indirect impacts of management measures combined with the effects of other activities. Ongoing and dramatic changes in the management, enforcement, and monitoring of groundfish fisheries in response to substantial reductions in the amount of available resources have combined to force management agencies to consider changes to the management regime.

7.4.1 Specific Area Management

Current groundfish regulations close broad depth intervals along the coast for both trawl and non-trawl gears as a means to reduce the take of overfished species. These closures or RCAs, take the approach of restricting fishing essentially throughout the major depth distribution of the species of concern. However, most fish, and certainly most rockfish, are not homogeneously distributed, but rather occur in patchy distributions, often associated with key habitat features. Restricting fishing in "hotspot" areas where overfished species are most concentrated, or focusing fishing in "hotspot" areas where target species are most concentrated might be a more direct management approach that recognizes the true nature of fish distributions.

Current RCA management recognizes changing fish distributions to some extent by stratifying bycatch information from the WCGOP by time, depth and geographic area. RCA management might be considered "hotspot" management in that the species "hotspot" is moved by time and area by shifting the lines according to information feedback from the observer program. As more information becomes available from the WCGOP, further refinement of these strata will likely be possible.

Depth based area management has been applied to recreational as well as commercial fisheries. For example the CCAs in California and the YRCA in Washington either prohibit or substantially limit recreational and commercial fishing in key areas of high abundance of the species of concern (i.e., "hotspots"). A conservation closure has also been established for commercial and recreational fisheries around the Cordell Banks in California. Additionally, WDFW Exempted Fishing Permit programs have established specifically defined areas within RCAs where arrowtooth flounder and spiny dogfish might be more cleanly targeted rather than considering the entire northern RCA as a single homogeneous area of uniform bycatch. Specific areas of concentrations of petrale sole have also been excluded from RCA restrictions in winter months to allow more cleanly targeting this species to achieve optimum yields. The ODFW has conducted an analysis of information collected from the shoreside whiting EFP identifying areas where widow bycatch in the fishery is highest. While these areas have not been restricted through regulation, the information has been made available to the whiting industry to facilitate voluntary action to reduce widow bycatch.

One advantage of this "hotspot" approach is that the desired conservation savings might be attained for a species without closing areas that are much lower in abundance, even though they may fall within the depth distribution typically inhabited by the species. Also, ocean bathymetry is such that a line drawn along the coast to approximate a fathom contour might fail to include isolated areas of higher relief or key habitat for the species of concern. Focusing management areas more specifically on such key habitats could encompass these areas while presenting the potential to exclude from restriction areas within RCA depth contours that don't contain habitats or concentrations of the species or species complexes of concern.

The obvious problem with establishing a conservation hotspot is assembling the information demonstrating that the area is, in fact, a "hotspot". Lack of this information is much of the reason that the current RCAs are based broadly on the primary depth intervals occupied by the species being addressed as measured by triennial survey and trawl logbook catch information. However, data sources are emerging that might provide for more specific siting of management areas than current RCAs. The WCGOP is continuing to collect information on a tow by tow basis for trawl gear and for individual sets for line gears. High (and low) catch rates from this program for individual species have the potential to be aggregated at a very area-specific level. Efforts associated with the development of the Essential Fish Habitat (EFH) Environmental Impact Statement (EIS) have produced much more refined definitions of key habitat areas along the coast than were previously available as well as summarized information on fish distributions. There have also been a number of submersible surveys conducted along the west coast observing both fish distributions and habitat that may prove useful in area management. Some of these surveys are designed to produce quantified results, such as the WDFW survey off Cape Flattery, Washington, designed to produce estimates of abundance in trawlable vs. untrawlable habitats. Tow-by-tow and set locations from state EFP programs also provide species specific catch areas. The set line survey conducted by the IPHC is an additional source of information on the distribution of a number of species. The IPHC survey records information on the species composition of the catch by precise set locations. Qualitative information from the fisheries is another possible source of information. Catch information from recreational and commercial fishery participants was instrumental in crafting both the

YRCA and the winter petrale trawl areas. Incorporation of information from the above sources into a Geographic Information System (GIS) data base might provide a useful tool to assist in designing specific area ("hotspot") management options.

Examples of Available Data Sources to Facilitate "Hotspot" Management

- Federal Observer Program
- Trawl Logbooks
- State Sponsored EFPS
- Detailed Habitat Mapping (EFH)
- Survey Data
    - Trawl Surveys
    - Submersible Surveys
    - Hook & Line Surveys (e.g., IPHC)
- Tribal Observer Information
- Observations from Commercial and Recreational Fisheries

Implementation of specific area management, conservation areas, or "hotspots" is not without costs to the management regime. Benefits of reduced bycatch and increased opportunity for target species is weighed against the management costs of researching, regulating, and enforcing these concepts. As described in Section 7.3.2.1, identification of new area management concepts and add complexity to regulatory and enforcement efforts. Although not ready for inclusion in the action alternatives under consideration in this EIS, area management concepts included in this section are currently being studied and may be proposed for inseason action in 2005-2006 but, additional analyses and NEPA documentation may be required.

7.4.1.1 Widow Rockfish

Research conducted by ODFW has explored the potential area management strategies for minimizing widow rockfish bycatch in the limited entry Pacific whiting trawl fishery (see Section 4.3.2.1). Analyses conducted have identified four "hotspots" of relatively high widow rockfish bycatch while targeting Pacific whiting.

7.4.1.2 Spiny Dogfish

One specific example of area management that seeks to focus fishing in an area of high catch rates of target species and low bycatch rates of overfished species is the Exempted Fishing Permit (EFP) fishery for spiny dogfish off the Washington coast. This EFP was conducted in 2003 using longline gear in very specific areas (Figure 7-4). During 2003, the vessel operating in this EFP made 78 longline sets (71,680 total hooks) with a resultant catch of 175,000 pounds of spiny dogfish and a bycatch of 129 pounds of yelloweye rockfish and 35 pounds of canary rockfish. During the EFP, a WDFW monitor was onboard for 100% of the fishing effort and full rockfish retention was required.

The EFP fishery is currently being repeated with the expectation that information from the program can be used to promulgate regulations that will accommodate a targeted hook and line dogfish fishery within acceptable bycatch impacts on overfished species.

7.4.1.3 Area Management in Recreational Fisheries

The effect of changes in the structuring of the recreational fishery for 2004 (offshore closures, harvest guidelines, etc.) will not be known at the time of adopting 2005 and 2006 management measures. The following are suggested management measures that could be implemented inseason if the 2004 (or 2005) fishery does not proceed as expected.

Although retention of canary rockfish and yelloweye rockfishes in recreational fisheries is prohibited, bycatch mortality of released fish is still large enough to constrain the fishery for other groundfish species. The large offshore RCA closure is an example of how these recreational fisheries are affected by bycatch of overfished species, especially yelloweye rockfish and canary rockfish. To help alleviate this constraint without increasing bycatch mortality, perhaps the large offshore RCA closures can be modified to close "hot spots" of known canary rockfish and yelloweye rockfish concentrations OR open "cold spots" of areas known to have no or low concentrations of canary rockfish and yelloweye rockfish. Identification of potential areas for "hot spots" or "cold spots" depends on adequate information about the distribution and abundance of these species. Review of NOAA Fisheries historical triennial surveys, International Pacific Halibut Commission surveys, a pilot study conducted by CDFG mapping recreational angler effort with canary rockfish occurrence, and other data sources may provide such information.

Similarly, other means to reduce bycatch mortality, especially of overfished species, may include gear restrictions and/or release techniques. For example, the Oregon Department of Fish & Wildlife is presently studying the effects of sub-surface release on survival of rockfish. If successful techniques are developed and accepted, their use may alleviate the current constraints from bycatch mortality on recreational fisheries. Other examples could include modifications of terminal gear, perhaps hook size or shape, to avoid or reduce capture of overfished species.

7.4.2 Implementation of Exempted Fishing Permits Into Regulations

Exempted fishing permits allow fishing activities that would otherwise be prohibited. As an example, EFPs provide a process for testing innovative fishing methods for prosecuting sustainable and risk-averse fishing opportunities. The Council has signaled its intent to make greater use of EFPs in the new groundfish management regime of depth restrictions and widespread area closures to reduce harvest of overfished species. However, there are potential drawbacks to significant EFP proliferation. Low OYs for overfished species force hard allocation decisions between allowing immediate fleet-wide fishing opportunities in directed and incidental groundfish fisheries versus the longer term potential benefits ascribed to gaining new information from EFPs.

From 2000 through 2003, the Oregon Department of Fish and Wildlife (ODFW), working cooperatively with Oregon State University and the National Marine Fisheries Service, developed and tested a modified flatfish trawl, comparing its performance to a typical West Coast sole trawl using an alternate haul sampling design (King *et al.* 2004). This experiment showed reductions in bycatch for several overfished species and many of the results and provisions of these experiments have been incorporated into the action alternatives for 2005-2006 management measures (see Section 2.3.2.1).

Although not ready for inclusion in the action alternatives under consideration in this EIS, the following EFPs included in this section are currently being considered for implementation in regulations and may be proposed for inseason action in 2005-2006. Additional analyses and NEPA documentation may be required before any regulatory changes are effective.

7.4.2.1 California Selective Flatfish Trawl

The California Selective Flatfish Trawl EFP is being continued in 2004 and contemplated for 2005. If adequate data is collected the EFP may be concluded in the fall of 2004. Therefore, the results necessary to implement this EFP into regulations were not available during the preseason planning of management measures for 2005-2006. The GMT has recommended consideration of EFP results and selective flatfish trawl provisions off California south of 40°10' N. lat. inseason in 2005 or 2006. Alternative trawl measures south of 40°10' N. lat. could be similar to those being considered north of 40°10' N. lat. under the action alternatives in this EIS as the California EFP was patterned after the research and EFP work conducted by Oregon (see Section 2.2.3.1).

7.4.2.2 Oregon Deepwater Complex Fishery Reduced-Discard Strategy

The ODFW Trawl Discard Reduction EFP for the DTS fishery is being conducted in 2004. The purpose of this EFP is to test a discard reduction strategy for the deepwater complex trawl fishery for Dover sole, shortspine thornyhead and sablefish (DTS). The strategy uses written vessel-processor, state-vessel and state-processor agreements to reduce economic incentives for discarding, mandate more complete or possibly full retention of DTS species, and create modest incentives for retention of DTS. The incentives created promote reduced discard, fewer tows, higher economic efficiency, and may be scalable to the West Coast fishery as a whole. The GMT supports the approval of this EFP because the primary objective is bycatch reduction and it will not impact canary rockfish. Pending review of the results of the data collected, the GMT has recommended that consideration be given to the potential for converting this EFP into regulation inseason for 2006.

7.4.2.3 Arrowtooth Flounder Trawl

The Washington Department of Fish and Wildlife (WDFW) proposed consideration of implementing provisions of their sponsored arrowtooth trawl EFP in regulations for 2005-2006. Provisions of the EFP considered for regulatory implementation include some access to the existing trawl RCA with discrete canary rockfish hotspots closed to fishing, full retention of all rockfish, 100% observer coverage, and overfished species' bycatch caps for each participant in the fishery (see Appendix B, Proposed Arrowtooth Flounder- Rockfish Conservation Area (AT-RCA) Trawl Fishing Program: Scoping Document). The NMFS has subsequently informed WDFW and the Council that the action to convert this EFP into regulations is beyond the scope of the Council actions contemplated for June 2004 to decide 2005-2006 management measures (and analyzed herein), and would require additional analysis of the consequences of some of the proposed regulatory provisions. It is expected that additional analysis beyond what is provided in this EIS would be needed to convert this EFP into regulations during the 2005-2006 management period (see Section 2.2.3.2). In particular, the full rockfish retention, 100% observer coverage provisions need further analysis since such provisions are not part of the current groundfish FMP. Therefore, WDFW is proposing delaying a final decision on amending federal regulations to implement these provisions pending further analysis.

The net effect of implementing these provisions may be consequential to the management regime. Pending the results of ongoing analysis there could be a regulatory burden to the management regime associated with converting this EFP into regulations. Fishery managers will need to weigh the costs of implementing these new concepts into the regulatory framework versus the potential fishery benefits of sustainable target species harvest with minimized bycatch of overfished species. The administrative burdens of implementing and monitoring the EFP under the No Action alternative also need to be considered. Mandatory 100% observer coverage could draw from the collective "pool" of trained observers from the WCGOP.

7.4.3 VMS Expansion

Enforcement methods of patrolling sea areas either by airplane or ship (carried out primarily by the U.S. Coast Guard, although state agencies have some capacity in this regard), and using fishery observers to monitor vessel position, can be used to monitor and enforce closed areas. However, VMS is a superior enforcement technology because the position of vessels with transmitting units can be tracked at all times. NMFS, in consultation with the Council and the VMSC, published a final rule in the Federal Register on November 4, 2003 that requires VMS on all limited entry trawl and limited entry fixed gear vessels beginning January 1, 2004. A complete analysis of the alternatives considered for this program can be found in the Environmental Analysis/Regulatory Impact Review/Regulatory Flexibility Analysis for A Program to Monitor Time-Area Closures in the Pacific Coast Groundfish Fishery (available online at: http://www.nwr.noaa.gov/1sustfsh/groundfish/VMS/VMS_EA_Final.pdf)(NMFS 2003b).

The risk of exceeding OYs due to non-compliance would be greater without the VMS monitoring program in place. Enforcement relying on monitoring by airplanes and ships to identify incursions into the closed areas would not be as effective as VMS. A lot of time and considerable cost would have to be spent investigating any vessel appearing on enforcement radar, whether or not they are legitimately fishing in an area or not. This would reduce the ability of enforcement vessels to cover a large proportion of the closed area in a timely manner, reducing total monitoring and deterrence.

The risk of exceeding OYs would be less if VMS were implemented under any of these alternatives. One of the major benefits of VMS is its deterrent effect. If fishery participants know they are being monitored, and a credible enforcement action will result, they are less likely to fish illegally in closed areas. In addition, the data collected with a VMS system can be used to better understand the distribution of fishing effort, which is likely to be affected by closed areas.

Depth-based management started in 2002 and became a major tool in the management of overfished groundfish species. Moving fisheries away from areas critical to the health of rebuilding stocks has quickly become a central aspect of West Coast groundfish management. The need to maintain the integrity of groundfish conservation areas through effective monitoring and enforcement is critical if fishery management agencies aim to provide fishing opportunity for healthy stocks while rebuilding overfished species in the future. The cumulative effect of declining fishery resources, increasing reliance on depth-based closed areas, and the long rebuilding time frames for overfished rockfish species have led management agencies to consider expansion of VMS to fishery sectors beyond limited entry fleets. The Council's Ad Hoc Vessel Monitoring System Committee (VMSC) met in October, 2003 to develop criteria and objectives for identifying key fishery sectors to consider for VMS expansion (summary minutes of the VMSC report can be found at the Council web site at: www.pcouncil.org/groundfish/gfvms.html). The VMSC is expected to give the Council a status report on the existing VMS program in 2004. At that time the Council is anticipated to consider the VMSC recommendations for the existing program as well as proposals for its expansion.

7.4.4 Impacts to Fishery Monitoring and Biennial Management

Fishery management tools recently implemented, such as depth restrictions for recreational fisheries if caps on impacts to overfished species are attained, and tools considered for the future, such as individual quotas or bycatch caps, require timely, inseason catch and bycatch information. A cumulative effect of decreasing fishing opportunity and tightened regulations that rely on inseason tracking of fishery impacts is development of data sources that are timely and accurate. Among the tools being developed or considered are electronic logbooks to improve the speed and ease of incorporating at-sea fishery data into management, redesigning the MRFSS program by putting an emphasis on dock-side sampling for more effective inseason use, and expanding the WCGOP. As these data sources expand and our knowledge of the stocks and fisheries improve, management agencies will need to consider mechanisms for incorporating this new information into biennial management. The Council has formed the Ad Hoc Groundfish Information Committee to look into the use of these new data during a two-year management cycle. Fishery management agencies strive to use the best available science when establishing fishery resource policy, but frequent adjustments to the harvest specifications or management measures could erode the benefits of biennial management.

7.4.5 Fleet Reduction and Fishery Rationalization

Fleet reduction and fishery rationalization have been considered by state and federal management agencies since the 1980's. Overcapitalization of the fishery and optimistic expectations of groundfish stock productivity led to overfished species and compromised fishing industries and communities. In response, the Council and NMFS have completed a trawl vessel buyback program to reduce the size of the limited entry fleet. Additionally, the Council will begin to explore the potential for individual quotas, in part, as a means of providing regulatory flexibility and economically viable fishing communities. The cumulative effects of past management practices, current fishery crises, and the foreseeable need to rebuild overfished species and strengthen coastal economies have combined to make these dramatic changes to the management regime attractive to the fishery regulatory agencies.

7.5 Summary of Impacts

7.5.1 The No Action Alternative

Estimated impacts under the No Action alternative are similar to the impacts associated with Action Alternative 1. The Council applied the concept of a buffer in the management of canary rockfish in 2004 could do so again under either the No Action or the first two action alternatives. Regional management concepts for constraining species such as canary rockfish, yelloweye rockfish, and lingcod are not specified for the No Action alternatives but are being considered for recreational fisheries in all of the action alternatives. Regional management increase public sector burdens of monitoring and regulating fisheries but, they can also reduce the complexity and charge of inseason management.

The size and complexity of the GCA's under the No Action alternative are similar to Action Alternative 1 and are larger than those proposed under Action Alternative 2 and Action Alternative 3. The implementation of VMS in 2004 will decrease the enforcement challenges of preserving the integrity of conservation areas minimizing the differential impacts between the alternatives. Perhaps more important to the enforcement of conservation areas than their size and configuration is the number of restricted areas and their relation to each other. Several new concepts for specific area management studied or proposed for possible implementation in 2005-2006. New area management concept that do not replace or enhance existing GCA's, add regulatory and enforcement complexity.

The implementation of selective flatfish trawl gear is a new concept and is not part of the No Action alternative. The No Action alternative includes differential regulations for large and small footrope trawl gear but does not have the regulatory and enforcement complexity of new gear specifications.

7.5.2 Action Alternative 1

All of the action alternatives have the increased burden on the management regime of constraining OYs and the need for complex regulations and active monitoring of fisheries. Projected impacts to constraining species, principally canary rockfish are lowest under this alternative. Therefore, this alternative provides the greatest opportunity for the use of a buffer against going over the adopted OY for 2005-2006.

Selective flatfish trawl gear is required under all of the action alternatives. There are regulatory and enforcement impacts to the public sector through the development specific trawl gear modifications and monitoring of vessel activity in areas restricted to selective flatfish trawl gear. An additional impact unique to Action Alternative 1 is the requirement of 100% observer coverage in the selective flatfish trawl fishery. This requirement could draw trained observers away from the WCGOP and thereby decreasing that program's ability to sample a wider variety of groundfish fisheries.

7.5.3 Action Alternative 2

Impacts to constraining species for this alternative are intermediate to Action Alternative 1 and Action Alternative 3. Impacts to canary rockfish under this alternative are not likely to leave a substantial buffer.

Alternative management strategies for limiting widow rockfish bycatch in the Pacific halibut are discussed under this alternative. Concepts such as specific area management, establishing an RCA, and penalizing vessels with high widow rockfish bycatch with reduced fishing time are all being considered. All of these concepts have impact implications for the management regime and the public sector.

7.5.4 Action Alternative 3

Projected impacts to constraining species, principally canary rockfish are highest under this alternative. It is anticipated that management measures under this alternative would achieve or exceed the canary rockfish OY. This alternative provides the least management flexibility as there is no OY available for setting aside as a buffer against fisheries exceeding impact expectations and frequent inseason adjustments.

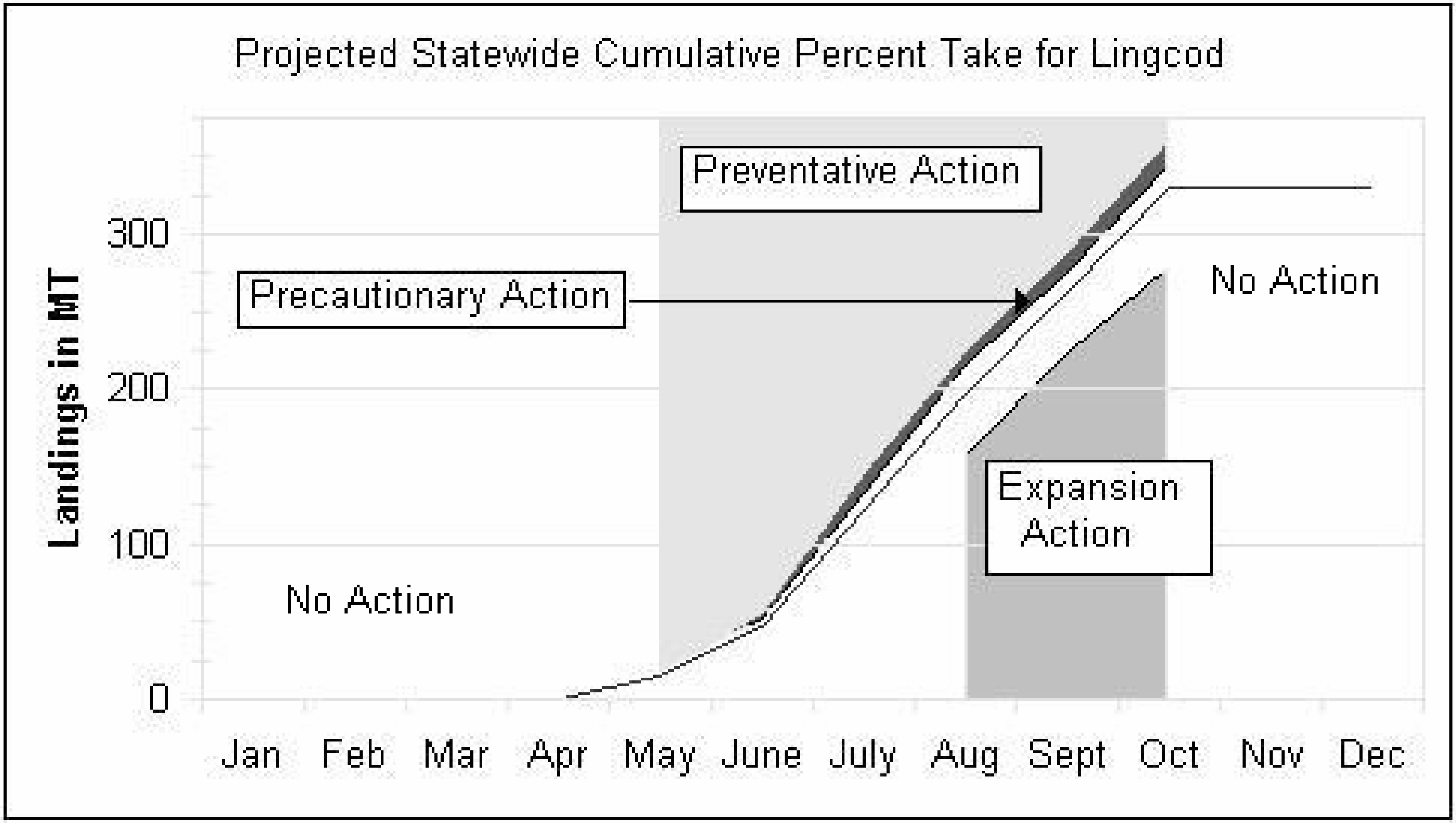
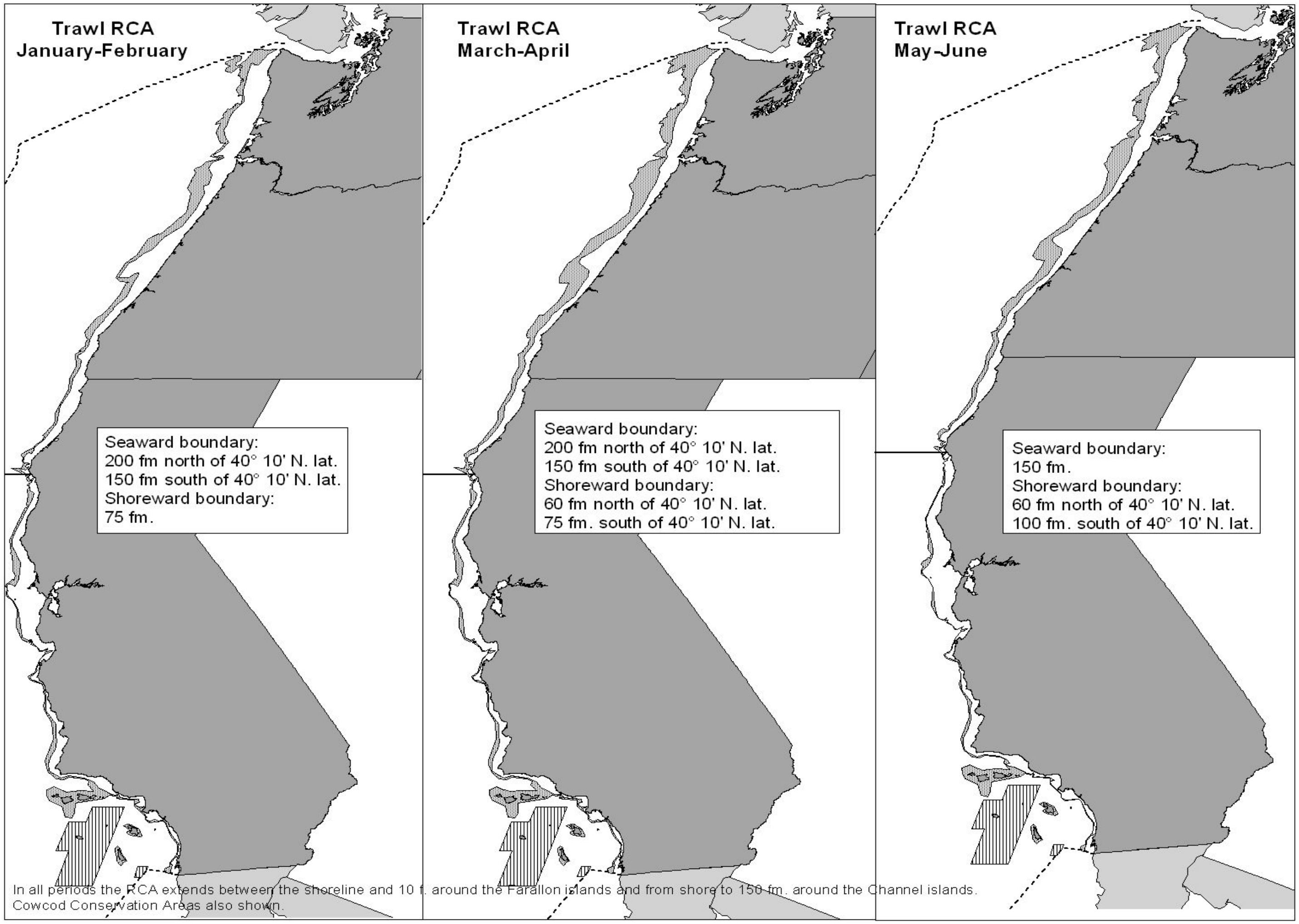


FIGURE 7-1. Example of California recreational fishery tracking with zones for specific inseason actions.



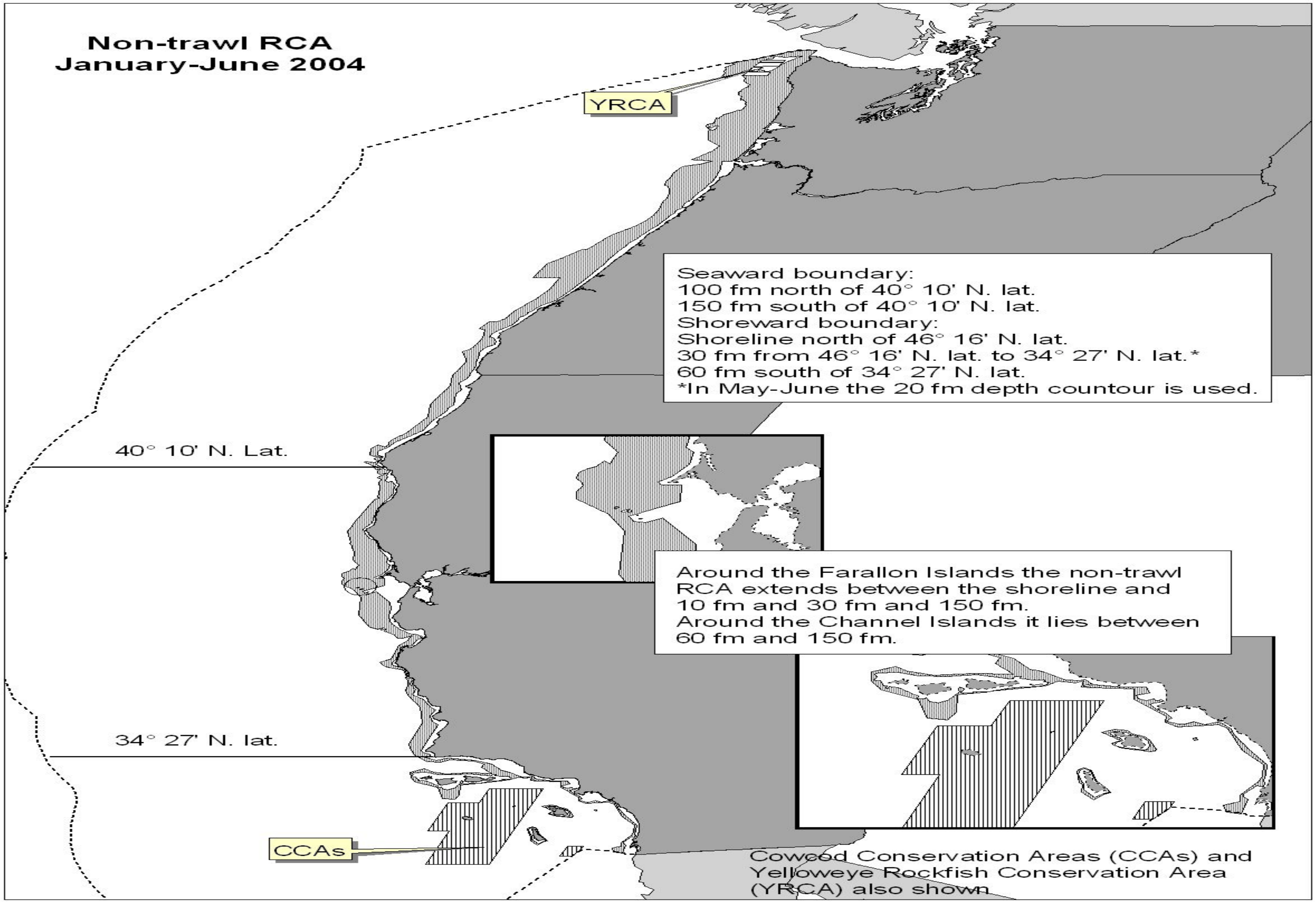
Seaward boundary:
200 fm north of 40° 10' N. lat.
150 fm south of 40° 10' N. lat.
Shoreward boundary:
75 fm.

Seaward boundary:
200 fm north of 40° 10' N. lat.
150 fm south of 40° 10' N. lat.
Shoreward boundary:
60 fm north of 40° 10' N. lat.
75 fm. south of 40° 10' N. lat.

Seaward boundary:
150 fm.
Shoreward boundary:
60 fm north of 40° 10' N. lat.
100 fm. south of 40° 10' N. lat.

In all periods the RCA extends between the shoreline and 10 f. around the Farallon islands and from shore to 150 fm. around the Channel islands.
Cowcod Conservation Areas also shown.

FIGURE 7-2. Trawl Rockfish Conservation Area closures in the first six months of 2004.



Non-trawl RCA
January-June 2004

Seaward boundary:
100 fm north of 40° 10' N. lat.
150 fm south of 40° 10' N. lat.
Shoreward boundary:
Shoreline north of 46° 16' N. lat.
30 fm from 46° 16' N. lat. to 34° 27' N. lat.*
60 fm south of 34° 27' N. lat.
*In May-June the 20 fm depth countour is used.

Around the Farallon Islands the non-trawl RCA extends between the shoreline and 10 fm and 30 fm and 150 fm.
Around the Channel Islands it lies between 60 fm and 150 fm.

Cowcod Conservation Areas (CCAs) and Yelloweye Rockfish Conservation Area (YRCA) also shown

FIGURE 7-3. Nontrawl Rockfish Conservation Area closures in the first six months of 2004.

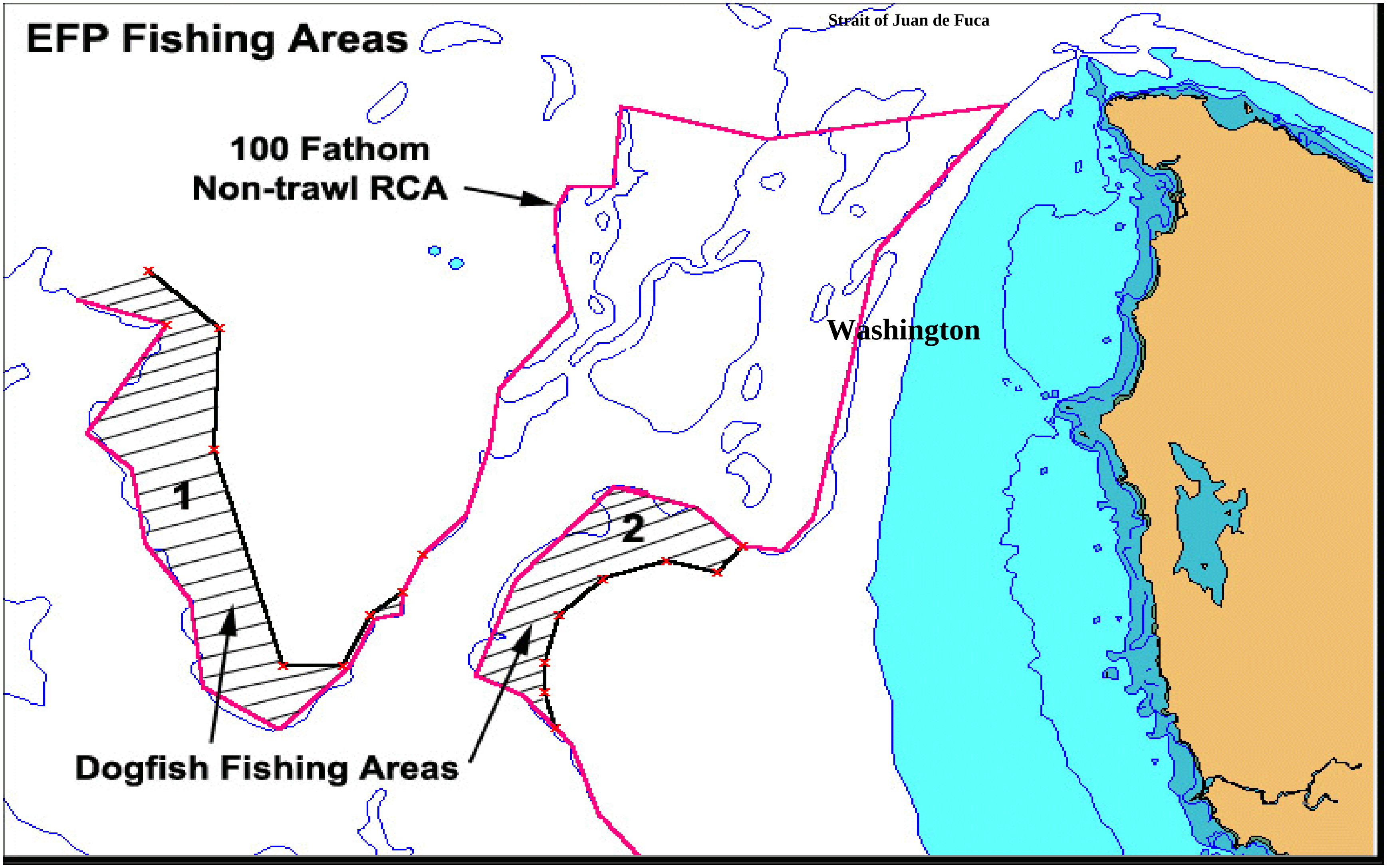


FIGURE 7-4. Spiny dogfish fishing areas in the 2004 WDFW sponsored exempted fishing permit.

8.0 SOCIOECONOMIC ENVIRONMENT

8.1 Affected Environment

The Pacific Coast groundfish fishery is a multi-species fishery that takes place off the coasts of Washington, Oregon, and California. Maintaining year-round fishing opportunities for groundfish has been one of the primary management objectives for the fishery. Pacific Coast groundfish support or contribute to a wide range of commercial, recreational, and tribal fisheries. These activities have a secondary impact on the fish buyers and processors, suppliers of recreational fishing equipment and services and ultimately the fishing-dependent communities where vessels dock and fishing families live. For a more extensive description of West Coast groundfish fisheries the reader is referred to Appendix A of this document. Key points and updates of that discussion are also summarized below.

According to PacFIN data, of 4,579 vessels active during November 2000 through October 2001, 37% landed some groundfish. These vessels accounted for nearly half of the value of all West Coast landings (groundfish and nongroundfish species). Commercial fisheries targeting groundfish are, for the most part, regulated under a limited entry program implemented in 1994. Other fisheries, which either target groundfish or catch them incidentally, but do not hold groundfish limited entry permits, are considered "open access" fisheries although these vessels may possess limited entry licenses for other, state-managed nongroundfish fisheries. The Council allocates harvest limits (expressed as optimum yields, or OYs) between different regulatory and fishery sectors, including limited entry and open access fisheries.

Marine recreational fisheries consist of both charter and private vessels. Charter vessels are larger vessels for hire, which typically can fish farther offshore than most vessels in the private recreational fleet. Fishing opportunity both in nearshore areas and farther out on the continental shelf are important for West Coast recreational groundfish fishermen.

Indian tribes in Washington, primarily the Makah, Quileute, and Quinault, also harvest groundfish in the EEZ. There are set tribal allocations for sablefish and Pacific whiting, while the other groundfish species' allocations are determined through the Council process in coordination with the tribes, states, and NMFS.

8.1.1 Commercial Fisheries

In 1994, NMFS implemented Amendment 6 to the groundfish FMP, a license limitation program intended to restrict vessel participation in the directed commercial groundfish fisheries off Washington, Oregon, and California. The limited entry permits that were created through that program specify the gear type a permitted vessel may use to participate in the limited entry fishery and the vessel length associated with the permit.

Most of the Pacific Coast non-tribal commercial groundfish harvest is taken by the limited entry fleet. The groundfish limited entry program includes most vessels using trawl, longline, and trap (or pot) gears. There are also several open access fisheries that take groundfish incidentally or in small amounts. Participants in those fisheries may use, among other gear types, longline, vertical hook-and-line, troll, pot, setnet, trammel net, shrimp and prawn trawl, California halibut trawl, and sea cucumber trawl. These vessels do not hold groundfish limited entry permits yet may target groundfish or catch them incidentally. Although their groundfish landings are much smaller, they are part of the economic make-up for West Coast groundfish vessels

In March, 2002, there were 450 vessels with Pacific Coast groundfish limited entry permits, of which approximately 243 were trawl vessels, 180 were longline vessels, and 27 were trap vessels. The number of vessels registered for use with limited entry permits has since decreased because of the implementation of the permit stacking program for sablefish-endorsed limited entry fixed gear permits in 2001, and the limited entry trawl vessel buyback program, completed in late 2003. The trawl program bought back 91 vessels, including 91 limited entry trawl permits, 121 state crab and shrimp permits and 27 other Federal fishing permits. As of April 2004, there were 406 Federal groundfish limited entry fishing permits and 312 registered vessels operating with Federal fishing permits on the West Coast. (Seventeen trawl permits, 8 longline permits and 1 trap permit were not associated with any particular vessel.) Of the total permits, 176 were endorsed only for limited entry trawl, 194 were endorsed for longline only, 27 were endorsed for trap gear only, 4 were endorsed for both trawl and longline gear, 1 was endorsed for both trawl and trap gear, and 4 were endorsed for both longline and trap gear. Of the total longline and trap permits, 164 were endorsed for sablefish; 28 of these were “tier 1", 42 were “tier 2" and 94 were “tier 3" permits.

Limited entry permits may be sold and leased out by their owners, so the distribution of permits between the three states often shifts. In 1999, the distribution of permits was approximately 41% for California, 37% for Oregon, and 21% for Washington. In 2002, roughly 23% of the limited entry permits were assigned to vessels making landings in California, 39% to vessels making landings in Oregon, and 37% to vessels making landings in Washington. The change in state distribution of limited entry permits between 1999 and 2002 may be partly due to the consolidation under the sablefish permit stacking program, as vessels operating from northern ports may have purchased or leased sablefish-endorsed permits from vessels that had been operating out of California ports. As of April 2004, 35% of limited entry permits were registered to California operators, 37% to Oregon operators and 27% to Washington operators. The shift in distribution of permits since 2002 is almost exclusively due to the buyback of trawl permits in late 2003.

Tables 8-1a, 8-1b, and 8-1c list 1981–2003 commercial landings by round weight, exvessel revenue in current dollars, and exvessel revenue in inflation-adjusted dollars for commercially important species on the West Coast. Tables 8-2a, 8-2b, and 8-2c summarize these commercial groundfish landings by state and also north and south of Cape Mendocino in round weight and exvessel value terms. Table 8-3 lists historical landings separately for the limited entry trawl, limited entry fixed gear, and open access fleets.

Table 8-1a shows the large volume of Pacific whiting landings and the emergence of shore-based processing in the early 1990s. (Note that the at-sea sector includes joint venture fisheries occurring in the 1980s. “Americanization” ultimately replaced foreign processors with domestic ones.) While total groundfish landings peaked in 1994, landings of species other than whiting continued a long-term declining trend during this period. Total groundfish landings measured by weight peaked in 1994 at 305,312 mt and have declined by nearly half since. Flatfish, sablefish, and rockfish landings all peaked in 1982, the first full year of groundfish FMP management. (Note that some decline in landings is to be expected, however, as standing stocks are “fished down” to MSY biomass.) Landings in all groundfish species categories declined steeply after 1998, when species began to be designated overfished. Rockfish landings fell by about three-quarters from 1998 to 2002.

Table 8-1b shows total groundfish exvessel value peaking in 1997 at $101.2 million, three years after the peak in total groundfish landings. The difference between these trends is partly explained by the observed run up in exvessel prices for sablefish between 1994 and 1997 at a time when total sablefish landings were pretty stable. Total exvessel value of groundfish landings declined 43% to about $58 million in 2003.

Table 8-1c adjusts the values in Table 6-1b for inflation, allowing a more direct comparison of the real value of landings between years. Low-value whiting is a much less prominent component of landings when measured this way. Rockfish have been, and continue to be important, as have sablefish, and to a lesser degree, flatfish. Measured in constant dollars, the change in rockfish landings between 1998 and 2003 is quite severe, falling by more than two thirds. But the inflation-adjusted value of sablefish and flatfish landings remained fairly stable during this period. Measured in constant dollars, landings value was greatest in the late 1980s, peaking in 1989 at almost $132 million. By 2003, the inflation adjusted value of total groundfish landings had fallen by more than half.

8.1.1.1 Limited Entry Trawl Sector

West Coast limited entry trawl vessels use midwater gear to target Pacific whiting and yellowtail rockfish, and bottom gear for targeting flatfish species on the continental shelf and slope, or DTS species (Dover sole, thornyhead and sablefish complex) in deep water. Some continental shelf and slope rockfish species have also been important targets in the limited entry trawl fishery. Although trawlers may catch a wide range of species, the following species account for the bulk of landings (other than Pacific whiting) measured by weight: Dover sole, arrowtooth flounder, petrale sole, sablefish, thornyheads, and yellowtail rockfish. Although some rockfish species were important component of landings in the past, management measures intended to reduce the directed and incidental catch of overfished rockfish and other depleted species have significantly reduced the rockfish catches in recent years.

Trawlers take the vast majority of the groundfish harvest measured by weight but somewhat less if measured by value. In 2003, groundfish trawlers landed 97% of total groundfish harvest by weight but only 78% by value (Table 8-3). In contrast, non-trawl vessels realized greater average value per landed weight, primarily due to relatively large landings of high-value sablefish. Pacific whiting, although accounting for a large share of groundfish landings—84% by weight in 2003—are a low-value product, accounting for only 27% of groundfish exvessel revenue in that year. Since whiting are caught almost exclusively by limited entry trawl vessels, they skew the overall value per unit weight calculations for this sector.

Table 8-4 shows groundfish and nongroundfish limited entry trawl landings in major species categories north and south of 40° 10' N latitude. This line of latitude, about 20 miles south of Cape Mendocino, is the primary demarcation used in groundfish management. Cumulative trip limits, for example, usually differ north and south of this line. For management purposes this line supplanted the boundary between the Eureka and Monterey management areas, at 40º 30' N latitude. Because important fishing grounds straddle that boundary, using a line slightly to the south simplifies management and enforcement.

Most limited entry trawl groundfish landings occur north of 40º 10' N latitude—134,574 mt of groundfish in 2003, or 97% of that year’s groundfish landings. Again, Pacific whiting account for a large share of these landings since that fishery occurs almost exclusively in the north. Excluding whiting, limited entry trawlers landed 16,466 mt of groundfish in the north, worth $22.4 million, compared to 4,510 mt, worth $5.6 million, in the south. The main groundfish bottom trawl fisheries include the deepwater DTS fishery, and trawling on the continental shelf for flatfish—principally arrowtooth flounder, petrale sole and Dover sole—and other bottom-dwellers. Trawl fisheries targeting rockfish, while important in the past, have been greatly diminished due to management restrictions put in place to prevent overfishing and rebuild overfished stocks. In 2003, rockfish accounted for 21% of non-whiting landings in the south versus only 12% in the north. In 1998, before overfishing declarations triggered more restrictive management measures, these shares were 55% in the north versus 46% in the south.

8.1.1.2 Limited Entry Fixed Gear Sector

Vessels deploying longlines and traps (pots) comprise the bulk of the limited entry fixed gear sector. These gear types also may be used by vessels in the open access sector, but preferential harvest limits favor license holders. High-value sablefish have been the principal target for these vessels; this species accounts for a large share of landings, especially when measured by exvessel value. According to Table 8-5, sablefish generated $3.9 million in revenues in 2003, about 62% of the $6.3 million in groundfish landings generated by this sector during the year. Not unexpectedly, this sector has been plagued by overcapacity, although a series of management initiatives have largely addressed the problem. In the early to mid 1990s the fishery was a “derby” managed by very short seasons of two weeks or less. Two groundfish FMP amendments, Amendment 9, requiring a permit endorsement to participate in the primary sablefish fishery, and Amendment 14, introducing permit stacking, have helped to alleviate the symptoms of over capacity in the fixed gear sablefish fishery, effectively eliminating the short, derby season. (Permit stacking allows up to three sablefish-endorsed permits to be used per vessel. Through a tier system, landing limits vary with the number and type of permits held.) According to Table 8-5, in 2003 total groundfish landings by this sector were more than four times greater in the north than in the south. However rockfish landings in the south were double what they were north of 40° 10' N latitude, making these species a much more important component of catches in the south.

8.1.1.3 The Open Access Sector

The open access sector comprises vessels that do not hold a federal groundfish limited entry permit and that target or incidentally catch groundfish using a variety of gears. As discussed in Section 1.2.4, the “open access” appellation can be confusing because vessels in this sector may hold limited entry permits for other, nongroundfish fisheries issued by the federal or state governments. However, groundfish catches by these vessels are regulated under the groundfish FMP. For example, open access vessels must comply with cumulative trip limits established for this sector and are subject to the other operational restrictions imposed in the regulations, including general exclusion from the Rockfish Conservation Areas.

Fishery managers divide this sector into directed and incidental categories. The directed fishery comprises vessels targeting groundfish while the incidental fishery category applies to vessels targeting other groundfish but landing some groundfish in the process. In practice it can be difficult to segregate vessels into these two categories because, ultimately, the choice depends on the intention of the fisher (which the manager does not know). Over the course of a year—or even during a single trip—a fisher may engage in several different strategies, switching between the directed and incidental categories. Such changes in strategy are likely the result of a variety of factors, but especially the potential economic return from landing a particular mix of species. Because of these complexities, managers typically distinguish directed from incidental vessels by applying a value threshold to the landings composition for a particular vessel (or trip, depending on the kind of analysis): open access vessels with more than half of their total landings value coming from groundfish are included in the directed fishery while the remainder are assumed to be landing groundfish incidentally while targeting other species. Based on this criterion, the number of unique vessels targeting groundfish in the open access fishery between 1995 and 1998 coastwide was 2,723, while 2,024 unique vessels landed groundfish as incidental catch (1,231 of these vessels participated in both) (SSC Economic Subcommittee 2000).

Fisheries are generally distributed along the coast in patterns governed by factors such as location of target species, presence of ports with supporting marine supplies and services, and restrictions or regulations imposed by state and federal governments. The majority of landings by the directed groundfish fishery, by weight, occur off California, while Oregon shows the next highest landings. In the incidental groundfish fisheries, Washington also has the lowest groundfish landings by the incidental fishery (Hastie 2001). Participation in the open access fishery is much greater in California than in Oregon and Washington combined. In 1998, 779 California boats, 232 Oregon boats, and 50 Washington boats participated in the directed open access groundfish fishery; and 520 California boats, 305 Oregon boats, and 40 Washington boats participated in the incidental open access fishery (SSC Economic Subcommittee 2000).

Hook-and-line gear, the most common open access gear type, is generally used to target sablefish, rockfish, and lingcod; pot gear generally is used when targeting sablefish and some thornyheads and rockfish. Though largely restricted from use under current regulations, in the past in Southern and Central California setnet gear was used to target rockfish, including chilipepper, widow rockfish, bocaccio, yellowtail rockfish, and olive rockfish, and to a lesser extent vermillion rockfish.

Although most groundfish landed by open access fishers are typically landed and sold dead, higher prices for live fish have stimulated landings in this category. Live fish harvests are a recent but growing component of the directed fishery: In 2001, 20% of fish landed (by weight, coastwide) by directed open access fishers was alive, compared to only 6% in 1996.[1/] In the live-fish fishery, the fish are caught using pots, stick gear, and rod-and-reel, and kept aboard the vessel in a seawater tank, to be delivered to foodfish markets—such as the large Asian communities in California—that pay a premium for live fish. Currently, Oregon and California are drafting nearshore fishery management plans that would move some species of groundfish landed in the live fish fishery from federal to state management.

Many fishers catch groundfish incidentally when targeting other species because of the kind of gear they use and the co-occurrence of target and groundfish species in a given area. Managers classify vessels in the open access incidental fishery if groundfish comprise 50% or less of their landings, measured by dollar value. Fisheries targeting pink shrimp, spot prawn, ridgeback prawn, California and Pacific halibut, Dungeness crab, salmon, sea cucumber, coastal pelagic species, California sheephead, highly migratory species, and the mix of species caught in the gillnet complex comprise this incidental segment of the open access sector.

Table 8-6 shows open access landings by major species groups north and south of 40° 10' N latitude. It can be seen that groundfish landings in this sector are generally more important in the south, measured by both landings and revenue. Open access fishers in the south generally earned more per pound of landed groundfish, reflecting more lucrative markets—especially for live fish—in that region. Total open access

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1/ Managers are faced with a similar problem as discussed above in determining landings from this fishery. Landings data do distinguish live fish sales, but the price information suggests that this classification is inaccurate. Therefore, in practice, only those sales of species other than sablefish that garner a landed price above $2.50 per pound are classified in the live fish sector (see Table 3.5.2-10 in PFMC 2004b for a price breakdown).

groundfish landings in 2003 (1,279 mt) were comparable to 1998 (1,162 mt). But the total masks a decline in landings over this period in the south and a gain in the north. The net result is that the landings differential between the two regions is now less dramatic. In 1998 vessels in the south landed almost three and a half times as much groundfish as those in the north. By 2002 it was less than one and half times as much, and in 2003 the totals are almost equal. Rockfish were an important component of open access groundfish landings in the south—75% of landings by weight in 1998. Limits imposed because of overfishing declarations for certain rockfish species, bocaccio and cowcod in particular, explain the steep drop in rockfish landings in the south.

8.1.2 Buyers, Processors and Seafood Markets

The seafood distribution chain begins with deliveries by the harvesters (exvessel landings) to the shoreside networks of buyers and processors, and includes the linkage between buyers and processors and seafood markets. In addition to shoreside activities, processing of certain species (e.g. Pacific whiting and pollock) also occurs offshore on factory ships. Several thousand entities have permits to buy fish on the West Coast. Of these 1,780 purchased fish caught in the ocean area and landed on Washington, Oregon, or California state fishtickets in the year 2000 (excluding tribal catch) and 732 purchased groundfish (Appendix A Table 7-1).[2/]

Larger buyers tend to handle groundfish more than smaller buyers. (Appendix A Table 7-2). The larger buyers also tend to handle trawl vessels more than smaller buyers. (Appendix A Tables 7-1 and 7-3). Mid-size buyers tend to have greater importance for nontrawl vessels than for trawl vessels.

Absent data on processor revenue and costs, gross exvessel value of purchases is used as an indicator of processor dependence on groundfish purchases. Large buyers of groundfish tend to have a lesser percentage of their overall purchases from groundfish than smaller buyers (Appendix A Table 7-4).

8.1.2.1 Live Fish Markets

An important and growing share of groundfish harvest is delivered live. These deliveries help feed the growing trade in live seafood consumed in restaurants. Groundfish delivered live were primarily nearshore rockfish and perch, but also included thornyheads, sablefish and lingcod. About 86% of live fish landings were in California with the remainder in Oregon (PFMC 2004b). There were no recorded live fish landings in Washington. Significantly higher exvessel price was paid for live product. The coastwide average price for live product was nearly four dollars per pound, compared with under one dollar for other deliveries of the same species.

8.1.2.2 Seasonality

Groundfish buyers (particularly larger buyers) tend to have more of a year-round presence in the fishery than nongroundfish buyers (Appendix A Table 7-5).

2/ A "buyer" was defined here by a unique combination of Pacific Coast Fisheries Information Network (PacFIN) port code and state buyer code on the fishticket. For California, a single company may have several buying codes that vary only by the last two digits. In PacFIN, these last two digits are truncated, and so were treated as separate buying units only if they appear for different ports.

8.1.2.3 West Coast Groundfish and the World Market

West Coast groundfish compete in a global market, not only with similar species produced in other regions of the world, but also with other fish species such as salmon and tuna. In addition, fish compete with other sources of protein in consumers' budgets. More than 4.7 million mt of fish and other seafood were landed in the U.S. in 2000, approximately the same amount landed in each of the prior two years (DOC 2001). West Coast groundfish contributed about 0.14 million mt, 0.13 million mt, and 0.12 million mt to this total in 1998, 1999 and 2000, respectively. Pacific whiting, a relatively abundant but low-value species, comprises about two-thirds of West Coast groundfish landings by weight, but only around 10% of groundfish exvessel revenue.

Production of farm-raised fish has increased rapidly in recent years. In 2000, more than 0.4 million mt of cultured fishery products were produced in the U.S., and more than 45 million mt were raised worldwide. Salmon aquaculture demonstrates the emerging importance of farmed species. While commercial salmon harvest is still near the 1980 to 1997 annual average, world salmon supply has tripled since 1980 due to a ninefold increase in farmed salmon to 1.5 million mt in 2000.

An objective of groundfish management has been to spread harvest of the annual OY over as much of the year as possible. Consequently, groundfish harvesting occurs in every month, although beginning in the late 1990s, it took on increased importance during the summer months when sablefish harvest peaked during the primary limited entry fixed gear fishery. (Appendix A Table 7-7).

Groundfish have historically provided West Coast commercial fisheries participants with a relatively steady source of income over the year, supplementing the other more seasonal fisheries. Although groundfish contributed only about 17% of total annual exvessel revenue in 2000, seasonally groundfish played a more significant role, providing one-fifth to one-third of monthly exvessel revenue coastwide during April and the three summer months. The peak contribution by the groundfish fishery in 2000 was sablefish during August (20% of exvessel revenue). Flatfish harvest supplied between 3% and 9% of monthly exvessel revenue throughout the year, and rockfish contributed an additional 2.5% to 6.8% to monthly exvessel revenue. For northern parts of the coast, groundfish is particularly important just before the start of the December crab fishery.

8.1.2.4 Exvessel prices

Table 8-7 shows average annual West Coast commercial exvessel prices for major species groups from 1981 to 2003. In 2002 and 2003, exvessel prices for groundfish species groups were generally above their 1998-2003 averages, with the exception of "other groundfish." This was due in part to the expansion of the high-value livefish fishery in recent years. Non-groundfish species notably below their 1998-2003 average prices include pink shrimp and Dungeness crab. It is worth noting that a large number of West Coast groundfish fishers also participate in seasonal fisheries for pink shrimp and Dungeness crab.

8.1.2.5 Exprocessor and wholesale prices

While producer prices for groundfish products have not fared quite as badly as for other frozen fish (including salmon), they still are significantly below recent highs. The trend may be flat or still lower in the future (Appendix A Table7-9). Increasing production of farmed salmon is partly responsible for a continuing slump in salmon commodity prices. Producer prices for meat products in general have been relatively weak, thereby helping to hold down prices for competitive fish protein. Preliminary 2003 estimates of producer price indices for fish and meat products were higher than seen in recent years, possibly due to the continuing improvement in the world economic outlook.

8.1.2.6 Trade and domestic demand

Most West Coast groundfish compete in the fresh and frozen fish product markets. In 2000 the U.S. imported 1.8 million mt of edible fishery products, including 1.5 million mt of edible fresh and frozen fish products. In 2000 the U.S. exported about one million mt of edible fishery products, including 190,000 mt of edible, fresh or frozen flatfish and groundfish products. One third of edible fishery exports were to Japan. While surimi was the single largest component of total fresh and frozen exports by weight, salmon was the most valuable export, generating $353 million on the 100 thousand mt of fresh and frozen product shipped, and another $146 million from exports of canned product. Asia was the largest export region, absorbing 61% of U.S. fishery exports by volume. Japan alone bought 34% of total fishery exports, and South Korea and China took 11% and 10%, respectively (Appendix A Section 7.1).

From 1910 through the early 1970s, annual per-capita fish consumption in the U.S. generally ran between 10 pounds and 12 pounds edible weight. Beginning in the early 1970s, per-capita consumption increased, and in the mid 1980s began shifting upward again to the 15-pound to 16-pound range where it has generally remained since 1985. In 2000 annual per-capita U.S. fish consumption was estimated to be 15.6 pounds. Internationally the U.S. ranks just above average in terms of per-capita fish consumption along with countries like the United Kingdom, Italy, Russia, and Canada, and not far below China, but less than half the level of Japan and South Korea (Appendix A Section 7.1).

8.1.3 Tribal Fisheries

West Coast treaty tribes have formal allocations for sablefish, black rockfish, and Pacific whiting. Members of the four coastal treaty tribes participate in commercial, ceremonial, and subsistence fisheries for groundfish off the Washington coast. Participants in the tribal commercial fisheries use similar gear to non-tribal fishers. Groundfish caught in the tribal commercial fishery are distributed through the same markets as non-tribal commercial groundfish catch.

There are several groundfish species taken in tribal fisheries for which the tribes have no formal allocations, and some species for which no specific allocation has been determined. Rather than try to reserve specific allocations of these species, the tribes annually recommend trip limits for these species to the Council, who try to accommodate these fisheries. Tribal trip limits for groundfish species without tribal allocations are usually intended to constrain direct catch and incidental retention of overfished species in the tribal groundfish fisheries.

Twelve western Washington tribes possess and exercise treaty fishing rights to halibut, including the four tribes that possess treaty fishing rights to groundfish. Tribal halibut allocations are divided into a tribal commercial component and the year-round ceremonial and subsistence component.

The bulk of tribal groundfish landings occur during the March-April halibut and sablefish fisheries. Most continental shelf species taken in the tribal groundfish fisheries are taken during the halibut fisheries, and most slope species are similarly taken during the tribal sablefish fisheries. Approximately one-third of the tribal sablefish allocation is taken during an open competition fishery, in which vessels from the four tribes on the Washington coast have access to this portion of the overall tribal sablefish allocation. The open competition portion of the allocation tends to be taken during the same period as the major tribal commercial halibut fisheries in March and April. The remaining two-thirds of the tribal sablefish allocation is split between the tribes according to a mutually agreed-upon allocation scheme. Specific sablefish allocations are managed by the individual tribes. The fishery begins in March and goes until some time in the autumn, depending on the number of vessels participating in the fishery. Participants in the halibut and sablefish fisheries tend to use hook-and-line gear, as required by the IPHC. For equity reasons, the tribes have agreed to also use snap-line gear in the fully competitive halibut and sablefish fisheries. Therefore, someone participating in a fully competitive sablefish fishery, and did not land any halibut, would not have to meet any IPHC requirements. But according to tribal regulations, they would still have to use snap-line gear.

In addition to these hook-and-line fisheries, the Makah tribe annually harvests a whiting allocation using mid-water trawl gear. Since 1996, a portion of the U.S. whiting OY has been allocated to the Pacific Coast treaty tribes. The tribal allocation is subtracted from the whiting OY before allocation to the nontribal sectors. Since 1999, the tribal allocation has been based on a sliding scale related to the U.S. whiting OY. To date, only the Makah tribe has fished on the tribal whiting allocation. Makah vessels fit with mid-water trawl gear have also been targeting widow rockfish and yellowtail rockfish in recent years.

The following table shows the distribution of vessels engaged in Tribal groundfish fisheries:

Treaty Tribe	Number of Vessels in Groundfish Fishery			Port
	Longline (length in ft)	Trawl (length in ft)	Total	
Makah	10 (49'-62')	35 (33'-62')	41	Neah Bay
Hoh	1	-	1	La Push
Quileute	7	-	7	La Push
Quinault	10	-	10	West Port

Table 8-8 shows recorded landings of groundfish species by treaty tribes from 1995 to 2003. Since 1996, Pacific whiting have comprised the vast bulk of tribal landings, even though in 2000 and 2001 whiting landings were relatively low due to reduced coastwide allocations. As shown in Table 8-9, in terms of exvessel revenue, sablefish landings provided well over half of total tribal groundfish revenue each year except 1998, 1999, 2002 and 2003; and over 30% of total revenue in those year.

8.1.4 Recreational Fisheries

The distribution of resident and non-resident ocean anglers among the West Coast states in 2000, 2001 and 2002 is shown in Table 8-10. The table demonstrates the importance of recreational fishing, especially in Southern California. The estimated number of resident recreational marine anglers in Southern California was more than double the number in the next most numerous region, Washington state. While most of the recreational anglers were residents of those states where they fished, a significant share were also non-residents. Oregon had the largest share of non-resident ocean anglers in all three years.

Fishing effort is related to weather, with relatively more effort occurring in the milder months of summer, and relatively less in winter (Table 8-11). As might be expected, this effect is more pronounced in higher latitudes, although the reasons include opportunity as well as climate. Salmon seasons are longer in California than in Oregon, which in turn are longer than in Washington. Until recently, groundfish seasons were also more restrictive in Washington, with the lingcod season being closed from November through March.

Recreational fishing in the open ocean has generally been on an increasing trend since 1996 (see Table 8-12); however, charter effort has decreased while private effort increased during that period. Part of this increase is likely the result of longer salmon seasons associated with increased abundance. Some effort shift from salmon to groundfish likely occurred prior to 1996 when salmon seasons were shortened. Groundfish are both targeted and caught incidentally when other species, such as salmon, are targeted. While the contribution of groundfish catches to the overall incentive to engage in a recreational fishing trip is uncertain, it seems likely that the possibility or frequency of groundfish catch on a trip adds to overall enjoyment and perceived value.

8.1.4.1 Recreational Charter Industry

The distribution of West Coast charter vessels engaged in ocean fishing in 2001 is shown in Appendix A Table 6-10. More than half of the charter vessels listed operated from California ports, demonstrating the importance of recreational fishing industry in that state.

8.1.4.2 Private Vessels and the Recreational Fishing Experience Market

Just as West Coast commercial groundfish is only one segment of a broader food market, the groundfish recreational fishery represents only one segment of a broader recreational market. Other types of marine recreational angler trips, freshwater angling, and other recreational activities are, to varying degrees, potential substitutes for ocean groundfish fishing.

Demand for recreational trips and estimates of the economic impacts resulting from recreational fishing are related to numbers of anglers. Reliable data are not available on the number of West Coast anglers targeting specific species. However, data are available on the total number of saltwater anglers, and it is evident the presence of opportunities to catch species other than directly targeted ones increases the propensity of anglers to fish and the value of the overall recreational fishing experience. In the U.S., over 9 million anglers took part in 76 million marine recreational fishing trips in 2000. The West Coast accounted for about 22% of these participants and 12% of trips. Seventy percent of West Coast trips were made off California, 19% off Washington, and 11% from Oregon (Gentner 2001).

Table 8-12 shows that in three of the four West Coast regions, groundfish catch, either targeted or incidental, accompanied a significant share of both charter and private recreational trips. This effect was greatest in Oregon where groundfish catch was consistently associated with over half the recreational trips each year. Only in Southern California did groundfish appear to be a relatively minor part of regional marine recreational effort.

8.1.5 General Public

8.1.5.1 Market and non-market Consumer Goods

For goods exchanged in markets where a consumer price can be determined (for example seafood), price and quantity information can be used to estimate the benefits consumers derive from consumption activities. A given regulatory action may have little or no impact on consumers if changes in the quantity of fish available are not expected to change prices. This is especially true if imports or other protein substitutes are readily available. In the market for recreational experiences, individuals pay fees to participate in recreational fishing trips on charterboats. Price and quantity information from these trips might allow estimation of the benefits participants derive from this type recreational fishing. However, charter trips may often be purchased as part of a bundle of goods and services that include nonfishing recreational activities. Therefore, the estimation of benefits from recreational charter activities is less straightforward than for marketed consumer goods.

For other consumer goods, especially bundles of goods and services such as a recreational fishing trip taken on a private vessel, the prices and quantities associated with each transaction are much more difficult to determine. For the private recreationalist, the amount spent on fishing gear, licenses, and other goods necessary to carry out a particular fishing trip is difficult to isolate. The term "private" is used here to designate a recreational fisher fishing from a private vessel, the shore, bank or a public pier, as opposed to using a charter vessel. Depending on the value a particular individual places on alternatives to fishing, the maximum benefit associated with a fishing trip may far exceed actual trip expenditures.

8.1.5.2 Consumptive vs. non-consumptive activities

The sectors benefitting from a resource can generally be placed into one of three groups: consumptive users (e.g., recreational fishers, commercial harvesters, and processors), nonconsumptive users (e.g., wildlife viewers), and nonconsumptive nonusers (e.g., members of the general public who derive value from knowing that a species is being maintained at a healthy biomass level). The following table displays the general relationship between use/non-use and consumptive/nonconsumptive types of activities.

Relationship between Use/Non-use and Consumptive/Non-consumptive Activities

	Consumptive	Non-Consumptive
Use	Commercial and Recreational Fishing, Processing.	Wildlife Viewing
Non-use	N/A	Existence Value, Options Value, Bequethal Value

In economic terms, renewable resource management entails a fundamental tradeoff between current and future costs and benefits. When management needs call for a substantial reduction in allowable harvests, additional costs may be born by the direct consumptive users, who may be left with much smaller harvests than they had been accustomed to. While this near-term sacrifice may create much greater harvest opportunities in the future once the stock has been replenished—depending on the duration of the rebuilding period—many fishers and processors may be unable to weather a long down period, opting instead to go out of business.

Nonconsumptive users may benefit from the use and non-use values provided by the resource. Wildlife viewing and the derivation of secondary benefits from ecosystem services are examples of non-consumptive use values. One or more of the following non-use benefits may accrue from the preservation of fish stocks at higher levels of abundance: (1) existence value derived from knowing a fish population or ecosystem is protected without intent to harvest the resource; (2) option value placed on knowing a fish population, habitat, or ecosystem has been protected and is available for use, regardless of whether the resources are actually used; and (3) bequethal value placed on knowing a fish population, habitat, or ecosystem is protected for the benefit of future generations. Offsite nonconsumptive uses of resources are public in nature in that no one is excluded from deriving the identified benefits, and one person's enjoyment does not affect another's potential benefit.

The existence of coastal fishing communities in themselves may have intrinsic social value. For example, the Newport Beach dory fishing fleet, founded in 1891, is a historical landmark designated by the Newport Beach Historical Society. The city grants the dory fleet use of the public beach in return for the business and tourism this unique fishery generates.

Value may also be placed on biological diversity. The value of biological diversity may be part of the total value placed on a site by nonconsumptive users (onsite or offsite). Three levels of biological diversity have been identified, (1) genetic diversity within a species, (2) species diversity (richness, abundance, and taxonomic diversity), and (3) ecosystem diversity. Ecosystem diversity encompasses the variety of habitats, biotic communities, and ecological processes (Caribbean Fishery Management Council 1998). Healthy ecosystems characterized by high biological diversity are generally able to provide a wider range of ecosystem services than are available from damaged or less diverse ecological communities. Examples of such ecosystem services include the nutrient recycling and filtering capabilities of wetlands, and the CO_2 sequestration function provided by growing forests.

The total societal value placed on offsite nonconsumptive use of a stock or component of the ecosystem will also depend on: (1) the size of the human population, (2) the level of income, (3) education levels, and (4) environmental perceptions and preferences. (After Spurgeon, 1992, as cited in Caribbean Fishery Management Council, 1998).

The above relationships imply that as human populations and the affluence of those populations increase, and as fish stocks and their ecosystems are depleted, nonconsumptive values associated with maintaining ocean resources are likely to increase. Another implication of these relationships is that once the basic integrity of ecosystem processes and marine fisheries components are preserved, the likely additional benefit from incremental increases biomass will decrease.

8.1.6 Communities

Fishing communities, as defined in the Magnuson-Stevens Act, include not only the people who actually catch the fish, but also those who share a common dependency on directly related fisheries-dependent services and industries. In commercial fishing this may include boatyards, fish handlers, processors, and ice suppliers. Similarly, entities that depend on recreational fishing may include tackle shops, small marinas, lodging facilities catering to out-of-town anglers, and tourism bureaus advertising charter fishing opportunities. People employed in fishery management and enforcement make up another component of fishing communities.

Fishing communities on the West Coast depend on commercial and/or recreational fisheries for many species. Participants in these fisheries employ a variety of fishing gears and combinations of gears. Naturally, community patterns of fishery participation vary coastwide and seasonally, based on species availability, the regulatory environment, and oceanographic and weather conditions. Communities are characterized by the mix of fishery operations, fishing areas, habitat types, seasonal patterns, and target species. While each community is unique, there are many similarities. For example, all face danger, safety issues, dwindling resources, and a multitude of state and federal regulations.

Chapter 8 of Appendix A to this document provides an overview of West Coast fishing communities organized around regions comprising port groups. The PacFIN ports have been further aggregated into 18 port groups. Figure 8-1 and Table 8-1 of Appendix A map the general location ports and port groups and lists the PacFIN ports included in each port group.

For comparison, the discussion in Chapter 8 of Appendix A further aggregates the port groups into seven larger regions, each comprising one or more port groups: Puget Sound, the Washington coast, the northern Oregon coast, the southern Oregon coast, Northern California, Central California, and Southern California.
The reader is referred to the following tables in Appendix A for detailed information on fleet characteristics by port group and region. These table are derived from PacFIN landings data:

Table 8-2a: Landings at each port by species group in 1998.
Table 8-2b:Landings at each port by species group in 2002.
Table 8-3a: Exvessel revenue at each port by species group in 1998.
Table 8-3b: Exvessel revenue at each port by species group in 2002.
Table 8-4: Number of vessels by primary port and species group in 2001.
Table 8-5: Number of vessels by primary port and vessel length class in 2001.
Table 8-6: Number of processors/buyers by primary port in 2001.
Table 8-7: Number of processors/buyers by purchase value of raw product by port group.

Detailed socioeconomic and demographic information by port group and region are shown in the following tables in Appendix A. These tables are derived from 2000 U.S. Census data:

Table 8-8: Income and employment from commercial fishing activities in 2001.
Table 8-9: Effort, personal income, and jobs related to recreational fishing on the West Coast in 2001.
Table 8-10: Urban and rural population at state, regional, and port levels in 2000.
Table 8-11: Racial composition at state, regional, and port levels in 2000.
Table 8-12: Hispanic population at state, regional, and port levels in 2000.
Table 8-13: Age distribution of the population at state, regional, and port levels in 2000.
Table 8-14: Educational attainment of the population at state, regional, and port levels in 2000.
Table 8-15: Unemployment and employment in natural-resource-related resource occupations at state, regional, and port levels in 2000.
Table 8-16: Median income, average income and poverty rate at state, regional, and port levels in 2000
Table 8-17a: and 8-17b: County-level economic profile.
Table 8-18: County unemployment rates, 2002.

8.2 Criteria Used to Evaluate Impacts

8.2.1 Commercial Fisheries

Changes in exvessel revenue are used to indicate the directions of change expected in net economic benefits derived from harvest by the commercial seafood vessels. Subgroups of the groundfish fleet are examined to determine if any particular group is experiencing greater effects than others. The primary divisions are between the limited entry trawl, limited entry fixed gear and open access fishery.

A complete assessment of changes in exvessel revenue requires an assessment of changes in fishing costs. Comprehensive information on fishing costs for the West Coast groundfish fishery is not currently available. However an effort is underway by PSMFC to fill this gap by collecting data on fixed an variable cost structures of vessels engaged in groundfish and other major West Coast fisheries.

In order to generate estimates of social net economic benefits, estimated net fishing costs should be adjusted by appropriate shadow prices to the determine real economic costs including opportunity costs. For example, expenditures for crew do not count as an economic opportunity cost if the labor would otherwise have been unemployed. Or if the labor would have been employed but at a lower wage, then the difference between the earnings in the fishery and in next best alternative employment is not be counted as an economic cost (i.e., only the next best wage rate would be counted as a cost).

Changes in operational flexibility resulting from regulatory constraints will be addressed qualitatively as an indicator of impacts on production costs.

Effects on human health and safety will be discussed primarily in terms of the effect of revenue changes on vessel maintenance and the effect of changes in the RCA on travel distances to fishing ports.

The discussion of cumulative impacts will include the effects of the trawl vessel buyback program and possible future implementation of an ITQ program. These regulatory changes will be discussed in terms of their likely effects on vessel revenue and operational costs. Changes in revenue will also be used as an indicator of the magnitude of likely harvest pressure that may affect adjacent fisheries as a result of changes in opportunity in the groundfish fishery.

8.2.2 Buyers, Processors and Seafood Markets

Due to the lack of data on prices, costs and profitability of buyers and processors, much the same indicators as used for the harvesting sectors are used for comparing impacts on the buyer/processing sector. Specifically, as a proxy for profits, exvessel revenue is used as an indicator of activity level. From the buyers' perspective, exvessel revenue represents expenditures for a primary production input. Projected change in exvessel revenue under the alternatives is stratified by different categories to examine impacts by buyer/processors' relative size and level of involvement in or dependence on groundfish purchases.

Substitutability of other products, or the same product imported from elsewhere, greatly affects regional seafood markets. Flatfish are generally lower value than rockfish and production is more constrained by the market than by availability of the resource itself. Rockfish are higher quality and valued in West Coast fresh markets. However, similar products from South America, Mexico, Canada or Alaska readily substitute for West Coast production. Whiting, which is turned into surimi, a generic fish product, competes with other sources of supply such as Alaska pollack.

The likelihood that the projected impacts on regional buyers and processors will affect the functioning of regional seafood markets is discussed below.

8.2.3 Tribal Fisheries

The criteria used in this section to compare 2004 management alternatives for the tribal groundfish fisheries are total projected groundfish landings and resulting exvessel revenue, assuming average 2003 exvessel prices.

8.2.4 Recreational Fisheries

8.2.4.1 Private Recreational Anglers

Recreational experiences generate economic value for individual anglers. Taken together, these values comprise a component of the net economic value that the recreational fishery contributes to the national economy. Estimating net economic value involves summing the marginal value of each trip (or, as an approximation, multiplying the number of trips by the average value per trip). However estimating these parameters is beyond the scope of this analysis. As a proxy, partial estimates of the change in total trips and indicators of the probable direction and degree of change in the average value per trip are provided. The following discussion highlights some of the issues to consider in estimating the net economic value of the recreational fishing experience.

Estimating Net Economic Value

The net value of a recreational fishing trip is a function of expected catch (species, number and size), attractiveness of the location, and distance traveled by the fisher. Restrictions can affect the quality of a trip by changing the relative species and size composition of the catch (decreasing trip quality). Reduced bag limits, while reducing the quality of existing trips, may also allow for an increased number of angler trips, thereby providing angling opportunities to a greater number of anglers, and thereby increasing the marginal value of each fish. With larger bag limits, while the marginal value of each additional fish caught per angler probably decreases, the cost per unit of catch for an individual angler also declines. So the net effect of changes in bag limits on the value of recreational experiences is ambiguous.

While a loss of fishing opportunity may translate into a direct loss in trip-related expenditures received by fishing-related businesses, the resulting change in net economic value will be considerably less than the change in expenditure. Presumably the recreationalist would still spend a similar amount but in another place and/or on another activity, even though this alternative experience may be somewhat inferior than what the person originally had in mind. Substitution of one activity for another in time and/or place may still involve a similar level of expenditures, although not of the same kind or necessarily in the same place. In this case, while analysis of the impact on expenditures would translate the change in revenue of the recreational fishing-related businesses as a direct loss in economic activity or income, analysis of net economic value would treat only the difference in the intrinsic value between the two types of experience to the individual as a net change in value.

An ideal model would allow us to measure the effect on total recreational effort (quantity and location of trips) and marginal value per trip resulting from changes in different management variables. Unfortunately, the data to populate such a model are currently lacking because the specific surveys to collect the required data have not been done.

Change in Recreational Effort

Conceptually, effort may change in response to caps on total landings (although if a cap is non-binding it may have no direct effect), change in seasons or change in area or depth closures. Estimates of the change in the number of angler trips in each state's recreational ocean fishery under each management alternative are derived. In general, where trips cannot be estimated, the projected change in total landings is used as a rough substitute for change in effort. Also considered are the proposed closure periods compared with the seasonal effort pattern observed in 2003, and the effect of shifts in the inshore closed area under the alternatives.

It should be noted that these estimates probably do not adequately project the effect of management changes on the distribution of effort, nor do they incorporate the impact of other changes on demand for recreational fishing experience. However this is the best available approach for evaluating impacts given the data limitations.

Change in Quality (Value) of Trips

Management measures may affect the perceived value of the recreational experience as well as the amount of effort. Those anglers forced to change their desired fishing patterns will probably experience a decrease in economic value from the trip. Historically, managers have observed little change in recreational effort in response to changes in bag limits. However downward adjustment of bag limits clearly does affect the quality of the recreational experience, and over time a reduced-quality experience would be expected to lead to reduced demand and lower levels of angler participation.

More Trips vs Higher Quality Trips

Greater restrictions (lower bag limits) on individual trips mean potentially more anglers may fish, but the individual experiences will be of a lower quality. More trips result in higher expenditures benefitting charter vessels and communities. However, especially in the short term, these expenditures may represent dollars taken away from other places and other types of activities. Therefore there may be a redistribution of benefits among local businesses even if net national benefit is unchanged. Since OYs and management measures are being changed together, we are not able to isolate these effects in the analysis.

8.2.4.2 Charter Boat Businesses

Demand for charter trips is affected by perceived quality of the experience. Factors affecting quality include bag limits and seasonal factors such as weather conditions during open seasons, and coincidental timing with recreational vacation periods. Impacts on charter boats under the alternatives are assessed based on estimated changes in total effort and timing of closure periods.

8.2.5 General Public

Measuring individuals' non-consumptive and non-use values for a marine resources is beyond the scope of this study. The primary criterion used as a proxy to compare impacts on non-consumptive users and non-users is unharvested biomass left in the ocean. This is assumed to be inversely proportional to total harvest levels under the alternatives.

8.2.6 Communities

8.2.6.1 Commercial Fisheries Impacts

Projected commercial landings under the alternatives are compared against recent historical landings to estimate change in landings by port area. Income multipliers generated by Fishery Economic Assessment Model (FEAM) (Jensen 1996) and differentiated by species, gear type and landing port are applied to the projected landings to estimate change in total personal income resulting from the estimated change in harvest under each alternative.

8.2.6.2 Recreational Fisheries Impacts

Annual recreational fishing effort under the alternatives is estimated by region and compared against recent data. Change in effort is assumed to be roughly proportional to the change in estimated harvest. Regional income multipliers derived from the recreational FEAM and average trip expenditures for recreational fishers in the four regions derived from (Gentner 2001) are applied to the estimated change in effort to generate the change in regional income resulting from the level of recreational fishing activity expected under each alternative.

8.2.6.3 Safety

Changes in vessel net income can have effects beyond economic ones. Reduced investment in maintenance and safety equipment can increase hazard associated with fishing. Reduced income opportunity could cause dislocation for crew members and their families. Individuals willing to work for lower paying jobs are generally less skilled and have fewer alternative employment opportunities. In addition to reduced operational efficiency, these factors could lead to deterioration in vessel safety conditions.

Safety of fishing vessels is also affected by the seasons and depth zones or areas open to fishing under the alternatives. Seasonal closures that push commercial and/or recreational vessels out to sea during poor weather months will increase the likelihood of safety problems for those vessels.

RCA boundaries and depth or area closures that pack vessels into shallow nearshore areas will also increase the likelihood of safety problems. Limits that push commercial, charter, and recreational fleets to fish in the same waters increase the risk of collisions, especially in bad weather. Recreational boaters tend to be less experienced and have less safety equipment than commercial skippers, and are often unfamiliar with bottom contours, wave dynamics, tides, and currents. This combination of increased vessel density, the inherent risks of navigating shallow waters, and relatively inexperienced skippers, increases the risks to vessels.

Effects on vessel safety under the alternatives will be evaluated by comparing revenue earning opportunities for commercial vessels, and the pattern of season and depth/area closures for both commercial and recreational vessels.

8.3 Discussion of Direct and Indirect Impacts

8.3.1 Commercial Fisheries

Effects on exvessel revenue under the management alternatives for the limited entry trawl fleet were estimated using the results from the trawl bycatch model run by the GMT, assuming a "medium" whiting OY level.[3/] The estimated exvessel revenue under each alternative is compared against 2003 experience.

For nontrawl limited entry sablefish vessels, estimates of aggregate changes in revenue were based on changes in the sablefish management measures under each alternative, compared against 2003 experience.

For the remainder of the limited entry and open access fleets, effects under the alternatives will be estimated based on changes in Pacific whiting OY, black and blue rockfish caps, black rockfish caps, season closures and changes in the boundaries of the RCA. In modeling these effects, it is generally assumed that vessels are affected in proportion to total harvest during the 2003 base period.

8.3.1.1 Limited Entry Trawl

Table 8-13 shows the distribution of total exvessel revenue derived in 2003 from landings by the limited entry trawl fleet by species group and PacFIN port (PCID) in thousands of dollars. Tables 8-14a, 8-14b, 8-14c, and 8-14d show estimated changes in the distribution of limited entry trawl fleet exvessel revenue under the alternatives: No Action, Alternative 1, Alternative 2, and Alternative 3, respectively. (Tables 8-15 and 8-16a, 8-16b, 8-16c and 8-16d show the equivalent estimates for the limited entry trawl fleet in terms of landed weight (mt).). Tables 8-17a, 8-17b, 8-17c and 8-17d display the average change in exvessel revenue under the alternatives (relative to 2003) by subsector of the limited entry trawl fleet (whiting and non-whiting) and by direction (higher or lower) and magnitude (< 20% or > 20% change) of the estimated average change.
Table 8-13 shows total exvessel revenue earned by the limited entry trawl fleet in 2003 was about $16.5 million.

Under the *No Action* alternative, limited entry trawl commercial fishery revenue is estimated to increase by $19.9 million, about the same amount as currently projected for the 2004 fishery. Almost half of this increase is due to anticipated increase in whiting harvest (Table 8-14a). Average exvessel revenue for limited entry trawl vessels is projected to increase by 92% relative to 2003 (Table 8-17a). The average increase for whiting vessels is 145%. For non-whiting vessels, average revenue is projected to increase by 54%. Average revenue for vessels with less than $100,000 exvessel revenue is projected to increase by 102%. Average revenue for vessels with more than $100,000 exvessel revenue is projected to increase by 90%.

Under Alternative 1, limited entry trawl revenue is projected to be $17.1 million higher than in 2003. More than half of this increase is due to whiting (Table 8-14b). Average exvessel revenue for limited entry trawl vessels is projected to increase by 81% relative to 2003 (Table 8-17b). The average increase for whiting vessels is 139%. For non-whiting vessels, average revenue is projected to increase by 41%. Average revenue for vessels with less than $100,000 exvessel revenue is projected to increase by 79%. Average revenue for vessels with more than $100,000 exvessel revenue is projected to increase by 82%.

[3/] While the actual decision on whiting OY will occur in a separate action in early 2005, and be based on a whiting stock assessment to be completed before that time, the choice of a medium OY level for whiting seems most likely at this time.

Under Alternative 2, limited entry trawl revenue is projected to be $19 million higher than in 2003. Nearly half of this increase is due to whiting (Table 8-14c). Average exvessel revenue for limited entry trawl vessels is projected to increase by 90% relative to 2003 (Table 8-17c). The average increase for whiting vessels is 141%. For non-whiting vessels, average revenue is projected to increase by 53%. Average revenue for vessels with less than $100,000 exvessel revenue is projected to increase by 104%. Average revenue for vessels with more than $100,000 exvessel revenue is projected to increase by 87%.

Under Alternative 3, limited entry trawl revenue is projected to increase by $19.5 million with respect to 2003. Nearly half of this increase is due to whiting (Table 8-14d). Average exvessel revenue for limited entry trawl vessels is projected to increase by 92% relative to 2003 (Table 8-17d). The average increase for whiting vessels is 141%. For non-whiting vessels, average revenue is projected to increase by 58%. Average revenue for vessels with less than $100,000 exvessel revenue is projected to increase by 109%. Average revenue for vessels with more than $100,000 exvessel revenue is projected to increase by 90%.

8.3.1.2 Limited Entry Fixed Gear Sablefish

Table 8-18 shows projected impacts on the limited entry fixed gear sablefish fleet under the alternatives compared with 2003. It should be noted that these projected impacts on total exvessel revenue assume that the entire allocation is landed and sold at prices prevailing during the 2003 season. In fact, 2003 landings data (Table 8-5) show that of the 2,019 mt landed catch target worth an estimated $8 million, limited entry fixed gear vessels landed only about 1,000 mt of sablefish and realized about $3.9 million in exvessel revenue.

Table 8-18 shows that the range of projected aggregate impacts under the alternatives for the limited entry sablefish fleet are comparable, with fairly small differences in potential exvessel revenue. Relative to 2003, total potential exvessel revenue increases by a similar amount under all the alternatives: under No Action, potential revenue increases by 21.4%, under Alternative 1A by 21%, under Alternative 1 by 20%, under Alternative 2 by 20.5%, and under Alternative 3 by 21%.

8.3.1.3 Other Commercial Fishing Sectors

The same nontrawl RCAs described in Section 2.2.4.2 under the alternatives for limited entry fixed gear also would apply for those open access fisheries that are not exempt from the RCA restrictions. Likewise the same minor nearshore species trip limits, seasonal restrictions, and permitting requirements described under the alternatives for limited entry fixed gear also apply to the open access sector.

Impacts to the open access groundfish and non-trawl, non-sablefish limited entry and sectors are therefore expected to be comparable to the impacts projected for the limited entry fixed gear sablefish fleet in the previous section.

8.3.1.4 Whiting Fishery and Widow Rockfish Constraints

Economic impacts were estimated assuming a “medium OY” for Pacific whiting is adopted in 2005 for the 2005 and 2006 whiting fisheries.

For the whiting fishery a weighted average of the 2000 through 2003 bycatch rates is used to estimate bycatch. Bycatch rates in the 2003 fishery were lower than previous years, purportedly because of higher abundance of whiting, resulting in easier targeting on concentrations with lower co-occurrence of other species, as compared to the years immediately preceding 2003.[4/]

Bycatch rates are substantially influenced by the rare occurrence of a “disaster tow” (a tow composed largely of one or more species other than whiting). The whiting fisheries occur at a different times of year, with the shoreside season opening first. There is concern that a few disaster tows might easily use all of the widow rockfish impacts planned for a given sector. Decisions on these and other issues affecting the whiting fishery will be part of the Council action next spring when it sets the whiting OY. Any reductions in whiting OY to reduce widow rockfish impacts will also affect the tribal allocation.

8.3.1.5 Operation Costs

New Gear Requirements for Selective Flatfish Trawl

Each of the three 2005-2006 management alternatives for limited entry trawl would require the use of selective flatfish trawl gear shoreward of the trawl RCA and north of 40˚10' N. lat. This would likely increase costs for vessels fishing in these areas relative to the No Action alternative, which retains differential limits depending on whether small or large footrope gear is used during a bimonthly period. However the relatively greater access to shallow depth target species afforded by the lower selective flatfish gear bycatch rates should at least partially mitigate the additional cost of the new gear.

Management Lines for the RCA

Vessel costs and safety are affected by the placement of lines delineating the RCA. If RCAs are expanded, costs may be affected by increased in transit distance and/or reduction in catch per unit effort. If catch per unit effort declines, effort-related costs would increase for vessels to bring in the same amount of catch. Revenues may decline if vessels are unable to take their full limits in the remaining open areas. In the catch projection models currently used, revenue is anticipated to change in response to depth closures due to reduced bycatch of certain species and/or a shift in catch location. However operational costs may also change, for example, for vessels forced to fish in greater depths. Closed areas may also affect vessel safety if vessels are must transit greater distances to fishing grounds, or must fish in shallower nearshore areas. Table 8-19 compares the size and configuration of RCAs under the action (and No Action) alternatives.

Trawl RCAs

For trawl vessels in 2004 (the No Action Alternative) south of Cape Mendocino, the inside boundary varies from 75 fm in periods 1 (Jan-Feb), 2 (Mar-Apr), 5 (Sep-Oct) and 6 (Nov-Dec); to 100 fathoms in periods 3 (May-Jun) and 4 (Jul-Aug), and the outside boundary is steady at 150 fathoms. Under the action alternatives the trawl RCA shoreward boundary varies between 75 and 100 fathoms, depending on the alternative and season, and the outside boundary is steady at 150 fathoms.

North of Cape Mendocino in 2004 (No Action), the inside boundary varies between 60 and 75 fm, depending on season, and the outside boundary was set at 200 fm in periods 1 (Jan-Feb) and 2 (Mar-Apr),

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[4/] While whiting stock abundance was also high in the late 1990s, fishers were not as actively trying to avoid the overfished species that are currently the subject of bycatch problems.

and at 150 fathoms for the rest of the year. Under the action alternatives, in periods 1 (Jan-Feb), 2 (Mar-Apr) and 6 (Nov-Dec) the inside boundary of the trawl RCA will be 75 fm. During periods 3 (May-Jun), 4 (Jul-Aug) and 5 (Sep-Oct), the inside boundary is set at either 60 fm in Alternative 1 or 100 fm in Alternative 2 and Alternative 3.

Non-trawl RCAs

For the nontrawl fisheries, in 2004 south of Cape Mendocino the outside RCA boundary is set at 150 fm and the inside boundary is 30 fm. Under the action alternatives for 2005-2006, the inside boundary is fixed at 30 fm, but the outside boundary varies from 150 fm under Alternative 1 and Alternative 1A, to 125 fm under Alternative 2, to 100 fm under Alternative 3.

North of Cape Mendocino in 2004, the non-trawl outside RCA boundary is set at 100 fm, and the inside boundary extends to 30 fm in Northern California and Oregon , and to the shoreline in Washington. Under the action alternatives for 2005-2006, the inside boundaries are the same as in 2004, but the outside boundary varies from 150 fm under Alternative 1, to 125 fm under Alternative 2, to 100 fm under Alternative 1 and Alternative 1A.

In general, trawl RCAs are somewhat larger under Alternative 1, and somewhat smaller under Alternative 2 and Alternative 3 than in 2004 (No Action). However, vessel costs resulting from transit distances or exclusion from prime fishing grounds should be no greater for trawl vessels under the alternatives than under No Action, because the seaward boundary of the trawl RCAs does not change.

Compared with No Action, non-trawl RCAs are least constraining coastwide under Alternative 3 and most constraining under Alternative 1. (Alternative 1A has the same RCA configuration as No Action.) Under Alternative 2, the non-trawl RCA is relatively more constraining than No Action north of Cape Mendocino, but relatively less constraining south of Cape Mendocino. Thus, compared with No Action, vessel costs resulting from transit distances or exclusion from prime fishing grounds should be lowest under Alternative 3, highest under Alternative 1, mixed under Alternative 2 (higher north, lower south), and no different from No Action under Alternative 1A.

8.3.2 Buyers, Processors and Seafood Markets

This section examines potential impacts on buyers and processors of groundfish resources under the alternatives. Data for this analysis are from West Coast fish landing receipts (fish tickets). These record buyer license numbers, but do not distinguish buyers from processors. Therefore, the analysis is restricted to examining buyers and processors in aggregate. While some buyers have landing or processing facilities in each port where they buy, others do not. For the purposes of this analysis, a simplifying assumption has been made that each unique combination of buyer code and PacFIN port area represents a different buying unit. This assumption exaggerates the number of entities affected since a single firm operating in different ports is treated as several different buying units.

8.3.2.1 Input Purchases

The projected change in the purchase of key inputs by seafood buyers and processors mirrors the change in exvessel revenue. Groundfish purchases by buyer/processors are expected to be higher under all of the alternatives than in 2003. However compared with the No Action alternative, total groundfish purchases are expected to be somewhat lower under the action alternatives. The lowest level of purchases is expected under Alternative 1, with the highest under Alternative 3.

8.3.2.2 Operating Costs

Output is expected to change roughly in proportion to change in input. However, the effect on net revenues will depend on changes in prices for final products or in the prices for material inputs and labor. Unfortunately, wholesale prices and processing/wholesaling costs are not available to assess the effects of harvest changes on gross or net revenue.

Processors have advocated year-round fishing in order to help maintain consistent groundfish supplies, even if this means low periodic landing limits for fishing vessels. If a processing plant is forced to shut down because of inconsistent or insufficient raw materials, the semi-skilled labor may find employment elsewhere, making it difficult to re-hire them when fish are again available.

8.3.2.3 Markets

Because of the availability of substitutes for West Coast groundfish products in the regional food distribution chain, differential effects on regional seafood markets under the management alternatives are expected to be minor. Most supermarkets and restaurants do not rely on local supplies to stock their shelves or prepare menus. Locally caught products that are no longer available would be replaced with close substitutes for the local products that are obtained from elsewhere in the global supply chain. As such we do not anticipate a discernable effect on the structure or functioning of regional markets for seafood products under any of the alternatives.

Since the regulations that would result under the management alternatives do not impose distortions, such as tariffs, or impose other barriers on regional markets, no significant change in the competitive position of West Coast buyer/processors vis a vis foreign ones, or large buyer/processors versus smaller ones is expected under any of the alternatives.

8.3.3 Tribal Fishery

Tribal allocations of sablefish and whiting are specified by negotiated agreements, with 10% of the north of 40°10' U.S. sablefish harvest guideline allocated to the tribes, and a whiting allocation consistent with the court-approved proposal in *United States v. Washington*, subproceeding 96-2. For species taken in tribal fisheries for which there is no formal allocation, the tribes recommend trip limits for these species that accommodate modest tribal fisheries. Trip limits are usually intended to constrain direct and incidental mortality of overfished species taken in the tribal groundfish fisheries.

Table 8-20 displays projected tribal harvests under the management alternatives for the 2005 and 2006 fisheries, compared with historic harvests for 1998, 2002, 2003 and estimated 2004 harvests. A medium OY Pacific whiting tribal allocation of 35,000 mt is assumed under each alternative for 2005. No projection for whiting OY is offered in the table for 2006. The difference in estimated landings between the alternatives is due to different assumption about lingcod targeting in the longline and trawl fisheries. Otherwise the landings for other species are assumed to be the same as expected in 2004. The estimated 2004 harvest levels represent the best estimate of impacts under the No Action alternative.

Exvessel value of the harvest levels in Table 8-20 is shown in Table 8-21. Average prices observed in 2003 were used to value estimated harvests in 2004 and in 2005 and 2006 under the alternatives.

8.3.4 Recreational Fishery

The recreational fishing management alternatives being considered for 2005 and 2006 retain the basic characteristics of the time and area closures introduced in 2003 in place during 2004.

While time/area closures may impose a loss on the individual angler forced to change from his or her optimal fishing plans, such closures are often intended to extend fishing opportunities over a longer period coastwide. Increased fishing opportunity allows for more angler trips and, depending on complementary regulations, a greater ocean catch. From a national or coastwide point of view, a loss to individual anglers in terms of quality of trips may be compensated by an increase in the total number of anglers able to participate in the ocean fishery.

With the exception of the state of Washington, there is no limit on the total number of charter vessels offering services. Even the limits in Washington are set at levels far above those required to meet current demand in the recreational fishery. Thus the effects on markets for guided or charter fishing activities under the alternatives will be driven by the same demand-related factors affecting the value of recreational experience overall: change in the quantity of available trips (season length) or the quality of the average trip taken (trip limits and time of the year).

Impacts on markets for recreational experience include both formal markets for guided or charter fishing experiences, and non-market measures of willingness-to-pay for recreational fishing experience. However there is insufficient data to measure the willingness to pay for recreational fishing experiences of varying quality. Thus while it is not possible to directly compare net economic value between the alternatives, it is possible to estimate projected catch and/or the number of recreational trips expected under the alternatives, and to use these measures to compare against baseline activity levels.

8.3.4.1 Modeling the Effects of Recreational Management Measures

This section describes the effects of different aspects of the alternative management measures, including season and depth restrictions, caps and size and retention limits.

Washington

Season and depth restrictions under all the management alternatives for 2005 and 2006 Washington ocean recreational fishery are the same as in 2004, i.e. open year round (except for lingcod) with no depth restrictions unless the harvest guideline is attained, in which case the fishery is closed outside of 30 fm. There is no difference in management measures or projected impacts between the alternatives. Table 8-23 shows estimated recreational groundfish effort in 2005 and 2006 under the management measures. The effort projection for Washington is based on an average of estimated groundfish effort in 2001, 2002 and 2003.

Oregon

Season and depth restrictions under all the management alternatives for 2005 and 2006 Oregon ocean recreational fishery are the same as in 2004, i.e. closed outside 40 fm June through September, closed outside 30 fm if a harvest guideline is attained anytime during the year. There is no expected differential impact between the alternatives.

Annual angler effort in 2005 and 2006 for ocean, shore and estuary areas is assumed to be similar to 2003 and 2004. Angler groundfish effort in 2003 for the ocean boat fishery was 57,000 angler trips. (Estimated groundfish angler trips in the shore and estuary fishery are not available, only total trips.) Table 8-23 shows estimated recreational groundfish effort in 2005 and 2006 under the management measures. The effort projection for Oregon is based on estimated groundfish effort in 2003.

California

The No Action Alternative

Management measures for the California recreational fishery under the No Action are the same as those regulations in place as of May 2004.

Action Alternative 1

Action Alternative 1 management measures for the California recreational fishery are the most conservative of the regulations considered for 2005-2006, with reduced daily bag limits, generally shorter seasons and more restrictive size limits.

Action Alternative 2

Action Alternative 2 management measures for the California recreational fishery result in intermediate effects relative to the other action alternatives considered for 2005-2006.

Action Alternative 3

Action Alternative 3 management measures for the California recreational fishery are the most liberal regulations considered for 2005-2006.

8.3.4.2Change in Total Catch and Effort

Section 4.3.2.6 describes the estimated distribution of recreational catch for important species and species groups under the 2005-2006 management measures. There is no difference in expected recreational catch between the alternatives for Washington and Oregon.

Table 8-23 shows estimated recreational fishing effort under the different management alternatives and in 2003. These estimates are based on catch and effort models developed by the states, and incorporate observations from recent years’ recreational fisheries. Due to uncertainty in the actual relationship between harvest level and effort, the relative rankings of the impacts under the alternatives are probably more reliable indicators than the absolute levels of impacts shown in the table.

There is no difference in estimated effort in Washington and Oregon between the alternatives.

Change in quality of trips

More trips vs higher quality trips

Because size limits and bag limits do not vary between the alternatives, and are identical or very similar to under the No Action alternative, there is probably very little tradeoff between quantity versus quality of trips between the alternatives.

Adjacent fisheries

Compared with No Action, opportunities for recreational groundfish fishing in Oregon and Washington do not change under of the 2005-2006 management alternatives.

Demand for Charter Boat Services

8.3.5General Public

This section compares non-consumptive values between the alternatives. The metric used, unharvested biomass left in the ocean, is assumed to be inversely proportional to total harvest levels under the alternatives.

Non-consumptive Users

Increased fish stocks may indirectly enhance the value of wildlife viewing experience for non-consumptive users. Presumably alternatives based on lower harvest levels will enhance these benefits more than alternatives based on higher harvests. While there is little difference in total expected harvest between the alternatives, Alternative 1 describes the largest RCAs, and so may have the highest value to non-consumptive users. There is little to distinguish between Alternative 2 and Alternative 3 in this regard.

Non-users

In the long run, increased stocks may enhance non-use values. Increases in existence value, options value or bequethal value for non-users may be proportional to the unharvested biomass. While there is little difference in total expected harvest between the alternatives, Alternative 1 describes the largest RCAs, and so may have the highest value to non-users in the general public. There is little to distinguish between Alternative 2 and Alternative 3 in this regard.

8.3.6 Fishing Communities

In this section, fishing communities are defined in a broad sense as collections of ports and processing facilities that are grouped based on geographical proximity and similarity of available commercial fishery opportunities and the applicable management regime. The Pacific Fisheries Information Network (PacFIN) ports comprising each commercial fishery port area are described in chapter 8 of Appendix A.

Due to data limitations and statistical uncertainty, recreational fisheries are differentiated at a broader, regional level: the state level for Washington and Oregon, and Northern (north of Point Conception) and Southern components for California recreational fisheries.

4.5.6.2 Direct and indirect impacts

Direct impacts consist of the changes in commercial landings, exvessel revenue and recreational effort expected under the different alternatives. Income impacts go beyond these direct impacts by measuring the total change in income received by participants in the local economy as a result of the direct effects. Income impacts (generated using FEAM) incorporate the indirect (change in suppliers and the distribution chain) and induced (change in spending by households) effects on the regional economies. (Appendix C for further discussion of income impact estimating methodology).

Commercial landings income impacts

Recreational fishing income impacts

Commercial landings employment impacts

Recreational Fishing Employment Impacts

Impacts on Safety

Commercial vessels

Compared with the No Action alternative, Alternatives 2 and 3 would generally have neutral to moderately positive impacts on trawl vessel safety. Alternative 1 would push some nearshore vessels into shallower water. For non-trawl vessels, Alternatives 3 would have neutral to positive impacts, while Alternatives 1 and 2 would tend to force vessels fishing north of Cape Mendocino into deeper water than under No Action.

Recreational vessels

In Washington, the same season and depth restrictions are in place under each alternative. There is no difference between the management alternatives in terms of safety considerations for recreational fishers.

In Oregon, the same season and depth restrictions are in place under each alternative. There is no difference between the management alternatives in terms of safety considerations for recreational fishers.

8.4 Discussion of Cumulative Impacts

It is generally not possible to distinguish differences in cumulative impacts among alternatives. The following cumulative impacts would be present under all alternatives.

8.4.1 Commercial Vessels

Exvessel Revenue

Trawl Buyback

The trawl buyback program removed 91 vessels from the groundfish limited entry trawl fishery along with 240 combined fishing permits associated with those vessels. These vessels account for 34.98% of total groundfish trawl permits and between 1.29% to 40.26% of total permits in each of the six fee-share fisheries. These vessels also account for 46.04% of total gross groundfish trawl revenues (excluding whiting) and from 1.13% to 29.70% of similar revenues in each of the six other fee-share fisheries. All told, these vessels involve annual gross revenues of a little over $20 million.

As an example of the potential effect of fleet reductions under the buyback program, a scenario was run using the trawl vessel participation model assuming a 33% reduction in the groundfish trawl fleet. The scenario showed potential trip limit increases for DTS species of roughly 50%. Other things being equal, the successful trawl buyback program should allow for higher trip limits, higher exvessel revenue, and more efficient use of fishing capital than prior to the program.

VMS Implementation

Implementing a VMS system in 2004 imposed additional costs on limited entry vessels. VMS allows shoreside personnel to remotely track vessel locations and determine vessel compliance with depth-based restrictions. Depth-based restrictions are a fundamental aspect of the current groundfish management regime, necessary to reduce bycatch of overfished species. These depth restrictions have provided significantly greater fishing opportunity than might have been allowed under a system without depth-based restrictions. The Council recommended VMS be required in 2003 for groundfish fishery limited entry vessels. However as a result of delays in implementation, VMS was not be required on trawl vessels until the start of the 2004 fishery.

VMS units cost around $800 per vessel, and cost between $1.50 and $5.00 per day to operate. VMS units may also have some safety benefits in helping to locate vessels in trouble at sea.

Individual Quotas

The Council will be considering individual quotas for the trawl fishery. While such a program will not be implemented for some time, substantial economic effects may be anticipated if the program is implemented in coming years. Among these would be a consolidation of most harvest among fewer vessels, more profitable harvesting businesses, increased flexibility in operation and safety, fewer but potentially better paying jobs, reduced vessel support services in some local communities and increased costs associated with the monitoring of catch and landings.

Impacts on Adjacent Fleets

In recent years, adjacent fleets have been impacted when vessels seek to make up lost fishing opportunity in the groundfish fishery by increasing revenue in other fisheries. Adjacent fisheries may also benefit over the short term if an expansion in the groundfish fishery absorbs effort that might otherwise be directed to the adjacent fisheries. The alternatives generally provide greater opportunities to harvest groundfish than were available in recent years. These increased opportunities, coupled with the effects of the trawl buyback, should help reduce pressure on adjacent fisheries compared with recent years resulting from vessels and effort displaced by groundfish restrictions.

8.4.2 Buyers and Processors

As noted in section 8.1, prices for fish products have recently been on a general downward trend, in spite of increasing demand. This is in part due to competition between and substitutability of different products, for example wild-caught domestic salmon versus imported or cultured supplies. Most consumers do not differentiate or attach a price premium to wild fish caught in sustainable fisheries, making it difficult for fishers to receive higher prices. Aquaculture producers have recently turned their attention to whitefish, with aquaculture production of halibut becoming a reality, and intensive development of production techniques for cod and other ocean species under way (Loy 2002). Competition with a more consistent supply of aquacultured products produced at lower cost will continue to exert downward pressure on seafood prices.

8.4.3 Tribal Fisheries

Tribal groundfish are an important component of the Washington coastal economy. Opportunities for tribal fisheries under the 2005-2006 management alternatives are improved compared with recent years. This should contribute to somewhat enhanced stability and opportunity for tribal fisheries participants and other Washington Coastal residents.

8.4.4 Recreational Fisheries

Periodic ocean and atmospheric phenomena that bring warm water closer to the West Coast north of Cape Mendocino can have a significant impact on recreational fisheries. During such periods, sport fishers get to experience fishing for species usually only found much further south, and local charter operators enjoy increased local demand for their services.

8.4.5 General Public

8.4.6 Communities

8.4.6.1 Cumulative impacts on income and employment

Many coastal fishing communities are also historically dependent on wood products industry and tourism. Both industries have suffered in recent years for different reasons. Wood products employment has generally been falling since the 1980s as a result of technological change in the industry (automation) and harvest restrictions on public land to protect critical habitat of threatened and endangered species. Tourism has suffered more recently as a result of the slow national economy and the perceived terror-related travel risk. Somewhat increased opportunities under the 2005-2006 management alternatives should help mitigate some of these negative impacts experienced by coastal communities in recent years.

8.4.4 Cumulative impacts on the built environment in fishing communities

While few coastal communities depend exclusively on fishing; harvesting, processing and related support industries (fuel, docks, ice, gear repair, etc.) are part of a complex web of interaction with other economic activities such as sport fishing, whale watching, tourism, and other recreational activities. Commercial and
recreational fishers both contribute financially to the businesses and infrastructure that serve and support them. Communities such as Newport, Oregon, celebrate their fishing industry, having turned the port waterfront into a major tourist attraction. This is also true for many other historic ports in Washington, Oregon, and California. Maintenance of port facilities for the fishing fleet provides access for other user groups, such as recreational fishers and boaters, and draws tourists who are attracted to the sights and smells of a working fishing port.

Management alternatives that reduce commercial and/or recreational fishing opportunity may reduce revenue and tax streams, thereby adversely affecting the ability of these ports to expand or maintain waterfront facilities and public infrastructure. However somewhat increased opportunities under the 2005-2006 management alternatives compared with recent years should help maintain the participation and revenue needed by coastal communities to maintain and enhance their waterfront facilities and public infrastructure.

8.5 Summary of Impacts

8.5.1 Commercial Fisheries

	Alternatives				
	No Action (Status Quo, 2004)	*Alt 1*	*Alt 2*	*Alt 3*	*Council Preferred*
Commercial Groundfish Exvessel Revenue (millions of dollars, no inflation adjustment)					
- At sea whiting					
- LE Trawl	$36.4	$33.6	$35.5	$36.0	
- LE fixed gear sablefish a/	*$9.8*	*$9.8*	*$9.7*	*$9.8*	
- other commercial					
Other Compliance Costs					
-RCA		Generally larger non-trawl and trawl RCAs than 2004	Generally larger non-trawl RCA, smaller trawl RCA than 2004	Some-what smaller non-trawl and trawl RCAs than 2004	
-Impact on Adjacent Fleets					
Safety		Non-trawl: negative; Trawl: neutral to negative	Non-trawl: negative; Trawl: neutral to positive	Non-trawl: neutral to positive; Trawl: neutral to positive	
Cumulative					
VMS	Imposed on the trawl fleet in 2004. Capital and operation costs are associated with the requirement. May be extended to other portions of the groundfish fleet in coming years.				
Buyback	Industry costs of approximately $36 million. May result in higher trip limits than would be otherwise.				
ITQs	Under consideration in the long-term. May result in consolidation within the fleet and increased efficiency. There will be monitoring and enforcement costs, some of which will likely be born by industry.				

a/ Total value of projected sablefish landed catch OY.

8.5.2 Buyers, Processors and Seafood Markets

Aggregate impacts on buyers and processors under the alternatives are shown in the table below.

Buyer/processor Impacts	*No Action* (Status Quo, 2004)	*Alt 1*	*Alt 2*	*Alt 3*	*Council Preferred*
Total raw material purchases (% change from No Action)					
Operating costs	unknown	unknown	unknown	unknown	
Markets and balance of trade	no effect	no effect	no effect	no effect	

8.5.3 Tribal Fishery

Aggregate impacts on tribal fisheries under the alternatives are shown in the table below.

Tribal Groundfish Harvest	*No Action* (Status Quo, 2004)	*Alt 1*	*Alt 2*	*Alt 3*	*Council Preferred*
landings (mt)	26,897	36,913	36,937	36,987	
revenue ($,000) a/	6,946	8,113	8,184	8,326	

a/ Assuming average 2003 exvessel prices.

8.5.4 Recreational Fisheries

Aggregate impacts on recreational fisheries under the alternatives are shown in the table below.

Recreational Fishery Impacts	Indicator	*No Action* (Status Quo, 2004)	*Alt 1*	*Alt 2*	*Alt 3*	*Council Preferred*
Estimated effort						
All Trips	(000 trips)[a/]					
GF Trips	(000 trips)					
Quality of trips	(-,0,+)					
Effect on adjacent fisheries	(-,0,+)					
Operational safety						
WA	(-,0,+)	0	0	0	0	0
OR	(-,0,+)	0	0	0	0	0
CA (North of 40-10)	(-,0,+)					
CA (40-10 to 34-27)	(-,0,+)					
CA (South of 34-27)	(-,0,+)					
Demand for charters	(-,0,+)					

a/ (-, 0, +)=Indicates decrease, no change, and increase respectively, with respect to conditions present in the 2002 recreational fishery.

8.5.5 General Public

8.5.6 Communities

Aggregate income and employment impacts on coastal communities under the alternatives resulting from commercial fishing and recreational fishing activities are shown in the table below.

Community Impacts	*No Action* (Status Quo, 2004)	*Alt 1*	*Alt 2*	*Alt 3*	*Council Preferred*
Commercial fishing community impacts:					
income impact ($,000)					
employment impact (jobs)					

Recreational fishing community impacts:					
income impact ($,000)					
employment impact (jobs)					

TABLE 8-1a. Total domestic shoreside landings and at-sea deliveries (round weight mt) from West Coast (WA, OR, CA) ocean area fisheries (0-200 miles) coastwide, 1981-2003 (includes commercial tribal fisheries, based on PacFIN data and Council [1997]). (Page 1 of 2)

Year	Lingcod	Whiting, At Sea	Whiting, Shoreside	Flatfish	Sablefish	Rockfish	Other Groundfish	Total Groundfish	Total Groundfish - Less Whiting	Total Groundfish - Less At Sea Whiting	Pink Shrimp	Spot Prawn, Trawl	Spot Prawn, Pot	Ridgeback Prawn, Trawl	Pacific Halibut
1981	3,307	73,557	838	25,972	11,419	59,774	1,729	176,596	102,201	103,039	18,202	174	4	87	160
1982	3,822	67,465	1,027	32,613	18,625	61,470	1,277	61,470	1,277	61,470	12,704	162	8	61	164
1983	4,163	72,100	1,051	29,639	14,685	48,157	889	170,684	97,533	98,584	6,052	58	1	70	322
1984	4,060	78,889	2,721	27,703	14,077	40,020	1,079	168,549	86,939	89,660	4,488	29	0	259	598
1985	3,883	31,692	3,894	30,400	14,308	37,347	967	122,491	86,905	90,799	12,408	26	4	357	536
1986	1,894	81,639	3,463	26,127	13,290	37,012	661	164,086	78,984	82,447	26,330	12	13	130	748
1987	2,586	105,997	4,795	28,796	12,784	40,242	2,644	197,844	87,052	91,847	31,060	21	14	85	307
1988	2,656	135,781	6,867	27,043	10,876	40,980	3,788	227,991	85,343	92,210	32,334	23	41	55	260
1989	3,580	203,578	7,414	29,880	10,439	45,334	2,694	302,919	91,927	99,341	35,550	30	48	61	212
1990	2,932	175,685	8,115	27,701	9,179	43,265	1,813	268,690	84,890	93,005	24,553	19	101	34	153
1991	3,167	200,594	21,040	30,515	9,496	35,282	2,978	303,072	81,438	102,478	19,064	21	103	52	169
1992	1,883	148,186	56,127	24,796	9,360	37,000	3,255	280,607	76,294	132,421	35,710	35	65	27	217
1993	2,200	91,640	42,108	22,107	8,145	38,252	3,483	207,935	74,187	116,295	22,451	51	105	33	252
1994	2,834	162,923	73,611	19,284	7,661	35,361	3,638	305,312	68,778	142,389	14,981	133	66	71	179
1995	1,700	98,376	74,967	19,706	7,951	32,171	2,135	237,006	63,663	138,630	11,342	136	42	187	142
1996	1,790	123,419	85,127	20,807	8,339	30,487	2,559	272,528	63,982	149,109	13,800	178	54	264	150
1997	1,652	142,726	87,410	19,508	7,951	25,576	2,271	287,094	56,958	144,368	17,456	263	79	177	201
1998	506	142,810	88,601	16,722	4,410	22,619	2,180	277,848	46,437	135,038	4,342	257	117	197	223
1999	441	139,940	83,637	20,213	6,660	16,408	1,627	268,926	45,349	128,986	12,404	185	93	632	220
2000	145	120,411	85,843	16,315	6,296	11,702	1,498	242,210	35,956	121,799	14,653	121	81	705	223
2001	156	99,875	73,475	13,863	5,646	7,806	1,427	202,248	28,898	102,373	17,595	92	95	161	331
2002	205	84,494	45,808	13,220	3,830	5,974	2,115	155,646	25,344	71,151	25,302	99	79	215	422
2003	166	86,212	55,336	14,160	5,451	4,136	2,154	167,615	26,067	81,402	13,874	3	73	225	399
1981-2003 Avg	*2,162*	*116,000*	*39,708*	*23,352*	*9,603*	*32,886*	*2,124*	*225,835*	*70,127*	*109,835*	*18,550*	*93*	*56*	*180*	*286*
1991-2003 Avg	*1,296*	*126,277*	*67,161*	*19,324*	*7,015*	*23,290*	*2,409*	*246,773*	*53,335*	*120,495*	*17,152*	*121*	*81*	*227*	*241*
1998-2003 Avg	*270*	*112,290*	*72,117*	*15,749*	*5,382*	*11,441*	*1,833*	*219,082*	*34,675*	*106,792*	*14,695*	*126*	*90*	*356*	*303*

NOTE: For 1981-1990, at-sea whiting catch estimates are from Council 1997.

TABLE 8-1a. Total domestic shoreside landings and at-sea deliveries (round weight mt) from West Coast (WA, OR, CA) ocean area fisheries (0-200 miles) coastwide, 1981-2003 (includes commercial tribal fisheries, based on PacFIN data and Council [1997]). (Page 2 of 2)

Year	California Halibut	Salmon	Sea Cucumber	California Sheephead	Gillnet Complex	CPS Squid	CPS Wetfish	HMS	Dungeness Crab	Other Crus-taceans	Other Species	Total Non-groundfish	Total
1981	191	7,967	0	0	1,258	23,510	105,357	152,465	9,011	1,480	38,365	358,231	534,827
1982	180	8,831	63	0	1,173	16,360	79,436	115,923	7,623	1,233	46,247	290,168	476,468
1983	289	2,936	74	0	678	1,959	32,076	114,644	7,169	1,403	48,437	216,168	386,852
1984	239	2,180	24	0	829	993	38,084	85,203	6,239	1,849	37,260	178,274	346,822
1985	149	5,043	0	0	1,954	11,071	26,657	34,004	7,703	1,754	43,790	145,456	267,947
1986	197	7,384	35	0	1,801	21,290	28,817	36,916	7,402	1,567	51,113	183,755	347,841
1987	224	9,410	49	0	1,370	19,985	36,860	35,902	8,464	1,447	56,546	201,744	399,588
1988	249	12,518	72	0	1,082	37,232	37,902	36,616	16,715	1,430	59,874	236,403	464,392
1989	273	6,869	0	0	875	40,936	35,160	27,446	16,045	1,806	67,110	232,421	535,341
1990	190	4,682	67	0	775	28,447	39,198	16,088	13,529	2,223	49,672	179,731	448,422
1991	235	3,734	264	0	851	37,388	45,047	11,135	6,185	2,035	31,752	158,035	461,107
1992	272	2,049	0	0	379	13,116	39,219	13,899	15,125	1,607	26,641	148,361	428,968
1993	218	2,214	295	0	309	42,889	31,397	17,300	17,411	1,773	20,341	157,039	364,974
1994	188	1,802	298	118	208	55,489	26,669	20,349	17,682	1,221	17,421	156,875	462,186
1995	262	4,756	268	115	276	70,363	52,963	18,538	16,937	1,462	17,857	195,646	432,652
1996	306	3,306	381	115	347	80,715	49,154	29,396	24,564	1,498	18,931	223,159	495,685
1997	415	3,700	209	141	340	70,471	70,617	26,406	12,347	2,010	22,731	227,563	514,655
1998	415	1,850	349	119	255	2,931	68,576	29,640	11,748	1,720	10,671	133,410	411,294
1999	385	2,709	272	63	394	92,122	76,092	17,702	15,783	1,478	11,901	232,435	501,575
2000	218	3,707	291	79	333	117,984	103,360	14,534	13,015	1,619	13,496	284,419	526,692
2001	245	3,358	323	68	264	85,959	106,105	14,816	11,234	1,643	12,530	254,819	457,100
2002	309	4,660	426	52	353	72,958	106,754	12,908	15,505	1,465	16,639	258,146	413,791
2003	293	5,986	344	48	141	39,348	77,843	20,004	32,556	1,287	24,577	217,001	384,616
1981-2003 Avg	*258*	*4,854*	*178*	*40*	*706*	*42,762*	*57,102*	*39,210*	*13,478*	*1,609*	*32,344*	*211,707*	*437,556*
1991-2003 Avg	*289*	*3,372*	*286*	*71*	*342*	*60,133*	*65,677*	*18,971*	*16,161*	*1,601*	*18,884*	*203,608*	*450,407*
1998-2003 Avg	*311*	*3,712*	*334*	*72*	*290*	*68,550*	*89,788*	*18,267*	*16,640*	*1,535*	*14,969*	*230,038*	*449,178*

NOTE: For 1981-1990, at-sea whiting catch estimates are from Council 1997.

TABLE 8-1b. Total domestic shoreside landings and at-sea deliveries (exvessel revenue, thousands of current dollars) from West Coast (WA, OR, CA) ocean area fisheries (0-200 miles) coastwide, 1981-2003 (includes commercial tribal fisheries, based on PacFIN data and Council [1997]). (Page 1 of 2)

Year	Lingcod	Whiting, At Sea	Whiting, Shoreside	Flatfish	Sablefish	Rockfish	Other Groundfish	Total Groundfish	Total Groundfish - Less Whiting	Total Groundfish - Less At Sea Whiting	Pink Shrimp	Spot Prawn, Trawl	Spot Prawn, Pot	Ridgeback Prawn, Trawl	Pacific Halibut
1981	1,662	12,264	141	14,834	5,258	22,339	757	57,254	44,850	44,991	20,160	780	38	165	411
1982	2,088	11,863	182	19,727	10,282	26,479	695	71,315	59,271	59,452	14,278	811	87	157	433
1983	2,284	12,783	186	17,735	7,691	23,775	529	64,983	52,014	52,200	9,753	370	13	141	805
1984	2,184	11,739	406	16,361	6,684	22,111	637	60,122	47,977	48,383	4,526	217	1	327	1,105
1985	2,241	4,631	571	18,633	10,564	23,223	576	60,440	55,238	55,809	9,648	245	47	483	1,226
1986	1,321	10,605	452	17,425	10,985	25,675	479	66,943	55,886	56,338	30,975	118	117	234	2,489
1987	2,151	14,662	664	22,235	13,423	31,069	1,949	86,153	70,827	71,491	46,534	203	176	209	1,250
1988	2,137	22,440	1,136	20,796	12,499	29,323	2,241	90,572	66,996	68,132	29,129	240	444	154	1,106
1989	2,768	29,256	1,071	20,521	10,796	32,137	1,570	98,119	67,792	68,863	28,615	215	503	176	863
1990	2,290	22,583	1,049	17,253	9,661	32,496	983	86,315	62,683	63,732	26,577	159	1,101	101	905
1991	2,457	23,437	2,396	21,246	14,330	28,922	1,669	94,457	68,624	71,020	23,407	222	1,189	148	1,077
1992	1,617	17,968	5,885	16,452	13,633	31,616	1,838	89,009	65,156	71,041	27,293	433	878	131	1,037
1993	1,846	7,071	2,843	14,669	10,009	32,530	1,774	70,742	60,827	63,670	16,472	610	1,545	140	972
1994	2,421	12,931	4,904	13,069	13,970	35,811	2,023	85,130	67,294	72,198	19,326	1,713	1,000	212	908
1995	1,683	10,194	7,821	15,367	23,640	39,581	1,721	100,007	81,992	89,814	18,088	1,898	670	476	676
1996	1,821	13,604	5,107	15,597	25,897	33,805	1,940	97,770	79,060	84,167	18,171	2,578	844	777	764
1997	1,740	19,195	8,162	14,323	27,878	27,883	2,044	101,224	73,867	82,029	15,224	3,721	1,235	690	891
1998	718	13,538	4,845	12,514	11,380	24,997	2,946	70,938	52,554	57,400	5,052	3,697	1,859	762	794
1999	715	11,723	6,871	13,679	17,103	20,497	2,547	73,134	54,541	61,411	12,822	2,682	1,577	1,545	962
2000	345	10,885	7,969	13,980	20,325	17,398	2,639	73,540	54,686	62,656	12,951	2,182	1,635	1,793	1,209
2001	387	10,569	5,748	12,631	17,512	12,880	1,957	61,684	45,367	51,115	10,293	1,703	1,905	532	1,474
2002	506	9,119	4,540	11,828	11,810	11,066	2,615	51,485	37,825	42,365	15,358	1,755	1,592	633	1,818
2003	412	10,454	5,525	13,141	18,442	7,675	2,632	58,281	42,302	47,827	7,668	61	1,504	676	2,303
1981-2003 Avg	*1,643*	*14,066*	*3,412*	*16,262*	*14,077*	*25,795*	*1,685*	*76,940*	*59,462*	*62,874*	*18,362*	*1,157*	*868*	*464*	*1,108*
1991-2003 Avg	*1,282*	*13,130*	*5,586*	*14,500*	*17,379*	*24,974*	*2,180*	*79,031*	*60,315*	*65,901*	*15,548*	*1,789*	*1,341*	*655*	*1,145*
1998-2003 Avg	*514*	*11,048*	*5,916*	*12,962*	*16,095*	*15,752*	*2,556*	*64,844*	*47,879*	*53,796*	*10,690*	*2,014*	*1,679*	*990*	*1,427*

NOTE: For 1981-1990, at-sea whiting catch estimates are from Council 1997.

TABLE 8-1b. Total domestic shoreside landings and at-sea deliveries (exvessel revenue, thousands of current dollars) from West Coast (WA, OR, CA) ocean area fisheries (0-200 miles) coastwide, 1981-2003 (includes commercial tribal fisheries, based on PacFIN data and Council [1997]). (Page 2 of 2)

Year	California Halibut	Salmon	Sea Cucumber	California Sheephead	Gillnet Complex	CPS Squid	CPS Wetfish	HMS	Dungeness Crab	Other Crus-taceans	Other Species	Total Non-groundfish	Total
1981	567	31,772	0	0	2,082	5,080	14,183	199,799	18,259	3,401	28,852	325,547	382,801
1982	551	37,410	25	0	1,897	3,581	9,636	134,490	18,155	3,944	27,199	252,654	323,970
1983	929	9,090	26	0	1,161	838	5,460	117,933	23,427	3,827	28,978	202,751	267,735
1984	897	10,748	10	0	1,397	500	6,852	95,099	21,798	6,705	17,509	167,690	227,811
1985	592	20,869	0	0	2,669	4,065	4,880	42,061	24,628	4,180	22,910	138,503	198,943
1986	865	25,187	16	0	2,483	4,527	4,857	44,987	22,709	5,309	23,395	168,268	235,213
1987	1,067	46,073	23	0	2,282	3,960	5,508	49,233	25,735	5,178	29,109	216,541	302,694
1988	1,246	68,050	32	0	1,936	7,868	6,461	59,069	43,507	5,758	34,883	259,885	350,457
1989	1,340	26,754	0	0	1,919	6,962	6,020	39,944	39,896	6,308	40,777	200,290	298,409
1990	985	21,966	36	0	1,649	4,748	5,420	24,676	45,598	7,187	47,905	189,014	275,329
1991	1,247	14,203	187	0	1,766	6,086	7,063	17,225	21,446	6,860	51,898	154,024	248,481
1992	1,443	9,271	0	0	939	2,497	6,270	26,177	38,884	6,710	47,608	169,570	258,580
1993	1,146	8,931	353	0	904	10,194	3,824	31,130	42,735	5,966	38,135	163,057	233,797
1994	1,117	7,260	424	750	541	14,369	3,882	37,482	52,617	5,742	35,903	183,243	268,371
1995	1,566	15,443	416	701	797	22,342	5,368	27,140	63,482	7,567	38,784	205,413	305,419
1996	1,738	9,337	544	694	982	21,908	5,452	45,587	74,352	8,091	39,254	231,072	328,845
1997	2,180	10,105	232	860	1,315	20,707	8,259	40,516	51,854	10,528	34,802	203,120	304,343
1998	2,107	5,712	456	693	892	1,631	6,860	40,274	46,281	8,658	11,416	137,143	208,080
1999	2,080	9,688	418	452	1,482	33,405	7,408	33,021	67,236	6,167	17,862	198,807	271,944
2000	1,349	13,943	605	593	1,280	27,076	11,935	32,941	61,658	8,197	20,248	199,595	273,136
2001	1,545	10,578	581	515	1,095	16,866	12,322	31,505	51,301	8,515	17,890	168,620	230,303
2002	1,988	13,015	792	391	1,504	18,261	11,944	22,032	57,848	8,257	15,082	172,270	223,755
2003	1,920	20,906	689	381	660	23,068	8,404	33,592	113,039	7,917	37,383	260,171	318,452
1981-2003 Avg	*1,325*	*19,405*	*255*	*262*	*1,462*	*11,328*	*7,316*	*53,300*	*44,628*	*6,564*	*30,773*	*198,576*	*275,516*
1991-2003 Avg	*1,648*	*11,415*	*438*	*464*	*1,089*	*16,801*	*7,615*	*32,202*	*57,133*	*7,629*	*31,251*	*188,162*	*267,193*
1998-2003 Avg	*1,832*	*12,307*	*590*	*504*	*1,152*	*20,051*	*9,812*	*32,227*	*66,227*	*7,952*	*19,980*	*189,434*	*254,278*

NOTE: For 1981-1990, at-sea whiting catch estimates are from Council 1997.

TABLE 8-1c. Total domestic shoreside landings and at-sea deliveries (exvessel revenue, thousands of inflation adjusted 2003 dollars) from West Coast (WA, OR, CA) ocean area fisheries (0-200 miles) coastwide, 1981-2003 (includes commercial tribal fisheries, based on PacFIN data and Council [1997]). (Page 1 of 2)

Year	Lingcod	Whiting, At Sea	Whiting, Shoreside	Flatfish	Sablefish	Rockfish	Other Groundfish	Total Groundfish	Total Groundfish - Less Whiting	Total Groundfish - Less At Sea Whiting	Pink Shrimp	Spot Prawn, Trawl	Spot Prawn, Pot	Ridgeback Prawn, Trawl	Pacific Halibut
1981	2,971	21,921	252	26,516	9,398	39,930	1,353	102,340	80,167	80,419	36,035	1,394	68	296	735
1982	3,517	19,986	306	33,233	17,323	44,609	1,170	120,143	99,852	100,158	24,053	1,367	147	265	729
1983	3,701	20,716	302	28,741	12,465	38,530	857	105,311	84,293	84,595	15,806	599	22	228	1,304
1984	3,412	18,336	634	25,554	10,440	34,536	995	93,908	74,938	75,572	7,070	339	1	511	1,726
1985	3,396	7,020	866	28,245	16,014	35,203	873	91,617	83,731	84,597	14,625	371	71	732	1,859
1986	1,959	15,728	670	25,844	16,293	38,079	711	99,285	82,886	83,556	45,940	175	174	347	3,692
1987	3,105	21,167	958	32,101	19,380	44,855	2,814	124,379	102,254	103,212	67,182	293	254	302	1,805
1988	2,984	31,327	1,586	29,033	17,450	40,936	3,128	126,444	93,531	95,116	40,667	335	620	215	1,544
1989	3,723	39,355	1,441	27,605	14,522	43,231	2,112	131,989	91,193	92,634	38,492	289	676	237	1,161
1990	2,967	29,249	1,358	22,346	12,513	42,088	1,273	111,794	81,186	82,545	34,421	205	1,426	131	1,172
1991	3,075	29,329	2,998	26,588	17,933	36,194	2,088	118,204	85,877	88,875	29,292	278	1,488	185	1,348
1992	1,978	21,980	7,199	20,125	16,677	38,676	2,248	108,883	79,704	86,903	33,387	530	1,074	160	1,268
1993	2,207	8,455	3,399	17,539	11,967	38,895	2,121	84,583	72,729	76,128	19,695	729	1,847	168	1,162
1994	2,834	15,139	5,742	15,301	16,355	41,927	2,369	99,668	78,787	84,529	22,626	2,006	1,171	248	1,063
1995	1,931	11,695	8,973	17,631	27,122	45,411	1,975	114,738	94,070	103,043	20,753	2,178	768	546	776
1996	2,050	15,317	5,750	17,561	29,159	38,063	2,185	110,085	89,018	94,768	20,459	2,902	950	875	860
1997	1,927	21,259	9,039	15,863	30,875	30,881	2,264	112,108	81,810	90,849	16,861	4,122	1,368	764	987
1998	787	14,829	5,307	13,707	12,465	27,381	3,227	77,704	57,567	62,874	5,534	4,050	2,036	834	869
1999	772	12,658	7,419	14,770	18,467	22,132	2,750	78,967	58,890	66,309	13,845	2,896	1,702	1,668	1,039
2000	365	11,502	8,421	14,773	21,478	18,385	2,788	77,712	57,789	66,210	13,685	2,306	1,728	1,895	1,278
2001	399	10,910	5,933	13,038	18,077	13,295	2,020	63,673	46,830	52,763	10,625	1,758	1,966	549	1,522
2002	514	9,271	4,616	12,024	12,006	11,250	2,659	52,341	38,454	43,070	15,613	1,784	1,619	644	1,848
2003	412	10,454	5,525	13,141	18,442	7,675	2,632	58,281	42,302	47,827	7,668	61	1,504	676	2,303
1981-2003 Avg	*2,217*	*18,157*	*3,856*	*21,360*	*17,253*	*33,572*	*2,027*	*98,442*	*76,429*	*80,285*	*24,101*	*1,346*	*986*	*542*	*1,393*
1991-2003 Avg	*1,481*	*14,831*	*6,179*	*16,312*	*19,310*	*28,474*	*2,410*	*88,996*	*67,987*	*74,165*	*17,696*	*1,969*	*1,479*	*709*	*1,255*
1998-2003 Avg	*542*	*11,604*	*6,204*	*13,576*	*16,822*	*16,686*	*2,679*	*68,113*	*50,305*	*56,509*	*11,161*	*2,143*	*1,759*	*1,045*	*1,476*

NOTE: Inflation adjustment used is the U.S. GDP Deflator (http://www.bea.gov/bea/dn/home/gdp.htm). For 1981-1990, at-sea whiting catch estimates are from Council 1997.

TABLE 8-1c. Total domestic shoreside landings and at-sea deliveries (exvessel revenue, thousands of inflation adjusted 2003 dollars) from West Coast (WA, OR, CA) ocean area fisheries (0-200 miles) coastwide, 1981-2003 (includes commercial tribal fisheries, based on PacFIN data and Council [1997]). (Page 2 of 2)

Year	California Halibut	Salmon	Sea Cucumber	California Sheephead	Gillnet Complex	CPS Squid	CPS Wetfish	HMS	Dungeness Crab	Other Crus-taceans	Other Species	Total Non-groundfish	Total
1981	1,013	56,791	0	0	3,721	9,080	25,351	357,132	32,637	6,078	51,571	581,902	684,242
1982	928	63,024	42	0	3,195	6,033	16,234	226,572	30,586	6,644	45,822	425,640	545,786
1983	1,506	14,731	42	0	1,881	1,358	8,849	191,121	37,965	6,203	46,962	328,576	433,888
1984	1,401	16,787	15	0	2,182	780	10,703	148,540	34,047	10,472	27,348	261,923	355,830
1985	898	31,634	0	0	4,045	6,162	7,398	63,758	37,331	6,336	34,728	209,946	301,562
1986	1,283	37,356	24	0	3,682	6,714	7,204	66,722	33,680	7,874	34,697	249,564	348,853
1987	1,540	66,516	34	0	3,295	5,717	7,952	71,079	37,154	7,475	42,025	312,623	437,002
1988	1,739	95,003	45	0	2,702	10,984	9,020	82,464	60,738	8,039	48,699	362,816	489,261
1989	1,802	35,989	0	0	2,581	9,365	8,099	53,732	53,667	8,486	54,853	269,429	401,418
1990	1,275	28,450	47	0	2,136	6,150	7,020	31,960	59,058	9,308	62,045	244,806	356,600
1991	1,561	17,774	234	0	2,210	7,616	8,839	21,555	26,838	8,584	64,945	192,747	310,951
1992	1,765	11,341	0	0	1,149	3,054	7,670	32,021	47,566	8,208	58,238	207,431	316,315
1993	1,370	10,678	422	0	1,081	12,188	4,572	37,221	51,096	7,133	45,597	194,960	279,542
1994	1,307	8,499	496	878	633	16,823	4,545	43,883	61,603	6,722	42,034	214,537	314,204
1995	1,797	17,717	477	804	914	25,633	6,158	31,137	72,832	8,681	44,497	235,670	350,406
1996	1,956	10,513	613	781	1,106	24,667	6,139	51,329	83,717	9,110	44,198	260,177	370,265
1997	2,414	11,192	257	953	1,457	22,934	9,147	44,872	57,430	11,660	38,544	224,961	337,069
1998	2,308	6,256	500	759	977	1,786	7,515	44,115	50,695	9,483	12,505	150,222	227,926
1999	2,246	10,460	451	488	1,600	36,069	7,998	35,655	72,599	6,659	19,286	214,663	293,632
2000	1,425	14,734	639	627	1,353	28,612	12,612	34,810	65,156	8,662	21,397	210,918	288,632
2001	1,595	10,919	600	532	1,130	17,410	12,719	32,521	52,955	8,790	18,467	174,056	237,727
2002	2,021	13,232	805	397	1,529	18,564	12,143	22,398	58,810	8,394	15,332	175,134	227,474
2003	1,920	20,906	689	381	660	23,068	8,404	33,592	113,039	7,917	37,383	260,171	318,452
1981-2003 Avg	*1,612*	*26,544*	*280*	*287*	*1,966*	*13,077*	*9,404*	*76,443*	*53,530*	*8,127*	*39,616*	*259,255*	*357,697*
1991-2003 Avg	*1,822*	*12,632*	*476*	*508*	*1,215*	*18,340*	*8,343*	*35,778*	*62,641*	*8,462*	*35,571*	*208,896*	*297,892*
1998-2003 Avg	*1,919*	*12,751*	*614*	*531*	*1,208*	*20,918*	*10,232*	*33,848*	*68,876*	*8,318*	*20,728*	*197,527*	*265,641*

NOTE: Inflation adjustment used is the U.S. GDP Deflator (http://www.bea.gov/bea/dn/home/gdp.htm). For 1981-1990, at-sea whiting catch estimates are from Council 1997.

TABLE 8-2a. Total domestic shoreside landings and at-sea deliveries (round weight mt) from West Coast ocean area fisheries (0-200 miles) North and South of Cape Mendocino and by state (WA, OR and CA), 1981-2003 (includes commercial tribal fisheries, based on PacFIN data (April, 2004) and Council (1997). (Page 1 of 1)

	All Groundfish							All Species						
	At-Sea Included		Not Including At Sea					At-Sea Included		Not Including At Sea				
Year	North of Cape Mendocino	South of Cape Mendocino	WA	OR	CA	Total	Total with At-Sea	North of Cape Mendocino	South of Cape Mendocino	WA	OR	CA	Total	Total with At-Sea
1981	151,004	25,592	23,290	37,315	42,434	103,039	176,596	200,657	334,063	33,937	66,554	360,779	461,270	534,827
1982	152,292	34,007	25,200	40,999	52,635	118,834	186,299	183,276	293,142	32,915	57,250	318,838	409,003	476,468
1983	143,709	26,973	22,912	35,103	40,567	98,583	170,683	164,636	222,109	30,740	44,898	239,115	314,752	386,852
1984	141,626	26,923	20,888	28,178	40,593	89,659	168,548	158,876	187,813	26,158	36,598	205,177	267,933	346,822
1985	96,178	26,312	19,166	28,967	42,665	90,798	122,490	125,107	142,474	27,921	43,062	165,272	236,255	267,947
1986	137,395	26,692	15,939	24,883	41,625	82,448	164,087	178,713	168,874	27,489	47,623	191,090	266,202	347,841
1987	174,325	23,519	20,097	30,531	41,219	91,847	197,844	220,706	178,523	31,820	58,994	202,778	293,591	399,588
1988	208,073	19,917	20,332	32,125	39,753	92,210	227,991	266,841	197,210	39,009	62,679	226,923	328,611	464,392
1989	279,717	23,202	20,012	36,836	42,492	99,341	302,919	340,343	194,791	36,795	72,104	222,864	331,763	535,341
1990	246,481	22,210	18,329	35,509	39,168	93,006	268,691	293,533	154,619	30,679	61,455	180,603	272,737	448,422
1991	283,082	19,989	16,941	49,750	35,786	102,477	303,071	314,390	146,533	24,777	66,239	169,497	260,513	461,107
1992	260,347	20,260	15,729	81,919	34,773	132,421	280,607	320,508	108,325	29,845	114,385	136,552	280,782	428,968
1993	191,730	16,205	17,018	71,211	28,066	116,295	207,935	241,100	123,751	34,261	92,938	146,135	273,334	364,974
1994	290,828	14,483	23,558	94,096	24,733	142,388	305,311	332,743	129,364	37,800	110,440	151,021	299,262	462,186
1995	219,667	17,339	18,455	91,644	28,531	138,630	237,006	255,753	176,863	32,695	107,495	194,086	334,276	432,652
1996	254,533	17,995	25,267	95,828	28,014	149,109	272,528	305,790	189,844	43,337	118,468	210,460	372,266	495,685
1997	270,417	16,675	19,106	95,875	29,333	144,314	287,093	313,325	201,296	30,163	116,860	224,838	371,862	514,655
1998	266,072	11,775	22,094	89,899	22,816	134,809	277,847	296,576	114,582	33,611	103,710	130,739	268,060	411,294
1999	260,219	8,707	21,496	92,089	14,863	128,448	268,926	296,771	204,567	32,007	112,253	216,505	360,765	501,575
2000	235,332	6,878	19,645	85,680	16,033	121,358	242,210	288,562	237,931	35,606	118,637	251,469	405,712	526,692
2001	196,620	5,627	24,197	66,450	11,403	102,051	202,247	263,965	192,980	49,532	104,343	202,565	356,440	457,100
2002	149,348	6,118	19,300	49,861	15,220	84,381	155,646	243,531	170,027	57,899	99,966	183,794	341,659	413,791
2003	161,919	5,696	23,585	47,269	10,433	81,287	167,615	265,551	119,065	74,470	100,470	132,773	307,713	384,616

TABLE 8-2b. Total domestic shoreside landings and at-sea deliveries (total exvessel revenue in thousands of current dollars) from West Coast ocean area fisheries (0-200 miles) North and South of Cape Mendocino and by state (WA, OR and CA), 1981-2003 (includes commercial tribal fisheries, based on PacFIN data (April, 2004) and Council (1997). (Page 1 of 1)

	All Groundfish							All Species						
	At-Sea Included		Not Including At Sea					At-Sea Included		Not Including At Sea				
Year	North of Cape Mendocino	South of Cape Mendocino	WA	OR	CA	Total	Total with At-Sea	North of Cape Mendocino	South of Cape Mendocino	WA	OR	CA	Total	Total with At-Sea
1981	43,673	14,083	9,260	14,668	21,457	45,384	57,755	124,664	261,459	28,873	56,592	288,307	373,773	386,144
1982	52,488	19,467	11,499	20,311	28,175	59,985	71,955	112,705	214,126	27,604	49,663	237,638	314,906	326,875
1983	49,245	16,228	11,354	18,481	22,758	52,593	65,473	93,782	175,823	28,109	37,254	191,506	256,868	269,748
1984	43,988	16,620	10,465	15,183	23,125	48,773	60,608	79,459	149,935	21,926	30,324	165,566	217,816	229,650
1985	42,792	18,082	12,542	17,217	26,451	56,209	60,874	93,699	105,604	27,766	42,294	125,645	195,705	200,370
1986	46,710	20,733	10,805	16,920	29,033	56,759	67,443	116,557	119,748	29,218	54,216	142,853	226,287	236,972
1987	66,641	20,029	16,711	24,330	30,879	71,920	86,669	164,019	138,934	41,100	83,247	165,416	289,762	304,512
1988	73,678	17,480	15,790	24,075	28,708	68,573	91,158	180,675	170,343	49,657	79,775	200,706	330,137	352,722
1989	78,660	20,026	13,663	25,367	30,229	69,260	98,684	165,710	133,661	42,383	72,001	156,322	270,706	300,130
1990	67,143	19,627	11,560	23,358	29,150	64,068	86,770	157,006	119,100	38,322	67,567	148,189	254,078	276,780
1991	76,062	19,007	14,159	29,957	27,363	71,479	95,068	132,078	117,744	30,437	58,415	137,650	226,500	250,089
1992	69,942	19,761	11,508	31,291	28,798	71,597	89,705	156,874	103,586	38,194	71,983	132,318	242,494	260,603
1993	54,932	16,104	10,967	29,116	23,852	63,935	71,037	133,399	101,206	41,155	58,456	128,061	227,672	234,773
1994	68,657	16,845	15,075	32,768	24,672	72,515	85,502	155,262	114,126	47,434	63,620	145,508	256,562	269,549
1995	76,306	24,055	17,816	37,895	34,419	90,131	100,361	168,664	137,737	58,833	76,310	161,129	296,272	306,501
1996	73,856	24,312	16,350	34,195	33,962	84,508	98,167	187,014	143,017	60,775	81,808	173,937	316,521	330,180
1997	78,835	22,516	16,329	33,824	31,975	82,128	101,351	159,828	144,789	44,696	67,947	172,862	285,505	304,731
1998	53,942	16,985	10,831	22,807	23,609	57,248	70,928	119,165	88,726	35,858	48,969	109,490	194,316	208,050
1999	58,418	14,747	12,379	27,559	21,094	61,033	73,165	147,541	124,473	46,496	66,844	146,589	259,929	272,062
2000	59,687	13,815	11,330	29,842	21,074	62,247	73,502	154,273	118,605	46,139	77,806	137,788	261,733	272,994
2001	50,659	11,025	10,809	23,392	16,664	50,866	61,684	138,307	91,850	48,123	66,860	104,493	219,477	230,303
2002	40,596	10,856	9,398	18,020	16,410	43,827	51,485	125,241	98,325	51,411	52,675	112,011	216,097	223,755
2003	48,209	10,072	12,143	20,789	14,749	47,680	58,281	201,967	116,485	79,442	79,039	148,806	307,288	318,452

TABLE 8-3. Historical harvests by West Coast commercial fisheries sectors (landed roundweight in mt and exvessel revenue in thousands of current dollars). (Page 1 of 1)

	Limited Entry Trawl			Limited Entry Non-Trawl			Open Access			TOTAL		
	Groundfish	Non-Groundfish	Total	Groundfish	Non-Groundfish	Total	Groundfish	Non-Groundfish	Total	Groundfish	Non-Groundfish	Total
Landed Roundweight (mt)												
1998	271,882	694	272,576	4,845	310	5,156	1,162	126,594	127,756	277,889	127,598	405,487
1999	263,150	1,267	264,417	5,145	220	5,365	642	225,410	226,052	268,937	226,897	495,834
2000	237,135	464	237,599	4,594	164	4,758	455	277,349	277,804	242,183	277,978	520,161
2001	197,737	730	198,468	3,915	283	4,198	484	247,790	248,274	202,136	248,803	450,940
2002	151,646	5,583	157,228	3,233	910	4,142	472	250,954	251,426	155,350	257,446	412,796
2003	139,084	1,268	140,352	2,374	673	3,047	1,279	198,583	199,862	142,737	200,524	343,261
Exvessel Revenue ($,000)												
1998	55,216	1,833	57,050	12,332	863	13,196	2,793	130,539	133,332	70,342	133,236	203,577
1999	54,335	1,518	55,853	15,608	1,008	16,616	2,539	189,886	192,425	72,482	192,412	264,894
2000	53,678	882	54,560	16,611	891	17,502	2,686	191,658	194,344	72,975	193,432	266,406
2001	42,001	1,149	43,150	13,335	1,324	14,659	2,555	159,985	162,541	57,892	162,458	220,350
2002	37,980	1,822	39,802	10,590	2,141	12,731	2,463	166,343	168,807	51,034	170,307	221,341
2003	41,188	1,223	42,411	6,306	804	7,110	4,885	227,072	231,957	52,379	229,099	281,478

TABLE 8-4 Historical harvests of species groups by the **Limited Entry Traw**l commercial fishery sector North and South of Cape Mendocino (landed roundweight in mt and exvessel revenue in thousands of current dollars). (Page 1 of 2)

Area/ Year	Lingcod	Whiting, At Sea	Whiting, Shoreside	Flatfish	Sablefish	Rockfish	Other Groundfish	Total Groundfish	Pink Shrimp	Spot Prawn, Trawl	Spot Prawn, Pot	Ridgeback Prawn, Trawl	Pacific Halibut	California Halibut
							Landed Roundweight (mt)							
North														
1998	340.4	142,938.4	88,678.4	13,504.6	1,766.3	14,490.1	1,389.2	263,107	0.0	0.0	0.0	0.0	0.0	12.8
1999	277.4	140,065.4	83,711.4	16,534.2	2,627.2	12,232.3	1,004.4	256,452	0.0	0.0	0.0	0.0	0.4	3.0
2000	66.2	120,519.2	85,919.2	13,101.6	2,292.2	9,184.1	755.7	231,838	0.0	0.0	0.0	0.0	0.7	0.3
2001	57.1	99,964.5	73,539.3	11,147.7	2,241.0	5,668.6	858.0	193,476	0.0	0.0	0.0	0.0	0.3	3.7
2002	96.2	84,494.3	45,748.3	10,222.4	1,204.0	3,571.8	1,322.6	146,660	0.0	0.0	0.0	0.0	0.1	0.1
2003	54.2	66,852.3	51,255.7	10,833.4	2,635.9	2,027.4	915.0	134,574	0.0	0.0	0.0	0.0	11.5	0.0
South														
1998	40.4	0.0	1.6	3,182.2	427.3	4,859.8	263.0	8,774	0.0	0.0	0.0	0.0	0.0	302.5
1999	44.3	0.0	0.0	3,648.8	559.1	2,331.8	114.2	6,698	0.0	0.0	0.0	0.0	0.0	271.0
2000	11.2	0.0	1.1	3,201.2	424.6	1,594.2	64.1	5,296	0.0	0.0	0.0	0.0	0.0	137.7
2001	10.4	0.0	1.1	2,682.8	372.9	1,119.3	74.8	4,261	0.0	0.0	0.0	0.0	0.0	158.8
2002	15.5	0.0	0.1	2,841.0	396.5	1,653.7	79.3	4,986	0.0	0.0	0.0	0.0	0.0	176.2
2003	9.1	0.0	0.0	2,890.7	599.9	965.1	44.9	4,510	0.0	0.0	0.0	4.1	0.0	117.2
							Exvessel Revenue ($,000)							
North														
1998	389	13,538	4,844	9,665	4,388	13,245	733	??	0	0	0	0	0	56
1999	343	11,724	6,870	10,552	5,734	11,698	469	47,390	0	0	0	0	0	13
2000	130	11,177	7,968	11,002	6,198	10,528	443	47,447	0	0	0	0	0	2
2001	111	7,837	5,747	9,867	5,941	6,884	520	36,905	0	0	0	0	1	16
2002	180	9,119	4,535	9,070	2,866	5,001	1,043	31,814	0	0	0	0	0	1
2003	88	8,106	5,096	9,880	8,787	2,827	833	35,617	0	0	0	0	58	0
South														
1998	60	0	2	2,781	882	4,597	93	8,414	0	0	0	0	0	1,463
1999	70	0	0	3,052	1,046	2,738	38	6,945	0	0	0	0	0	1,374
2000	23	0	0	2,913	898	2,371	25	6,231	0	0	0	0	0	787
2001	21	0	0	2,667	794	1,586	27	5,095	0	0	0	0	0	946
2002	30	0	0	2,651	874	2,581	31	6,166	0	0	0	0	0	1,019
2003	20	0	0	2,688	1,529	1,315	19	5,571	0	0	0	10	0	627

TABLE 8-4. Historical harvests of species groups by the **Limited Entry Trawl** commercial fishery sector North and South of Cape Mendocino (landed roundweight in mt and exvessel revenue in thousands of current dollars). (Page 2 of 2)

Area/ Year	Salmon	Sea Cucumber	California Sheephead	Gillnet Complex	CPS Squid	CPS Wetfish	HMS	Dungeness Crab	Other Crustaceans	Other Species	Total Non-groundfish	Grand Total
						Landed Roundweight (mt)						
North												
1998	0.0	0.0	0.0	0.0	27.4	258.0	0.4	0.1	17.6	0.0	316	263,424
1999	3.8	0.0	0.0	0.0	17.9	913.3	1.7	2.3	1.7	0.0	944	257,396
2000	4.4	0.0	0.0	0.0	6.3	282.8	1.1	0.0	1.8	0.0	298	232,136
2001	5.1	0.0	0.0	0.0	30.2	526.5	1.2	0.1	3.5	0.0	571	194,047
2002	2.1	0.0	0.0	0.0	14.3	12.9	0.2	0.0	1.0	5,336.7	5,368	152,027
2003	7.1	0.0	0.0	0.0	16.7	82.2	0.4	10.8	0.0	984.9	1,114	135,688
South												
1998	0.0	61.5	0.0	0.0	3.8	6.5	1.1	1.8	0.3	0.0	377	9,152
1999	0.0	45.8	0.0	0.0	1.2	1.5	1.3	0.5	1.5	0.0	323	7,021
2000	0.0	27.2	0.0	0.0	0.8	0.5	0.4	0.0	0.3	0.0	167	5,463
2001	0.0	0.0	0.2	0.0	0.2	0.3	0.1	0.0	0.1	0.0	160	4,421
2002	0.0	0.0	0.0	0.0	0.6	0.0	0.7	0.7	2.6	34.3	215	5,201
2003	0.0	0.0	0.0	0.0	0.6	0.0	1.2	0.0	0.3	31.0	154	4,664
						Exvessel Revenue ($,000)						
North												
1998	0	0	0	0	2	38	0	0	164	0	261	47,063
1999	0	0	0	0	0	15	4	9	17	0	59	47,449
2000	4	0	0	0	4	29	2	0	11	0	52	47,498
2001	19	0	0	0	1	128	1	0	37	0	202	37,108
2002	6	0	0	0	1	2	0	0	1	738	748	32,562
2003	25	0	0	0	10	16	0	51	0	393	554	36,171
South												
1998	0	87	0	0	7	3	3	10	1	0	1,573	9,986
1999	0	62	0	0	2	1	1	3	17	0	1,459	8,404
2000	0	40	0	0	1	0	1	0	1	0	831	7,062
2001	0	0	0	0	0	0	0	0	0	0	947	6,043
2002	0	0	0	0	2	0	2	3	12	36	1,074	7,240
2003	0	0	0	0	1	0	2	0	1	28	669	6,240

TABLE 8-5. Historical harvests of species groups by the **Limited Entry Fixed Gear** commercial fishery sectors North and South of Cape Mendocino (landed roundweight in mt and exvessel revenue in thousands of current dollars). (Page 1 of 2)

Area/ Year	Lingcod	Whiting, At Sea	Whiting, Shoreside	Flatfish	Sablefish	Rockfish	Other Groundfish	Total Groundfish	Pink Shrimp	Spot Prawn, Trawl	Spot Prawn, Pot	Ridgeback Prawn, Trawl	Pacific Halibut	California Halibut
Landed Roundweight (mt)														
North														
1998	46.8	0.0	0.0	2.6	1,593.7	1,056.5	34.4	2,734	0.0	0.0	0.0	0.0	73.1	0.0
1999	60.4	0.0	0.0	7.3	2,658.4	808.2	76.2	3,611	0.0	0.0	0.0	0.0	144.2	0.0
2000	35.0	0.0	0.0	5.7	2,656.8	277.9	363.0	3,338	0.0	0.0	0.0	0.0	79.7	0.0
2001	45.3	0.0	0.0	5.5	2,148.5	384.3	264.5	2,848	0.0	0.0	0.0	0.0	209.1	0.0
2002	36.0	0.0	0.0	8.9	1,599.4	256.3	474.7	2,375	0.0	0.0	0.0	0.0	309.0	0.0
2003	7.9	0.0	0.0	198.5	843.9	137.0	705.3	1,893	0.0	0.0	0.0	0.0	81.3	0.0
South														
1998	39.5	0.0	0.0	9.9	408.8	1,332.6	320.3	2,111	0.0	0.0	0.0	0.0	2.9	35.6
1999	25.4	0.0	0.4	18.0	591.4	651.3	248.0	1,534	0.0	0.0	0.0	0.0	2.0	16.4
2000	10.6	0.0	0.1	3.6	673.6	400.3	167.3	1,255	0.0	0.0	0.0	0.0	0.0	16.9
2001	12.8	0.0	0.0	14.6	584.2	348.1	107.1	1,067	0.0	0.0	0.0	0.0	0.0	14.1
2002	12.4	0.0	0.3	7.8	473.2	246.9	116.8	857	0.0	0.0	0.0	0.0	0.1	22.0
2003	0.8	0.0	0.7	0.8	162.5	275.3	41.5	482	0.0	0.0	0.0	0.0	0.0	0.8
Exvessel Revenue ($,000)														
North														
1998	100	0	0	2	4,453	1,509	92	??	0	0	0	0	219	0
1999	141	0	0	4	8,190	1,544	146	10,025	0	0	0	0	617	0
2000	110	0	0	4	10,142	756	428	11,440	0	0	0	0	386	0
2001	118	0	0	4	7,856	1,087	359	9,424	0	0	0	0	902	0
2002	117	0	0	4	6,111	765	595	7,592	0	0	0	0	1,330	0
2003	17	0	0	250	3,412	221	632	4,533	0	0	0	0	477	0
South														
1998	90	0	0	10	1,028	3,966	1,080	6,175	0	0	0	0	10	186
1999	73	0	0	18	1,466	3,021	1,005	5,584	0	0	0	0	7	107
2000	37	0	0	7	2,166	2,254	707	5,171	0	0	0	0	0	102
2001	47	0	0	22	1,773	1,745	324	3,911	0	0	0	0	0	95
2002	34	0	0	10	1,366	1,365	224	2,998	0	0	0	0	1	128
2003	3	0	3	2	507	1,237	21	1,773	0	0	0	0	0	6

TABLE 8-5. Historical harvests of species groups by the **Limited Entry Fixed Gear** commercial fishery sectors North and South of Cape Mendocino (landed roundweight in mt and exvessel revenue in thousands of current dollars). (Page 2 of 2)

Area/ Year	Salmon	Sea Cucumber	California Sheephead	Gillnet Complex	CPS Squid	CPS Wetfish	HMS	Dungeness Crab	Other Crustaceans	Other Species	Total Non-groundfish	Grand Total
Landed Roundweight (mt)												
North												
1998	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.1	69.7	143	2,877
1999	0.0	0.0	0.0	0.0	0.0	0.0	13.1	0.0	0.0	0.3	158	3,768
2000	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.3	0.3	80	3,419
2001	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	209	3,057
2002	0.0	0.0	0.0	0.0	0.0	0.0	0.1	0.0	0.0	439.4	748	3,124
2003	0.0	0.0	0.0	0.0	0.0	0.4	0.0	0.0	1.3	559.8	643	2,535
South												
1998	0.0	83.8	43.7	0.0	0.0	0.0	0.0	0.0	0.1	1.5	167	2,279
1999	0.0	0.0	27.0	0.0	0.0	4.3	10.3	0.0	0.0	2.1	62	1,597
2000	0.0	0.0	20.0	41.9	0.2	4.2	0.0	0.0	0.2	0.0	83	1,339
2001	0.0	0.0	16.8	27.2	8.9	5.7	0.0	0.3	0.5	0.1	74	1,140
2002	0.0	0.0	11.0	0.0	0.4	0.0	0.2	0.0	0.4	126.9	161	1,019
2003	0.0	0.0	0.2	0.0	0.1	4.5	0.0	0.0	5.0	19.9	31	512
Exvessel Revenue ($,000)												
North												
1998	0	0	0	0	0	0	0	0	1	70	290	6,447
1999	0	0	0	0	0	0	48	0	0	1	666	10,691
2000	0	0	0	0	0	0	0	0	3	1	389	11,829
2001	0	0	0	0	0	0	0	0	0	0	902	10,327
2002	0	0	0	0	0	0	0	0	0	275	1,604	9,196
2003	0	0	0	0	0	0	0	0	10	245	732	5,264
South												
1998	0	125	251	0	0	0	0	0	0	2	574	6,749
1999	0	0	175	0	0	9	41	0	0	2	342	5,926
2000	0	0	145	244	1	9	0	0	0	0	502	5,673
2001	0	0	123	183	2	13	0	2	3	0	421	4,332
2002	0	0	74	0	2	0	1	0	1	330	537	3,535
2003	0	0	2	0	0	18	0	0	17	30	72	1,845

TABLE 8-6. Historical harvests of species groups by the **Open Access** commercial fishery sectors North and South of Cape Mendocino (landed roundweight in mt and exvessel revenue in thousands of current dollars). (Page 1 of 2)

Area/ Year	Lingcod	Whiting, At Sea	Whiting, Shoreside	Flatfish	Sablefish	Rockfish	Other Groundfish	Total Groundfish	Pink Shrimp	Spot Prawn, Trawl	Spot Prawn, Pot	Ridgeback Prawn, Trawl	Pacific Halibut	California Halibut
							Landed Roundweight (mt)							
North														
1998	19.4	0.0	0.2	7.3	14.1	214.0	6.7	262	4,347.9	0.5	0.4	0.0	20.3	0.1
1999	19.0	0.0	0.0	3.9	4.1	116.1	16.4	159	12,415.7	0.6	0.0	0.0	19.8	0.0
2000	14.8	0.0	0.0	0.7	8.5	90.9	7.1	122	13,562.4	0.0	0.0	0.0	15.8	0.0
2001	17.0	0.0	0.0	1.3	21.7	125.0	15.5	180	17,610.9	1.2	0.0	0.0	11.5	0.0
2002	28.1	0.0	0.0	1.2	13.2	109.3	45.9	198	25,302.4	0.0	0.2	0.0	112.4	3.4
2003	43.8	0.0	0.1	3.7	291.3	188.2	88.5	616	13,434.3	0.0	0.0	0.0	95.8	0.2
South														
1998	19.7	0.0	0.1	29.9	5.0	677.0	168.7	900	0.0	256.4	116.3	197.5	0.0	64.0
1999	15.0	0.0	0.0	19.2	2.8	276.2	168.8	482	0.0	185.1	92.7	632.4	0.0	94.6
2000	7.4	0.0	0.0	17.1	6.3	159.9	142.0	333	0.0	106.1	96.9	705.6	0.0	99.3
2001	11.5	0.0	0.2	23.1	6.3	154.7	107.9	304	0.0	90.8	95.2	161.1	0.4	68.3
2002	17.0	0.0	0.0	17.5	28.2	136.1	75.2	274	0.0	99.2	78.7	215.2	0.0	107.4
2003	27.5	0.0	0.1	14.7	315.2	166.1	139.6	663	439.8	3.1	72.6	220.4	0.0	174.6
							Exvessel Revenue ($,000)							
North														
1998	36	0	0	7	33	299	21	??	5,054	9	2	0	69	0
1999	42	0	0	3	12	216	54	327	12,825	8	0	0	83	0
2000	28	0	0	0	29	176	32	266	11,908	0	0	0	78	0
2001	50	0	0	1	75	312	99	537	10,293	27	0	0	51	0
2002	82	0	0	1	45	321	324	772	15,358	0	1	0	487	19
2003	141	0	0	3	1,082	613	359	2,199	7,348	0	0	0	508	2
South														
1998	42	0	0	49	11	1,369	927	2,398	0	3,686	1,856	762	0	403
1999	46	0	0	49	10	1,272	835	2,212	0	2,675	1,577	1,546	0	586
2000	17	0	0	54	39	1,307	1,003	2,420	0	1,922	1,900	1,794	0	674
2001	38	0	1	69	34	1,249	628	2,018	0	1,676	1,905	532	2	489
2002	63	0	0	64	132	1,033	399	1,692	0	1,755	1,589	633	0	821
2003	109	0	0	39	937	1,072	530	2,686	320	61	1,504	666	0	1,284

TABLE 8-6. Historical harvests of species groups by the **Open Access** commercial fishery sectors North and South of Cape Mendocino (landed roundweight in mt and exvessel revenue in thousands of current dollars). (Page 2 of 2)

Area/ Year	Salmon	Sea Cucumber	California Sheephead	Gillnet Complex	CPS Squid	CPS Wetfish	HMS	Dungeness Crab	Other Crustaceans	Other Species	Total Non-groundfish	Grand Total
						Landed Roundweight (mt)						
North												
1998	715.6	0.0	0.0	0.8	4.0	1,278.9	11,374.6	10,272.0	172.6	140.7	28,329	28,590
1999	615.4	0.0	0.0	5.9	0.0	876.8	4,132.1	14,733.9	121.9	170.8	33,093	33,252
2000	624.5	0.1	0.0	0.2	22.5	14,504.3	7,536.4	12,244.9	1,311.3	559.4	50,382	50,504
2001	1,717.4	0.0	0.0	0.0	0.0	24,051.8	8,743.6	10,386.1	214.2	674.8	63,411	63,592
2002	2,038.7	0.0	0.0	0.6	0.0	39,363.3	8,426.9	11,086.0	179.1	908.1	87,421	87,619
2003	2,490.3	0.3	0.0	0.0	1.2	37,606.7	15,282.4	29,701.5	229.6	783.3	99,626	100,241
South												
1998	1,091.7	204.2	75.7	254.6	2,898.1	67,094.5	18,271.9	1,484.3	1,456.3	4,800.0	98,265	99,166
1999	2,006.6	226.6	36.5	388.6	92,186.0	74,364.1	13,553.3	725.9	1,354.0	6,470.8	192,317	192,799
2000	2,923.8	263.5	58.9	255.4	118,060.4	88,661.3	7,008.7	780.0	1,297.4	6,650.4	226,968	227,300
2001	1,484.6	322.9	51.0	237.1	85,996.5	81,616.0	6,077.6	842.3	1,336.0	5,999.1	184,379	184,682
2002	1,973.7	425.6	41.2	352.0	72,942.3	67,378.1	4,480.3	4,417.9	1,253.9	9,767.6	163,533	163,807
2003	3,221.0	344.0	47.9	140.9	39,329.2	40,149.7	4,760.4	2,199.4	1,050.5	6,803.6	98,957	99,620
						Exvessel Revenue ($,000)						
North												
1998	2,155	0	0	4	2	145	15,843	38,531	1,248	144	??	??
1999	2,035	0	0	13	0	154	7,619	61,545	982	207	85,472	85,798
2000	2,350	1	0	0	0	1,863	14,175	57,307	2,677	843	91,202	91,468
2001	4,734	0	0	0	0	2,910	16,428	46,280	1,859	946	83,529	84,066
2002	5,391	0	0	0	0	4,857	11,994	39,914	1,690	774	80,486	81,257
2003	8,654	1	0	0	1	4,508	22,239	101,869	1,476	537	147,143	149,342
South												
1998	3,472	244	441	887	1,620	6,675	24,413	7,738	7,163	7,973	67,333	69,731
1999	7,413	356	277	1,469	33,404	7,229	25,298	3,960	5,148	13,475	104,414	106,627
2000	11,192	564	448	820	27,069	10,033	18,761	4,336	6,491	14,451	100,456	102,876
2001	5,525	579	392	912	16,862	9,271	15,064	4,953	6,524	11,771	76,456	78,474
2002	5,811	792	317	1,503	18,257	7,086	10,034	17,931	6,462	12,866	85,858	87,549
2003	11,714	688	379	660	23,057	3,863	11,317	8,457	6,413	9,545	79,930	82,616

TABLE 8-7. Average annual coastwide ex-vessel prices for deliveries of West Coast species groups: 1981-2003 ($ per lb). (Page 1 of 2)

Year	Lingcod	Whiting, At Sea	Whiting, Shoreside	Flatfish	Sablefish	Rockfish	Other Groundfish	Total Groundfish	Total Groundfish - Less Whiting	Total Groundfish - Less At Sea Whiting	Pink Shrimp	Spot Prawn, Trawl	Spot Prawn, Pot	Ridgeback Prawn, Trawl	Pacific Halibut
1981	0.23	0.08	0.08	0.26	0.21	0.17	0.20	0.15	0.20	0.20	0.50	2.03	4.29	0.86	1.17
1982	0.25	0.08	0.08	0.27	0.25	0.20	0.25	0.17	0.23	0.23	0.51	2.27	4.96	1.17	1.20
1983	0.25	0.08	0.08	0.27	0.24	0.22	0.27	0.17	0.24	0.24	0.73	2.89	6.03	0.91	1.13
1984	0.24	0.07	0.07	0.27	0.22	0.25	0.27	0.16	0.25	0.24	0.46	3.40	0.00	0.57	0.84
1985	0.26	0.07	0.07	0.28	0.34	0.28	0.27	0.22	0.29	0.28	0.35	4.27	5.30	0.61	1.04
1986	0.32	0.06	0.06	0.30	0.38	0.31	0.33	0.19	0.32	0.31	0.53	4.47	4.10	0.82	1.51
1987	0.38	0.06	0.06	0.35	0.48	0.35	0.33	0.20	0.37	0.35	0.68	4.39	5.72	1.12	1.85
1988	0.37	0.08	0.08	0.35	0.52	0.32	0.27	0.18	0.36	0.34	0.41	4.74	4.92	1.27	1.93
1989	0.35	0.07	0.07	0.31	0.47	0.32	0.26	0.15	0.33	0.31	0.37	3.26	4.76	1.31	1.85
1990	0.35	0.06	0.06	0.28	0.48	0.34	0.25	0.15	0.34	0.31	0.49	3.79	4.95	1.36	2.68
1991	0.35	0.05	0.05	0.32	0.69	0.37	0.25	0.14	0.38	0.31	0.56	4.80	5.24	1.29	2.89
1992	0.39	0.06	0.05	0.30	0.66	0.39	0.26	0.14	0.39	0.24	0.35	5.61	6.13	2.20	2.17
1993	0.38	0.04	0.03	0.30	0.56	0.39	0.23	0.15	0.37	0.25	0.33	5.43	6.68	1.93	1.75
1994	0.39	0.04	0.03	0.31	0.83	0.46	0.25	0.13	0.44	0.23	0.59	5.85	6.88	1.35	2.30
1995	0.45	0.05	0.05	0.35	1.35	0.56	0.37	0.19	0.58	0.29	0.72	6.34	7.24	1.16	2.16
1996	0.46	0.05	0.03	0.34	1.41	0.50	0.34	0.16	0.56	0.26	0.60	6.57	7.09	1.34	2.31
1997	0.48	0.06	0.04	0.33	1.59	0.49	0.41	0.16	0.59	0.26	0.40	6.42	7.10	1.77	2.01
1998	0.64	0.04	0.02	0.34	1.17	0.50	0.61	0.12	0.51	0.19	0.53	6.53	7.21	1.76	1.62
1999	0.74	0.04	0.04	0.31	1.17	0.57	0.71	0.12	0.55	0.22	0.47	6.58	7.70	1.11	1.99
2000	1.08	0.04	0.04	0.39	1.47	0.68	0.80	0.14	0.69	0.23	0.40	8.19	9.16	1.15	2.46
2001	1.13	0.05	0.04	0.41	1.41	0.75	0.62	0.14	0.71	0.23	0.27	8.40	9.10	1.50	2.02
2002	1.12	0.05	0.05	0.41	1.40	0.84	0.56	0.15	0.68	0.27	0.28	8.03	9.15	1.34	1.96
2003	1.13	0.06	0.05	0.42	1.54	0.84	0.55	0.16	0.74	0.27	0.25	8.98	9.41	1.37	2.62
1981-2003 Avg	0.35	0.06	0.04	0.32	0.67	0.36	0.36	0.15	0.38	0.26	0.45	5.68	7.05	1.17	1.76
1991-2003 Avg	0.44	0.05	0.04	0.34	1.10	0.48	0.40	0.14	0.50	0.25	0.42	6.70	7.39	1.31	2.09
1998-2003 Avg	0.83	0.04	0.04	0.37	1.32	0.61	0.65	0.13	0.61	0.22	0.35	7.24	8.37	1.25	2.00

NOTE: For 1981-1990, at-sea whiting catch estimates are from Council 1997.

TABLE 8-7. Average annual coastwide ex-vessel prices for deliveries of West Coast species groups: 1981-2003 ($ per lb). (Page 2 of 2)

Year	California Halibut	Salmon	Sea Cucumber	California Sheephead	Gillnet Complex	CPS Squid	CPS Wetfish	HMS	Dungeness Crab	Other Crustaceans	Other Species	Total Non-groundfish	Total
1981	1.35	1.81	0.00	0.00	0.75	0.10	0.06	0.59	0.92	1.04	0.34	0.41	0.32
1982	1.39	1.92	0.18	0.00	0.73	0.10	0.06	0.53	1.08	1.45	0.27	0.40	0.31
1983	1.46	1.41	0.16	0.00	0.78	0.19	0.08	0.47	1.48	1.24	0.27	0.43	0.31
1984	1.70	2.24	0.19	0.00	0.77	0.23	0.08	0.51	1.59	1.65	0.21	0.43	0.30
1985	1.80	1.88	0.00	0.00	0.62	0.17	0.08	0.56	1.45	1.08	0.24	0.43	0.34
1986	1.99	1.55	0.21	0.00	0.63	0.10	0.08	0.55	1.39	1.54	0.21	0.42	0.31
1987	2.16	2.22	0.22	0.00	0.76	0.09	0.07	0.62	1.38	1.62	0.23	0.49	0.34
1988	2.27	2.47	0.20	0.00	0.81	0.10	0.08	0.73	1.18	1.83	0.26	0.50	0.34
1989	2.23	1.77	0.00	0.00	1.00	0.08	0.08	0.66	1.13	1.59	0.28	0.39	0.25
1990	2.35	2.13	0.25	0.00	0.97	0.08	0.06	0.70	1.53	1.47	0.44	0.48	0.28
1991	2.41	1.73	0.32	0.00	0.94	0.07	0.07	0.70	1.57	1.53	0.74	0.44	0.24
1992	2.41	2.05	0.00	0.00	1.13	0.09	0.07	0.86	1.17	1.90	0.81	0.52	0.27
1993	2.39	1.83	0.54	0.00	1.33	0.11	0.06	0.82	1.11	1.53	0.85	0.47	0.29
1994	2.70	1.83	0.65	2.88	1.18	0.12	0.07	0.84	1.35	2.13	0.94	0.53	0.26
1995	2.71	1.47	0.70	2.77	1.31	0.14	0.05	0.66	1.70	2.35	0.99	0.48	0.32
1996	2.58	1.28	0.65	2.74	1.29	0.12	0.05	0.70	1.37	2.45	0.94	0.47	0.30
1997	2.38	1.24	0.50	2.77	1.76	0.13	0.05	0.70	1.91	2.38	0.70	0.41	0.27
1998	2.31	1.40	0.59	2.64	1.59	0.25	0.05	0.62	1.79	2.29	0.49	0.47	0.23
1999	2.45	1.62	0.70	3.26	1.71	0.16	0.04	0.85	1.93	1.89	0.68	0.39	0.25
2000	2.81	1.71	0.94	3.41	1.75	0.10	0.05	1.03	2.15	2.30	0.68	0.32	0.24
2001	2.86	1.43	0.82	3.44	1.88	0.09	0.05	0.97	2.07	2.35	0.65	0.30	0.23
2002	2.92	1.27	0.84	3.40	1.94	0.11	0.05	0.77	1.69	2.56	0.41	0.30	0.25
2003	2.97	1.59	0.91	3.59	2.13	0.27	0.05	0.76	1.58	2.79	0.69	0.54	0.38
1981-2003 Avg	2.33	1.81	0.65	2.98	0.94	0.12	0.06	0.62	1.50	1.85	0.43	0.43	0.29
1991-2003 Avg	2.55	1.53	0.67	2.95	1.42	0.12	0.05	0.77	1.61	2.12	0.76	0.41	0.26
1998-2003 Avg	2.62	1.48	0.78	3.15	1.78	0.12	0.05	0.81	1.92	2.28	0.57	0.34	0.24

NOTE: For 1981-1990, at-sea whiting catch estimates are from Council 1997.

TABLE 8-8. West Coast groundfish catch in ocean areas by Tribal fleet: 1995 through 2003 (round weight-lbs.). (Page 1 of 1)

Species	1995	1996	1997	1998	1999	2000	2001	2002	2003
Arrowtooth Flounder	240	3		255	13,195	331	961	7,137	49,745
Dover Sole	1,764	2,441	1,268	4,509	11,594	2,030	4,619	35,417	72,527
English Sole		4	118	1,847	593	996	7,103	88,684	149,277
Petrale Sole		5	12	3,249	545	80	1,954	45,479	185,732
Rex Sole					26	151	1,358	6,632	10,886
Rock Sole				2,396	16		22	5,833	5,160
Unsp. Flatfish				38	775		437	8,406	6,380
Unspecified Sanddab							1,599	19,655	1,725
Sand Sole		12	40				269	2,748	62
Starry Flounder		22	54				3	301	
Butter Sole								605	0
Flatfish Total	2,004	2,487	1,492	12,294	26,744	3,588	18,325	220,897	481,494
Bocaccio				2	38	145	449	0	916
Nom. Canary Rockfish	59	171	26	609	1,033	539	4,064	7,071	
Canary Rockfish				277	252	330	1,380	0	4,712
Darkblotched Rockfish				0	36	76	226	3,273	81
Greenstriped Rockfish				1	51	16	0		0
Pacific Ocean Perch				0	110	20	16	0	2,601
Redbanded Rockfish				1	128	492	0		0
Redstripe Rockfish				1	63	131	1,510		2,333
Rougheye Rockfish				1	80	76	1,529		7
Rosethorn Rockfish				0	0		0		0
Sharpchin Rockfish				1	9	10	85		2,332
Silvergrey Rockfish				0	36	4	12		81
Unsp. Pop Group		3			104			472	0
Unsp. Rockfish	114,684	79,545	65,121	65,245	59,875	45,953			0
Widow Rockfish				54	411	2,010	16,265	0	24,670
Nom. Widow Rockfish					53	3	51	27,969	0
Yelloweye Rockfish					68	3	2	0	594
Nom. Yellowtail Rockfish	519	1,297	2,471	10,448	28,671	9,585	7,598	572,996	
Yellowtail Rockfish				3,263	6,498	68,463	210,006	0	677,073
Unsp. Shelf Rockfish						3,099	20,503	23,629	2,354
Unsp. Near-shore						10	58	116	45
Unsp. Slope Rockfish						19,891	54,920	32,941	41,458
Blackgill Rockfish							19		0
Shortraker Rockfish							289		5
Rockfish Total	115,262	81,016	67,618	79,903	97,516	150,856	318,982	668,467	759,262
Spiny Dogfish		5,521			881	6,251		2,607	10,760
Lingcod	2,873	2,732	1,648	5,247	7,051	6,817	9,429	24,854	49,276
Pacific Cod	2,814	1,540	2,166	4,873	2,677	4,573	8,712	128,530	471,655
Sablefish	1,696,098	1,881,702	1,775,108	980,719	1,566,260	1,555,808	1,451,522	959,982	1,328,253
Unspecified Skate	2,517	1,689	1,017	2,031	2,169	1,920	1,407	18,635	47,158
Nom. Shrtsp. Thnyhd.	15,697	16,010	16,892	7,606	13,251	8,987	10,945	10,499	0
Shortspine Thornyhead				471	240		27		12,703
Nom. Longsp. Thnyhd.	1,305	538	139	28					284
Other Groundfish Total	1,721,304	1,909,732	1,796,970	1,000,975	1,592,529	1,584,356	1,482,042	1,145,107	1,920,089
Pacific Whiting		33,039,64	54,713,65	53,984,58	56,768,06	13,781,25	13,404,00	45,867,38	51,673,540
All Groundfish Species	1,838,570	35,032,88	56,579,73	55,077,75	58,484,85	15,520,05	15,223,35	47,901,85	54,834,385

TABLE 8-9. West Coast groundfish catch in ocean areas by tribal fleet: 1995 through 2003 (exvessel revenue $). (Page 1 of 1)

Species	1995	1996	1997	1998	1999	2000	2001	2002	2003
Arrowtooth Flounder	24	1		26	1,319	33	111	715	5,336
Dover Sole	570	768	393	1,478	3,817	663	1,498	11,335	23,219
English Sole		1	106	613	220	309	2,726	29,289	49,792
Petrale Sole		8	8	3,249	545	84	1,692	46,509	191,965
Rex Sole					8	51	471	2,316	3,764
Rock Sole				791	5		7	2,033	1,717
Unsp. Flatfish				13	271		145	2,773	2,103
Unspecified Sanddab							372	5,110	455
Sand Sole		9	30				204	2,084	47
Starry Flounder		7	16				1	98	
Butter Sole								206	
Flatfish Total	594	794	553	6,170	6,185	1,140	7,227	102,468	278,398
Bocaccio				1	13	64	207	0	383
Nom. Canary Rockfish	20	60	12	230	372	196	1,901	3,329	
Canary Rockfish				97	89	145	655	0	2,229
Darkblotched Rockfish				0	12	33	104	1,477	33
Greenstriped Rockfish				0	18	7	0		
Pacific Ocean Perch				0	38	9	7	0	1,150
Redbanded Rockfish				0	44	216	0		0
Redstripe Rockfish				0	22	58	689		920
Rougheye Rockfish				0	27	33	705		2
Rosethorn Rockfish				0	0		0		0
Sharpchin Rockfish				0	3	4	39		912
Silvergrey Rockfish				0	12	2	5		33
Unsp. Pop Group		1			36			212	
Unsp. Rockfish	48,130	32,345	26,723	26,575	25,334	20,737			
Widow Rockfish				19	143	883	7,801	0	11,705
Nom. Widow Rockfish					19	1	16	13,425	
Yelloweye Rockfish					24	2	0	0	885
Nom. Yellowtail Rockfish	189	438	864	3,542	10,256	3,429	3,379	274,509	
Yellowtail Rockfish				1,142	2,275	30,124	99,901		323,272
Unsp. Shelf Rockfish						1,758	13,068	9,794	1,072
Unsp. Near-shore						4	25	14,434	21
Unsp. Slope Rockfish						8,238	22,558	55	18,325
Blackgill Rockfish							9		
Shortraker Rockfish							134		2
Rockfish Total	61,977	48,699	42,552	39,366	49,703	73,143	159,637	317,235	360,944
Spiny Dogfish		544			177	830		405	1,564
Lingcod	1,404	1,255	731	3,007	4,169	4,065	6,075	18,176	34,597
Pacific Cod	1,086	587	818	1,924	1,096	1,987	3,792	63,961	235,241
Sablefish	3,046,910	3,003,716	3,162,376	1,280,233	2,045,434	2,544,542	2,411,517	1,512,595	2,187,823
Unspecified Skate	588	120	68	136	145	129	143	2,563	6,308
Nom. Shrtsp. Thnyhd.	12,581	15,340	14,828	7,310	10,751	7,199	8,414	8,232	
Shortspine Thornyhead				425	215		20		10,605
Nom. Longsp. Thnyhd.	1,057	515	125	25					233
Other Groundfish Total	3,049,988	3,006,222	3,163,993	1,285,300	2,051,021	2,551,553	2,421,527	1,605,932	2,476,371
Pacific Whiting		1,651,982	2,735,683	2,699,229	2,838,403	551,250	536,160	2,065,122	2,773,686
All Groundfish Species	3,112,559	4,707,697	5,942,781	4,030,065	4,945,312	3,177,086	3,124,551	4,090,757	5,889,399

TABLE 8.10. Estimated number of West Coast marine anglers: 2000 - 2002.

Year/State	Total	Residents	Non-Residents	% Non-Residents
2000				
Washington	497	450	47	9.5%
Oregon	365	285	80	21.9%
Northern California	-	388	-	
Southern California	-	1,097	-	
Total California	1,705	1,485	220	12.9%
2001				
Washington	915	861	54	5.9%
Oregon	601	505	97	16.1%
Northern California	-	961	-	
Southern California	-	1,838	-	
Total California	3,084	2,799	285	9.2%
2002				
Washington	1,493	1,399	94	6.3%
Oregon	1,056	845	211	20.0%
Northern California	-	2,022	-	
Southern California	-	3,709	-	
Total California	6,406	5,731	675	10.5%

TABLE 8-11. Total estimated west Coast recreational marine angler boat trips in 2003 by region (thousands of angler trips).

State/Region	Boat Mode	Jan-Feb	Mar-Apr	May-Jun	Jul-Aug	Sep-Oct	Nov-Dec	Annual Total
Washington	Charter	0.0	1.3	18.0	42.5	6.8	0.0	68.6
	Private	68.5	60.6	178.0	102.3	15.6	0.0	425.0
	Total	68.5	61.9	195.9	144.8	22.5	0.0	493.6
Oregon	Charter	0.8	4.4	27.0	34.2	7.7	0.7	74.8
	Private	31.4	31.2	123.6	108.4	19.4	1.3	315.3
	Total	32.2	35.7	150.6	142.5	27.1	2.0	390.1
N. California	Charter	3.4	11.3	24.1	73.3	33.0	3.3	148.4
	Private	75.9	83.9	332.5	502.8	211.5	278.2	1,485.0
	Total	79.4	95.2	356.7	576.1	244.6	281.5	1,633.4
S. California	Charter	32.7	42.0	113.0	256.2	87.3	42.4	573.6
	Private	136.9	192.8	348.2	400.8	331.3	222.5	1,632.5
	Total	169.5	234.8	461.1	657.0	418.6	264.9	2,206.1
Total All States	Charter	36.9	59.1	182.1	406.2	134.8	46.4	865.4
	Private	312.6	368.6	982.3	1,114.3	577.9	502.1	3,857.8
	Total	349.5	427.6	1,164.4	1,520.5	712.7	548.4	4,723.2

TABLE 8-12. Trends in effort for recreational ocean fisheries in thousands of angler trips. (Page 1 of 1)

	Charter								Private							
Area	1996	1997	1998	1999	2000	2001[b/]	2002[a/]	2003[c/]	1996	1997	1998	1999	2000	2001[a/]	2002[a/]	2003[b/]
Total Angler Trips																
Washington	51	50	44	49	40	61	56	61	52	55	37	52	87	164	116	136
Oregon	54	65	57	60	87	70	62	75	57	87	213	173	330	140	130	315
Northern CA	90	139	158	162	206	221	142	148	253	312	528	549	523	901	556	1,485
Southern CA	982	812	674	609	876	577	438	574	1,099	1,073	1,167	879	1,314	1,757	1,494	1,632
Total	1,177	1,066	933	880	1,218	927	843	858	1,461	1,527	1,945	1,653	2,219	2,886	2,587	3,569
Trips with Groundfish Target and Incidental																
Washington	24	19	23	21	25	12	9	11	24	21	54	25	30	10	10	11
Oregon	43	47	47	44	69	47	46	32	33	57	119	88	153	22	36	25
Northern CA	63	159	58	95	101	141	53		110	113	160	188	120	164	253	
Southern CA	59	23	33	45	57	204	189		35	11	15	30	28	252	391	
Total	189	248	161	205	252	404	297		202	202	348	331	331	448	690	

[a/] Between September 2001 and October 2002, approximately 10% of the coastwide limited entry trawl landed weight and 30% of the limited entry fixed gear landed weight was observed.
[b/] The 2001 and 2002 estimates are not directly comparable to previous years due to differences in estimation methodology.
[c/] Preliminary.

TABLE 8-13. 2003 groundfish landings by species and port for the **limited entry traw**l fleet ($,000). (Page 1 of 1)

Port (PCID)	Lingcod	Whiting	Sablefish	POP	Widow	Canary	Chili-pepper	Yellow-tail	Short-spine	Long-spine	Slope Rockfish	Other Rockfish	Dover	Petrale	Arrow-tooth	Other Flatfish	Port Total
Blaine	1.9	0.0	71.3	6.9	0.0	0.9	0.0	6.5	3.8	0.0	6.1	1.8	46.9	350.9	53.7	11.6	562.3
Neah Bay	5.7	0.0	31.3	0.0	0.0	0.8	0.0	7.6	0.0	0.0	0.0	0.1	15.7	48.5	1.1	103.5	214.4
Westport	1.8	585.7	33.6	2.7	0.8	0.0	0.0	13.3	4.9	1.8	2.2	0.0	47.3	37.5	8.8	20.9	761.3
Ilwaco	0.0	123.8	0.0	0.0	1.9	0.0	0.0	1.9	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	127.6
Astoria	11.3	842.7	650.5	22.8	0.2	0.7	0.0	24.0	86.1	169.0	35.2	0.5	691.7	727.5	75.9	366.2	3,704.3
Garibaldi	0.4	0.0	3.4	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	2.1	34.3	0.2	26.4	66.8
Newport	9.1	2,060.9	566.8	18.0	0.7	0.8	4.0	6.7	79.2	92.9	20.1	3.2	302.7	148.3	19.1	50.1	3,382.6
Florence	0.6	0.0	1.1	0.0	0.0	0.1	0.0	0.0	0.0	0.0	0.0	0.0	3.6	5.1	0.0	19.9	30.3
Charleston	11.1	441.5	545.4	2.2	5.1	1.1	0.7	7.1	82.5	207.7	20.5	2.2	515.7	618.7	21.8	136.8	2,620.0
Brookings	0.0	214.8	183.0	0.1	0.0	0.0	0.0	0.1	26.8	74.7	3.0	0.0	150.5	29.1	0.9	20.7	703.6
Crescent City	0.6	0.0	70.6	0.0	0.0	0.0	0.0	0.0	8.0	48.4	1.9	0.0	65.8	11.9	1.3	33.9	242.4
Eureka Area	0.1	77.6	222.3	0.0	0.0	0.0	0.0	0.0	50.3	88.9	2.7	6.3	225.2	26.4	2.0	39.6	741.3
Fort Bragg	0.1	0.0	270.8	0.0	0.0	0.0	0.0	0.0	95.5	160.6	5.8	4.7	385.6	12.0	0.2	24.5	959.8
Bodega Bay	0.0	182.1	53.9	0.0	0.0	0.0	0.0	1.8	14.3	21.4	1.3	24.2	51.3	9.4	0.3	13.5	373.5
San Francisco	3.1	0.0	141.8	0.0	2.3	0.0	0.1	0.0	35.2	41.7	27.2	20.8	181.3	85.5	0.1	53.5	592.7
Princeton	0.6	0.0	4.5	0.0	0.0	0.0	0.6	0.0	0.3	0.3	0.0	0.7	11.1	61.5	0.0	174.4	254.0
Santa Cruz	0.0	0.0	0.0	0.0	0.0	0.0	0.1	0.0	0.0	0.0	0.0	0.0	0.0	0.2	0.0	2.1	2.5
Moss Landing	1.5	0.0	63.6	0.0	0.1	0.0	1.2	0.0	30.2	55.3	14.5	18.0	131.8	10.5	2.8	65.5	395.0
Monterey	0.8	0.0	57.4	0.0	0.0	0.0	1.2	0.0	22.9	61.8	3.6	9.0	83.5	4.5	0.0	38.6	283.5
Morro Bay	0.2	0.0	9.4	0.0	0.0	0.0	0.0	0.0	3.2	13.0	3.0	1.0	22.4	12.9	0.0	3.4	68.6
Avila	0.0	0.0	74.6	0.0	0.0	0.0	0.0	0.0	27.5	99.8	28.5	8.1	138.7	11.0	0.0	10.0	398.2
Species Total	48.9	4,529.1	3,055.2	52.7	11.1	4.5	7.7	69.1	570.7	1,137.3	175.7	100.8	3,072.7	2,245.6	188.1	1,215.3	16,484.6

TABLE 8-14a. Projected 2005 groundfish landings by species and port for the **limited entry trawl** fleet under the **No Action Alternative** (difference from 2003 Landings [$,000]). (Page 1 of 1)

Port (PCID)	Lingcod	Whiting	Sablefish	POP	Widow	Canary	Chili-pepper	Yellow-tail	Short-spine	Long-spine	Slope Rockfish	Other Rockfish	Dover	Petrale	Arrow-tooth	Other Flatfish	Port Total
Blaine	0.4	-0.0	2.2	-5.8	0.0	0.4	0.0	-0.8	2.8	0.4	1.5	-0.1	2.6	-150.0	-25.2	37.3	-135.1
Neah Bay	-0.5	0.0	35.7	0.0	0.0	0.4	0.0	-5.7	1.0	0.0	0.0	0.1	1.8	35.8	1.0	130.3	200.1
Westport	0.6	1,109.1	10.5	-2.5	-0.8	0.5	0.0	-11.4	-0.7	-0.9	-0.6	0.0	17.1	36.6	-5.6	30.9	1,182.8
Ilwaco	0.1	126.3	6.9	0.0	-1.9	0.0	0.0	-1.9	0.3	0.0	0.7	0.0	1.2	0.0	0.0	0.0	131.7
Astoria	3.9	1,727.8	580.1	3.8	-0.2	2.8	0.0	2.9	93.3	1.4	23.9	1.7	537.7	714.4	26.6	341.7	4,062.0
Garibaldi	1.2	0.0	5.2	0.0	0.0	0.4	0.0	0.0	0.1	0.0	0.0	0.0	7.2	29.5	0.1	33.6	77.3
Newport	-6.7	4,890.2	606.6	-2.3	-0.7	-0.3	-3.0	-2.1	84.0	-1.4	35.2	0.5	270.3	586.9	42.2	147.6	6,647.0
Florence	0.5	0.0	1.2	0.0	0.0	0.1	0.0	0.0	0.2	0.1	0.0	0.0	1.9	3.4	0.0	31.6	39.0
Charleston	-6.4	481.8	439.0	22.0	-5.1	-0.1	-0.7	-3.5	69.0	-30.7	16.2	-0.5	312.0	605.2	-6.3	387.8	2,279.7
Brookings	0.5	549.0	135.4	4.6	-0.0	0.1	0.0	-0.1	21.2	-22.8	1.8	0.1	66.1	67.9	-0.4	31.7	855.1
Crescent City	-0.3	0.0	138.1	4.2	-0.0	0.0	0.0	0.1	18.2	1.2	1.0	0.1	83.8	51.4	-0.4	120.5	417.8
Eureka Area	1.7	158.1	282.2	9.5	-0.0	0.4	0.0	1.9	44.0	21.4	10.2	-5.8	201.7	258.6	3.3	154.8	1,142.1
Fort Bragg	1.4	0.0	140.2	0.0	0.0	0.1	9.0	0.0	42.2	-20.4	52.1	-2.2	103.5	47.6	0.1	97.0	470.6
Bodega Bay	0.2	392.8	35.2	0.7	-0.0	0.0	0.9	-1.8	6.0	3.1	9.3	-22.1	13.6	21.3	-0.1	24.6	483.9
San Francisco	8.3	0.0	69.2	0.2	-2.3	1.1	8.3	3.5	21.1	-0.3	63.5	-16.6	85.4	141.1	3.3	413.3	799.1
Princeton	9.9	0.0	14.1	0.0	0.0	0.7	3.2	0.0	1.8	1.3	1.2	-0.1	14.1	43.1	0.0	168.5	257.7
Santa Cruz	0.4	0.0	56.2	1.1	0.0	0.0	0.3	0.5	4.3	2.8	0.6	0.1	28.0	26.9	0.4	55.5	177.1
Moss Landing	1.9	0.0	54.0	0.3	-0.1	0.1	2.8	0.1	16.4	-11.2	38.1	-15.6	71.9	71.7	0.4	110.9	341.9
Monterey	1.8	48.0	33.5	0.3	0.0	0.1	2.2	0.0	12.4	-17.1	35.3	-7.7	25.6	16.1	0.7	66.6	217.7
Morro Bay	0.3	0.0	-0.1	0.0	0.0	0.0	0.3	0.0	2.3	-6.7	6.6	-0.3	-1.9	24.7	0.0	23.4	48.6
Avila	0.5	0.0	30.0	0.0	0.0	0.0	0.2	0.0	31.7	-34.7	101.5	-5.4	23.2	32.1	0.1	17.3	196.5
Species Total	19.7	9,483.1	2,675.2	36.3	-11.1	6.3	23.4	-18.2	471.4	-114.2	398.0	-73.7	1,867.0	2,664.3	40.1	2,424.9	19,892.6

TABLE 8-14b. Projected 2005 groundfish landings by species and port for the **limited entry trawl** fleet under **Action Alternative 1** (difference from 2003 Landings [$,000]). (Page 1 of 1)

Port (PCID)	Lingcod	Whiting	Sablefish	POP	Widow	Canary	Chili-pepper	Yellow-tail	Short-spine	Long-spine	Slope Rockfish	Other Rockfish	Dover	Petrale	Arrow-tooth	Other Flatfish	Port Total
Blaine	1.0	-0.0	5.1	-6.6	-0.0	-0.3	0.0	-4.9	2.6	0.4	1.6	-1.5	-8.5	-253.4	-18.7	32.4	-251.1
Neah Bay	-3.9	0.0	12.3	0.0	0.0	-0.1	0.0	-5.5	0.3	0.0	0.0	0.1	-2.5	26.8	0.5	61.4	89.5
Westport	-1.4	1,058.5	11.9	-2.5	-0.8	0.1	0.0	-11.6	-1.7	-0.9	-0.6	0.0	-1.0	29.1	-5.4	25.4	1,099.2
Ilwaco	0.0	118.9	6.9	0.0	-1.9	0.0	0.0	-1.9	0.3	0.0	0.7	0.0	0.9	0.0	0.0	0.0	124.0
Astoria	1.1	1,651.2	492.3	-5.3	-0.2	1.2	0.0	-9.0	87.8	1.1	24.3	0.7	364.7	571.5	15.2	186.1	3,382.9
Garibaldi	-0.0	0.0	-1.5	0.0	0.0	0.1	0.0	-0.0	0.1	0.0	0.0	0.0	2.1	16.1	-0.0	18.2	35.1
Newport	-1.1	4,683.0	551.4	-8.8	-0.7	0.4	-3.0	-5.3	80.2	-1.5	34.8	-0.5	210.5	556.9	39.1	112.4	6,247.8
Florence	-0.3	0.0	0.6	0.0	0.0	-0.1	0.0	0.0	0.2	0.1	0.0	0.0	-0.6	1.2	0.0	20.3	21.4
Charleston	-3.2	454.3	376.2	14.7	-5.1	0.1	-0.7	-4.4	65.8	-22.7	16.3	-0.8	225.2	591.0	-7.0	299.7	1,999.4
Brookings	2.1	526.2	116.9	2.5	-0.0	0.3	0.0	-0.1	20.1	-22.8	1.8	0.0	44.4	69.0	-0.4	25.8	786.0
Crescent City	1.7	0.0	127.7	1.9	-0.0	0.3	0.0	0.1	17.6	1.2	1.0	0.1	67.4	54.6	-0.4	109.3	382.5
Eureka Area	4.1	151.1	245.7	5.3	-0.0	0.7	0.0	0.8	41.9	21.4	10.4	-5.9	147.2	252.5	3.0	119.8	997.8
Fort Bragg	0.6	0.0	109.6	0.0	0.0	0.0	9.0	0.0	39.0	-20.4	44.2	-3.2	63.6	45.9	0.1	35.2	323.5
Bodega Bay	0.7	375.7	11.0	0.0	-0.0	0.1	0.9	-1.8	5.6	3.1	28.5	-22.1	1.0	21.3	-0.1	8.1	431.9
San Francisco	3.7	0.0	44.6	0.0	-2.3	0.6	8.3	1.7	19.8	-0.3	86.3	-17.8	56.4	129.8	4.3	219.4	554.4
Princeton	8.0	0.0	12.6	0.0	0.0	0.6	3.2	0.0	1.7	1.3	1.2	-0.1	13.8	49.9	0.0	65.7	157.9
Santa Cruz	0.6	0.0	54.0	0.7	0.0	0.1	0.3	0.2	4.2	2.8	0.6	0.1	25.9	26.9	0.4	43.2	159.9
Moss Landing	0.6	0.0	45.6	0.0	-0.1	0.1	2.8	0.0	15.3	-11.2	45.0	-15.9	50.7	52.7	-0.2	23.7	209.2
Monterey	1.0	46.5	27.1	0.0	0.0	0.1	2.2	0.0	11.5	-17.1	45.6	-8.1	15.1	6.4	0.6	29.3	160.2
Morro Bay	0.0	0.0	-0.8	0.0	0.0	0.0	0.3	0.0	2.1	-6.7	4.6	-0.3	-1.6	17.3	0.0	9.2	24.1
Avila	0.4	0.0	22.1	0.0	0.0	0.0	0.2	0.0	30.3	-34.7	114.3	-5.6	9.2	32.1	0.1	3.9	172.3
Species Total	15.5	9,065.5	2,271.3	2.0	-11.1	4.3	23.4	-41.8	444.6	-106.8	460.7	-80.6	1,283.9	2,297.4	31.0	1,448.5	17,107.9

TABLE 8-14c. Projected 2005 groundfish landings by species and port for the **limited entry trawl** fleet under **Action Alternative 2** (difference from 2003 Landings [$,000]). (Page 1 of 1)

Port (PCID)	Lingcod	Whiting	Sablefish	POP	Widow	Canary	Chili-pepper	Yellow-tail	Short-spine	Long-spine	Slope Rockfish	Other Rockfish	Dover	Petrale	Arrow-tooth	Other Flatfish	Port Total
Blaine	0.3	-0.0	-1.5	-6.9	-0.0	-0.5	0.0	0.8	2.7	0.4	1.9	0.5	1.2	-218.6	-44.9	56.7	-207.8
Neah Bay	-2.0	0.0	52.1	0.0	0.0	0.1	0.0	-4.4	1.4	0.0	0.0	0.9	2.5	58.4	3.5	155.4	267.8
Westport	-0.5	1,058.5	26.3	-2.5	-0.8	0.2	0.0	-10.2	-0.7	-0.9	-0.6	0.0	10.9	41.8	-4.0	34.9	1,152.5
Ilwaco	0.0	118.9	6.9	0.0	-1.9	0.0	0.0	-1.9	0.3	0.0	0.7	0.0	0.9	0.0	0.0	0.0	124.0
Astoria	6.3	1,651.2	569.2	-5.2	-0.2	1.8	0.0	13.0	88.1	-5.1	24.4	2.8	469.1	730.9	4.3	434.8	3,985.3
Garibaldi	0.6	0.0	5.6	0.0	0.0	0.2	0.0	0.0	0.1	0.0	0.0	0.0	9.9	34.4	0.2	40.6	91.6
Newport	0.2	4,683.0	559.7	-8.7	-0.7	0.5	-3.0	0.3	80.5	-1.6	34.6	2.6	229.0	624.6	43.9	164.9	6,409.8
Florence	0.1	0.0	1.7	0.0	0.0	0.0	0.0	0.1	0.2	0.1	0.0	0.0	3.6	7.1	0.0	42.5	55.4
Charleston	-1.8	454.3	372.8	15.2	-5.1	0.2	-0.7	-3.0	63.9	-42.8	16.3	0.4	251.0	631.4	-6.0	444.5	2,190.6
Brookings	2.2	526.2	120.3	2.6	-0.0	0.4	0.0	-0.1	20.1	-22.8	1.8	0.1	45.3	71.6	-0.4	37.5	804.8
Crescent City	1.9	0.0	131.2	2.0	-0.0	0.3	0.0	0.1	17.6	1.2	1.0	0.3	70.0	55.7	-0.4	142.7	423.8
Eureka Area	5.1	151.1	257.9	5.4	-0.0	0.8	0.0	3.2	41.9	21.5	10.3	-4.5	163.9	270.3	3.7	181.5	1,112.1
Fort Bragg	1.1	0.0	110.9	0.0	0.0	0.1	9.0	0.0	39.0	-20.4	44.3	-2.2	66.5	47.6	0.1	49.6	345.4
Bodega Bay	0.8	375.7	33.7	0.0	-0.0	0.1	0.9	-1.8	5.6	3.1	28.5	-22.1	1.0	21.3	-0.1	12.4	459.1
San Francisco	5.3	0.0	59.2	0.0	-2.3	0.7	8.3	6.6	19.9	-0.3	86.2	-15.9	63.6	158.5	5.0	304.2	698.9
Princeton	8.8	0.0	12.8	0.0	0.0	0.6	3.2	0.0	1.7	1.3	1.2	-0.1	13.8	50.3	0.0	119.8	213.5
Santa Cruz	0.6	0.0	54.0	0.8	0.0	0.1	0.3	0.5	4.2	2.8	0.6	0.1	25.9	29.4	0.4	52.7	172.4
Moss Landing	1.1	0.0	47.3	0.0	-0.1	0.1	2.8	0.1	15.3	-11.2	44.9	-15.6	51.5	71.7	0.4	44.7	253.2
Monterey	1.8	46.5	29.0	0.0	0.0	0.1	2.2	0.0	11.6	-17.1	45.6	-7.7	15.2	17.3	0.7	50.5	195.6
Morro Bay	0.2	0.0	-0.8	0.0	0.0	0.0	0.3	0.0	2.1	-6.7	4.6	-0.3	-1.6	24.7	0.0	13.4	35.9
Avila	0.4	0.0	22.1	0.0	0.0	0.0	0.2	0.0	30.3	-34.7	114.4	-5.4	9.2	32.1	0.1	6.7	175.6
Species Total	32.5	9,065.5	2,470.6	2.9	-11.1	5.9	23.4	3.1	445.7	-133.0	460.7	-66.0	1,502.4	2,760.4	6.5	2,389.9	18,959.5

TABLE 8-14d. Projected 2005 groundfish landings by species and port for the Limited Entry Trawl fleet under Action Alternative 3 (difference from 2003 Landings [$,000]). (Page 1 of 1)

Port (PCID)	Lingcod	Whiting	Sablefish	POP	Widow	Canary	Chili-pepper	Yellow-tail	Short-spine	Long-spine	Slope Rockfish	Other Rockfish	Dover	Petrale	Arrow-tooth	Other Flatfish	Port Total
Blaine	0.5	-0.0	5.9	-6.9	-0.0	-0.4	0.0	3.1	2.9	0.4	1.9	0.8	-1.5	-182.7	-45.0	66.2	-154.8
Neah Bay	-1.5	0.0	73.4	0.0	0.0	0.2	0.0	-2.8	2.4	0.0	0.0	1.1	5.8	66.5	4.2	193.9	343.3
Westport	-0.4	1,058.5	39.1	-2.5	-0.8	0.2	0.0	-9.0	1.7	-0.9	-0.6	0.1	5.0	50.4	-2.9	35.3	1,173.3
Ilwaco	0.0	118.9	7.1	0.0	-1.9	0.0	0.0	-1.9	0.3	0.0	0.7	0.0	0.9	0.1	0.1	0.0	124.3
Astoria	6.0	1,651.2	611.2	-5.2	-0.2	1.9	0.0	17.2	91.3	-15.5	24.3	3.2	444.3	768.3	5.1	467.9	4,071.0
Garibaldi	0.7	0.0	7.0	0.0	0.0	0.2	0.0	0.0	0.1	0.0	0.0	0.0	10.6	44.9	0.3	40.6	104.4
Newport	0.6	4,683.0	610.5	-8.6	-0.7	0.6	-3.0	0.8	82.7	-1.5	34.6	3.5	236.9	663.6	44.6	177.5	6,525.3
Florence	0.2	0.0	4.5	0.0	0.0	0.0	0.0	0.1	0.4	0.1	0.0	0.0	6.1	7.6	0.0	49.0	68.0
Charleston	-1.7	454.3	391.0	15.2	-5.1	0.2	-0.7	-2.7	62.6	-57.1	16.3	0.8	261.5	668.7	-5.2	450.4	2,248.6
Brookings	2.3	526.2	131.1	2.6	-0.0	0.4	0.0	-0.1	20.1	-22.8	1.8	0.1	45.7	71.6	-0.4	37.6	816.2
Crescent City	1.8	0.0	128.6	2.0	-0.0	0.3	0.0	0.1	17.6	-6.1	1.0	0.3	72.6	56.7	-0.4	147.1	421.8
Eureka Area	5.3	151.1	277.6	5.5	-0.0	0.8	0.0	4.1	42.2	21.5	10.2	-4.1	168.9	273.6	4.3	188.3	1,149.3
Fort Bragg	1.1	0.0	125.6	0.0	0.0	0.1	9.0	0.0	39.0	-20.4	44.3	-2.2	66.5	47.6	0.1	49.6	360.1
Bodega Bay	0.8	375.7	34.5	0.0	-0.0	0.1	0.9	-1.8	5.6	3.1	28.5	-22.0	1.0	21.4	-0.1	12.7	460.3
San Francisco	5.4	0.0	69.4	0.0	-2.3	0.8	8.3	7.4	20.6	-0.3	86.2	-15.9	62.9	175.4	5.5	312.8	736.3
Princeton	8.8	0.0	13.4	0.0	0.0	0.6	3.2	0.0	1.7	1.3	1.2	-0.1	13.8	50.3	0.0	119.8	214.1
Santa Cruz	0.6	0.0	55.1	0.8	0.0	0.1	0.3	0.5	4.2	2.8	0.6	0.1	25.9	29.4	0.4	52.7	173.4
Moss Landing	1.1	0.0	50.7	0.0	-0.1	0.1	2.8	0.1	15.3	-11.2	45.0	-15.3	51.5	72.1	0.4	44.8	257.4
Monterey	1.8	46.5	31.2	0.0	0.0	0.1	2.2	0.0	11.6	-17.1	45.6	-7.7	15.2	17.3	0.7	50.5	197.9
Morro Bay	0.2	0.0	-0.5	0.0	0.0	0.0	0.3	0.0	2.1	-6.7	4.6	-0.3	-1.6	24.7	0.0	13.4	36.2
Avila	0.4	0.0	26.0	0.0	0.0	0.0	0.2	0.0	30.3	-34.7	114.5	-5.4	9.2	32.1	0.1	6.7	179.5
Species Total	33.9	9,065.5	2,692.5	3.0	-11.1	6.4	23.4	15.1	454.7	-164.9	460.7	-63.0	1,501.4	2,959.7	11.9	2,516.7	19,506.0

TABLE 8-15. 2003 groundfish landings by species and port for the **limited entry trawl** fleet (mt). (Page 1 of 1)

Port (PCID)	Lingcod	Whiting	Sablefish	POP	Widow	Canary	Chili-pepper	Yellow-tail	Short-spine	Long-spine	Slope Rockfish	Other Rockfish	Dover	Petrale	Arrow-tooth	Other Flatfish	Port Total
Blaine	1.7	0.0	24.3	6.5	0.0	0.9	0.0	6.1	2.4	0.0	6.0	1.7	60.8	154.1	243.8	16.7	525.1
Neah Bay	3.7	0.0	11.2	0.0	0.0	0.8	0.0	7.2	0.0	0.0	0.0	0.1	22.1	21.2	4.9	142.6	213.7
Westport	1.3	5,904.0	11.7	3.1	1.0	0.0	0.0	16.8	2.9	1.7	2.2	0.0	57.8	16.1	30.8	18.6	6,067.9
Ilwaco	0.0	1,247.8	0.0	0.0	2.4	0.0	0.0	2.3	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	1,252.5
Astoria	7.7	8,494.2	235.8	24.5	0.2	0.7	0.0	23.9	52.5	126.6	35.5	0.5	838.1	312.7	271.7	343.7	10,768.4
Garibaldi	0.2	0.0	1.4	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	2.5	13.9	0.6	18.0	36.7
Newport	5.4	20,706.5	213.7	18.2	0.7	0.8	3.5	6.7	45.2	61.8	20.7	4.6	378.7	67.7	70.4	65.5	21,670.2
Florence	0.3	0.0	0.4	0.0	0.0	0.1	0.0	0.0	0.0	0.0	0.0	0.0	4.2	2.3	0.0	24.2	31.5
Charleston	6.4	4,426.8	191.8	2.4	5.3	1.0	0.4	8.2	44.4	144.1	21.9	2.9	629.2	278.2	75.9	150.3	5,989.1
Brookings	0.0	2,165.3	65.2	0.1	0.0	0.0	0.0	0.1	16.2	46.9	3.1	0.0	182.0	14.7	3.0	20.9	2,517.5
Crescent City	0.4	0.0	26.5	0.0	0.0	0.0	0.0	0.0	3.4	28.6	2.1	0.0	79.3	5.8	4.6	35.3	186.1
Eureka Area	0.1	805.8	79.2	0.0	0.0	0.0	0.0	0.0	21.9	66.1	3.1	8.9	271.8	13.6	6.8	44.9	1,322.3
Fort Bragg	0.2	0.0	126.9	0.0	0.0	0.0	0.0	0.0	54.7	119.1	6.5	6.5	471.0	6.3	0.8	24.8	816.8
Bodega Bay	0.0	1,835.8	17.0	0.0	0.0	0.0	0.0	1.8	8.0	22.5	1.3	25.4	64.2	5.2	1.1	14.8	1,997.3
San Francisco	1.4	0.0	59.7	0.0	1.9	0.0	0.0	0.0	17.6	37.8	32.3	31.5	225.4	35.6	0.1	51.9	495.1
Princeton	0.2	0.0	2.8	0.0	0.0	0.0	0.5	0.0	0.1	0.1	0.0	0.7	13.8	24.6	0.0	157.7	200.5
Santa Cruz	0.0	0.0	0.0	0.0	0.0	0.0	0.1	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	1.1	1.3
Moss Landing	0.8	0.0	29.9	0.0	0.0	0.0	0.8	0.0	11.8	31.6	9.2	29.1	181.4	5.5	3.9	93.6	397.7
Monterey	0.5	0.0	30.0	0.0	0.0	0.0	0.8	0.0	16.2	44.8	4.4	14.6	120.3	2.2	0.0	59.1	293.0
Morro Bay	0.1	0.0	4.4	0.0	0.0	0.0	0.0	0.0	2.6	10.3	1.7	1.3	29.8	5.3	0.0	4.2	59.7
Avila	0.0	0.0	34.1	0.0	0.0	0.0	0.0	0.0	19.3	71.7	25.2	13.7	182.9	5.1	0.0	10.1	362.2
Species Total	30.4	45,586.5	1,165.9	54.7	11.5	4.3	6.0	73.2	319.3	813.8	175.4	141.7	3,815.4	990.0	718.4	1,298.0	55,204.4

TABLE 8-16a. Projected 2005 groundfish landings by species and port for the **limited entry trawl** fleet under the **No Action Alternative** (difference from 2003 Landings [mt]). (Page 1 of 1)

Port (PCID)	Lingcod	Whiting	Sablefish	POP	Widow	Canary	Chili-pepper	Yellow-tail	Short-spine	Long-spine	Slope Rockfish	Other Rockfish	Dover	Petrale	Arrow-tooth	Other Flatfish	Port Total
Blaine	-0.2	-0.0	2.0	-5.4	-0.0	-0.3	0.0	-0.3	1.1	0.3	1.8	0.3	-0.4	-61.7	-124.0	38.0	-148.8
Neah Bay	-0.4	0.0	12.9	0.0	0.0	0.4	0.0	-5.2	0.6	0.0	0.0	0.1	-0.8	17.6	3.7	118.6	147.6
Westport	0.2	11,142.7	4.1	-2.9	-1.0	0.5	0.0	-14.8	-0.7	-1.0	-0.6	0.1	20.9	17.9	-17.4	39.3	11,187.5
Ilwaco	0.0	1,268.0	2.5	0.0	-2.4	0.0	0.0	-2.3	0.1	0.0	0.7	0.0	1.4	0.0	0.2	0.0	1,268.3
Astoria	2.0	17,361.0	205.7	2.7	-0.2	2.7	0.0	3.7	44.1	-5.6	25.4	2.1	664.8	350.2	158.1	447.1	19,263.8
Garibaldi	0.8	0.0	1.7	0.0	0.0	0.4	0.0	0.0	0.0	0.0	0.0	0.0	8.9	15.5	0.4	49.0	76.7
Newport	-3.9	49,210.3	210.4	-2.1	-0.7	-0.3	-2.8	-2.0	43.1	3.2	35.5	-0.1	323.9	270.0	185.9	155.4	50,425.6
Florence	0.3	0.0	0.4	0.0	0.0	0.1	0.0	0.0	0.1	0.1	0.0	0.0	2.4	1.6	0.1	33.4	38.6
Charleston	-3.3	4,860.1	161.4	22.3	-5.3	-0.1	-0.4	-4.5	37.2	-18.5	15.8	-0.7	382.6	284.5	-11.0	435.8	6,155.9
Brookings	0.3	5,517.4	49.0	4.7	-0.0	0.1	0.0	-0.1	9.6	-10.1	1.8	0.1	82.8	30.0	-1.0	37.6	5,722.2
Crescent City	-0.2	0.0	48.3	4.3	-0.0	0.0	0.0	0.1	10.8	6.6	0.8	0.2	103.6	23.3	-0.9	137.1	333.9
Eureka Area	1.1	1,565.2	101.8	9.7	-0.0	0.4	0.0	1.9	28.9	12.2	10.1	-8.3	250.1	117.4	15.5	172.2	2,278.2
Fort Bragg	0.5	0.0	62.0	0.0	0.0	0.0	6.7	0.0	23.4	-18.6	44.9	-2.8	157.4	19.5	-0.3	112.8	405.6
Bodega Bay	0.1	3,947.4	17.1	0.7	-0.0	0.0	0.7	-1.8	3.2	-5.1	8.3	-22.8	17.2	8.1	-0.4	28.3	4,000.9
San Francisco	4.3	0.0	33.9	0.2	-1.9	0.8	6.2	3.6	14.2	-8.1	48.9	-25.5	115.4	64.5	12.5	475.4	744.3
Princeton	4.5	0.0	5.8	0.0	0.0	0.3	2.4	0.0	1.1	1.1	1.1	0.2	18.5	20.7	0.0	230.7	286.3
Santa Cruz	0.2	0.0	20.2	1.1	0.0	0.0	0.2	0.5	2.3	2.0	0.6	0.1	34.3	12.3	1.6	63.4	139.0
Moss Landing	0.8	0.0	21.5	0.3	-0.0	0.1	2.2	0.1	14.5	0.1	37.6	-25.5	79.6	30.5	2.5	106.2	270.5
Monterey	0.7	482.4	9.0	0.3	0.0	0.1	1.8	0.0	3.6	-12.9	30.2	-12.7	19.1	6.7	1.2	60.0	589.5
Morro Bay	0.2	0.0	-0.1	0.0	0.0	0.0	0.2	0.0	0.5	-5.8	6.8	-0.2	-3.6	11.0	0.0	26.2	35.3
Avila	0.2	0.0	13.6	0.0	0.0	0.0	0.2	0.0	14.2	-25.0	90.4	-9.7	25.2	13.6	0.1	20.8	143.6
Species Total	8.3	95,354.5	983.4	36.1	-11.5	5.2	17.4	-20.9	251.9	-85.2	360.4	-105.2	2,303.3	1,253.2	226.7	2,787.2	103,364.6

TABLE 8-16b. Projected 2005 groundfish landings by species and port for the **limited entry trawl** fleet under **Action Alternative 1** (difference from 2003 Landings [mt]). (Page 1 of 1)

Port (PCID)	Lingcod	Whiting	Sablefish	POP	Widow	Canary	Chili-pepper	Yellow-tail	Short-spine	Long-spine	Slope Rockfish	Other Rockfish	Dover	Petrale	Arrow-tooth	Other Flatfish	Port Total
Blaine	0.1	-0.0	3.1	-6.3	-0.0	-0.3	0.0	-4.5	1.0	0.3	1.9	-1.3	-14.0	-109.3	-96.6	32.5	-193.5
Neah Bay	-2.5	0.0	4.5	0.0	0.0	-0.1	0.0	-5.0	0.2	0.0	0.0	0.1	-6.0	13.5	1.8	41.7	48.0
Westport	-1.0	10,634.7	4.6	-2.9	-1.0	0.1	0.0	-15.1	-1.2	-1.0	-0.6	0.0	-1.2	14.5	-16.5	33.2	10,646.6
Ilwaco	0.0	1,193.0	2.5	0.0	-2.4	0.0	0.0	-2.3	0.1	0.0	0.7	0.0	1.2	0.0	0.2	0.0	1,193.0
Astoria	0.2	16,590.5	174.2	-6.5	-0.2	1.1	0.0	-8.5	41.2	-5.9	25.8	0.9	453.2	284.5	110.5	273.3	17,934.5
Garibaldi	0.0	0.0	-0.7	0.0	0.0	0.1	0.0	-0.0	0.0	0.0	0.0	0.0	2.6	9.3	-0.0	31.8	43.2
Newport	-0.3	47,126.6	190.4	-8.8	-0.7	0.4	-2.8	-5.3	41.1	3.1	35.2	-1.3	250.5	256.1	172.9	116.0	48,173.0
Florence	-0.2	0.0	0.2	0.0	0.0	-0.1	0.0	0.0	0.1	0.1	0.0	0.0	-0.6	0.6	0.1	20.7	21.0
Charleston	-1.3	4,583.3	138.9	14.8	-5.3	0.1	-0.4	-5.4	35.5	-12.8	16.0	-1.1	276.5	278.0	-13.9	337.3	5,640.2
Brookings	1.3	5,288.4	42.4	2.6	-0.0	0.3	0.0	-0.1	9.0	-10.1	1.8	0.0	56.3	30.5	-1.1	31.1	5,452.6
Crescent City	1.0	0.0	44.6	1.9	-0.0	0.3	0.0	0.1	10.4	6.6	0.9	0.2	83.5	24.8	-0.8	124.6	298.1
Eureka Area	2.6	1,494.5	88.7	5.4	-0.0	0.6	0.0	0.8	27.7	12.2	10.3	-8.4	183.4	114.6	14.0	133.2	2,079.7
Fort Bragg	0.1	0.0	47.9	0.0	0.0	0.0	6.7	0.0	21.6	-18.6	38.0	-4.2	106.1	18.8	-0.3	42.8	258.8
Bodega Bay	0.4	3,775.0	8.2	0.0	-0.0	0.1	0.7	-1.8	3.0	-5.1	25.4	-22.8	1.3	8.1	-0.4	9.5	3,801.6
San Francisco	1.9	0.0	23.3	0.0	-1.9	0.4	6.2	1.8	13.4	-8.1	69.2	-27.0	78.6	59.0	16.6	256.2	489.5
Princeton	3.7	0.0	5.1	0.0	0.0	0.3	2.4	0.0	1.0	1.1	1.1	0.2	18.2	23.7	0.0	114.2	170.8
Santa Cruz	0.3	0.0	19.4	0.7	0.0	0.1	0.2	0.2	2.3	2.0	0.6	0.1	31.7	12.3	1.6	49.6	121.2
Moss Landing	0.2	0.0	17.7	0.0	-0.0	0.1	2.2	0.0	13.9	0.1	43.7	-26.0	52.5	21.9	1.6	7.4	135.3
Monterey	0.4	468.1	6.0	0.0	0.0	0.1	1.8	0.0	3.1	-12.9	39.3	-13.3	5.8	2.5	0.9	17.9	519.7
Morro Bay	0.0	0.0	-0.4	0.0	0.0	0.0	0.2	0.0	0.4	-5.8	5.0	-0.2	-3.2	7.8	0.0	10.1	14.0
Avila	0.2	0.0	10.1	0.0	0.0	0.0	0.2	0.0	13.4	-25.0	101.8	-10.0	7.1	13.6	0.1	5.6	117.2
Species Total	7.3	91,154.2	830.8	1.1	-11.5	3.5	17.4	-45.2	237.2	-79.9	416.3	-114.2	1,583.5	1,084.7	190.6	1,688.6	96,964.3

TABLE 8-16c. Projected 2005 groundfish landings by species and port for the **limited entry trawl** fleet under **Action Alternative 2** (difference from 2003 landings [mt]). (Page 1 of 1)

Port (PCID)	Lingcod	Whiting	Sablefish	POP	Widow	Canary	Chili-pepper	Yellow tail	Short-spine	Long-spine	Slope Rockfish	Other Rockfish	Dover	Petrale	Arrow-tooth	Other Flatfish	Port Total
Blaine	-0.3	-0.0	0.7	-6.5	-0.0	-0.5	0.0	1.3	1.1	0.3	2.3	1.0	-2.1	-93.3	-206.7	59.7	-242.9
Neah Bay	-1.3	0.0	18.7	0.0	0.0	0.1	0.0	-3.9	0.8	0.0	0.0	1.1	0.1	28.0	14.3	146.6	204.5
Westport	-0.4	10,634.7	9.8	-2.9	-1.0	0.2	0.0	-13.6	-0.7	-1.0	-0.6	0.1	13.4	20.3	-10.5	43.7	10,691.4
Ilwaco	0.0	1,193.0	2.5	0.0	-2.4	0.0	0.0	-2.3	0.1	0.0	0.7	0.0	1.2	0.0	0.2	0.0	1,193.0
Astoria	3.5	16,590.5	201.8	-6.5	-0.2	1.7	0.0	14.2	41.3	-10.2	25.8	3.4	580.9	357.8	64.6	551.0	18,419.6
Garibaldi	0.4	0.0	1.9	0.0	0.0	0.2	0.0	0.0	0.1	0.0	0.0	0.0	12.1	17.7	0.9	56.8	90.1
Newport	0.5	47,126.6	193.4	-8.7	-0.7	0.5	-2.8	0.4	41.2	3.0	35.0	2.4	273.0	287.3	193.0	174.7	48,318.9
Florence	0.1	0.0	0.6	0.0	0.0	0.0	0.0	0.1	0.1	0.1	0.0	0.0	4.5	3.3	0.1	45.6	54.4
Charleston	-0.4	4,583.3	137.7	15.4	-5.3	0.2	-0.4	-4.1	34.5	-27.0	16.0	0.3	308.1	296.5	-9.9	499.1	5,843.9
Brookings	1.4	5,288.4	43.6	2.6	-0.0	0.4	0.0	-0.1	9.0	-10.1	1.8	0.1	57.3	31.7	-0.9	44.1	5,469.4
Crescent City	1.2	0.0	45.9	2.0	-0.0	0.3	0.0	0.1	10.4	6.6	0.9	0.3	86.8	25.3	-0.7	161.9	341.0
Eureka Area	3.3	1,494.5	93.1	5.5	-0.0	0.8	0.0	3.2	27.7	12.2	10.2	-6.7	203.9	122.8	17.1	202.0	2,189.7
Fort Bragg	0.4	0.0	48.5	0.0	0.0	0.0	6.7	0.0	21.6	-18.6	38.0	-2.8	109.8	19.5	-0.3	59.1	281.9
Bodega Bay	0.5	3,775.0	16.4	0.0	-0.0	0.1	0.7	-1.8	3.0	-5.1	25.3	-22.8	1.3	8.1	-0.4	14.4	3,814.7
San Francisco	2.8	0.0	29.0	0.0	-1.9	0.5	6.2	6.7	13.5	-8.1	69.1	-24.7	87.5	72.1	19.7	351.6	624.1
Princeton	4.0	0.0	5.2	0.0	0.0	0.3	2.4	0.0	1.0	1.1	1.1	0.2	18.2	23.8	0.0	175.5	232.8
Santa Cruz	0.4	0.0	19.4	0.8	0.0	0.1	0.2	0.5	2.3	2.0	0.6	0.1	31.7	13.5	1.6	60.2	133.4
Moss Landing	0.5	0.0	18.5	0.0	-0.0	0.1	2.2	0.1	13.9	0.1	43.7	-25.5	53.5	30.5	2.5	31.2	171.2
Monterey	0.8	468.1	6.9	0.0	0.0	0.1	1.8	0.0	3.1	-12.9	39.4	-12.7	5.8	7.2	1.2	41.8	550.5
Morro Bay	0.1	0.0	-0.4	0.0	0.0	0.0	0.2	0.0	0.4	-5.8	5.0	-0.2	-3.2	11.0	0.0	14.9	22.1
Avila	0.2	0.0	10.1	0.0	0.0	0.0	0.2	0.0	13.5	-25.0	101.9	-9.7	7.2	13.6	0.1	8.8	120.8
Species Total	17.5	91,154.2	903.3	1.9	-11.5	5.0	17.4	0.9	237.8	-98.5	416.3	-96.1	1,850.9	1,296.8	85.9	2,742.7	98,524.6

TABLE 8-16d. Projected 2005 groundfish landings by species and port for the **limited entry trawl** fleet under **Action Alternative 3** (difference from 2003 Landings [mt]). (Page 1 of 1)

Port (PCID)	Lingcod	Whiting	Sablefish	POP	Widow	Canary	Chili-pepper	Yellow-tail	Short-spine	Long-spine	Slope Rockfish	Other Rockfish	Dover	Petrale	Arrow-tooth	Other Flatfish	Port Total
Blaine	-0.2	-0.0	3.4	-6.5	-0.0	-0.4	0.0	3.7	1.2	0.3	2.3	1.4	-5.3	-76.8	36.8	70.2	30.0
Neah Bay	-1.0	0.0	26.4	0.0	0.0	0.2	0.0	-2.2	1.3	0.0	0.0	1.3	4.1	31.7	22.2	189.6	273.7
Westport	-0.4	10,634.7	14.4	-2.9	-1.0	0.2	0.0	-12.3	0.6	-1.0	-0.6	0.1	6.1	24.3	24.9	44.2	10,731.3
Ilwaco	0.0	1,193.0	2.6	0.0	-2.4	0.0	0.0	-2.3	0.1	0.0	0.7	0.0	1.2	0.0	0.2	0.0	1,193.2
Astoria	3.3	16,590.5	216.9	-6.5	-0.2	1.8	0.0	18.4	43.0	-17.6	25.8	3.8	550.6	375.0	68.1	588.0	18,461.1
Garibaldi	0.4	0.0	2.4	0.0	0.0	0.2	0.0	0.0	0.1	0.0	0.0	0.0	13.0	22.6	1.9	56.8	97.4
Newport	0.8	47,126.6	211.7	-8.6	-0.7	0.6	-2.8	0.9	42.4	3.0	35.0	3.5	282.8	305.2	266.6	188.8	48,455.9
Florence	0.1	0.0	1.6	0.0	0.0	0.0	0.0	0.1	0.2	0.1	0.0	0.0	7.5	3.6	0.1	52.8	66.1
Charleston	-0.4	4,583.3	144.2	15.3	-5.3	0.2	-0.4	-3.7	33.8	-37.2	15.9	0.8	320.9	313.7	69.3	505.7	5,956.3
Brookings	1.4	5,288.4	47.5	2.7	-0.0	0.4	0.0	-0.1	9.0	-10.1	1.8	0.1	57.8	31.7	2.1	44.2	5,476.9
Crescent City	1.1	0.0	45.0	2.0	-0.0	0.3	0.0	0.1	10.5	1.4	0.9	0.4	89.9	25.7	3.9	166.8	348.0
Eureka Area	3.4	1,494.5	100.2	5.6	-0.0	0.8	0.0	4.3	27.9	12.2	10.2	-6.3	210.0	124.3	26.3	209.6	2,223.0
Fort Bragg	0.4	0.0	55.2	0.0	0.0	0.0	6.7	0.0	21.6	-18.6	38.0	-2.8	109.8	19.5	0.5	59.1	289.5
Bodega Bay	0.5	3,775.0	16.7	0.0	-0.0	0.1	0.7	-1.8	3.0	-5.1	25.4	-22.8	1.3	8.1	0.7	14.8	3,816.6
San Francisco	2.9	0.0	33.3	0.0	-1.9	0.6	6.2	7.6	13.9	-8.1	69.1	-24.6	86.7	79.9	21.9	361.2	648.7
Princeton	4.0	0.0	5.5	0.0	0.0	0.3	2.4	0.0	1.0	1.1	1.1	0.2	18.2	23.8	0.0	175.5	233.1
Santa Cruz	0.4	0.0	19.8	0.8	0.0	0.1	0.2	0.5	2.3	2.0	0.6	0.1	31.7	13.5	1.6	60.2	133.8
Moss Landing	0.5	0.0	20.0	0.0	-0.0	0.1	2.2	0.1	13.9	0.1	43.7	-25.1	53.5	30.7	6.6	31.3	177.4
Monterey	0.8	468.1	7.9	0.0	0.0	0.1	1.8	0.0	3.1	-12.9	39.4	-12.7	5.8	7.2	1.2	41.8	551.6
Morro Bay	0.1	0.0	-0.2	0.0	0.0	0.0	0.2	0.0	0.4	-5.8	5.0	-0.2	-3.2	11.0	0.0	14.9	22.3
Avila	0.2	0.0	11.9	0.0	0.0	0.0	0.2	0.0	13.5	-25.0	101.9	-9.7	7.2	13.6	0.1	8.8	122.6
Species Total	18.4	91,154.2	986.2	2.1	-11.5	5.5	17.4	13.2	242.7	-121.1	416.3	-92.4	1,849.7	1,388.4	555.1	2,884.3	99,308.5

TABLE 8-17a. Summary of changes in projected 2005 **limited entry trawl** vessel groundfish revenue from 2003 under the **No Action Alternative.** (Page 1 of 1)

Fleet	**< 20% change in projected revenue**					**> 20% change in projected revenue**					**All vessels**				
Avg. 2003 revenue Direction of change	# of Vessels	Avg. 2003 GF ($)	Proj. 2005 GF ($)	Average change in GF revenue $	Average change in GF revenue %	# of Vessels	Avg. 2003 GF ($)	Proj. 2005 GF ($)	Average change in GF revenue $	Average change in GF revenue %	# of Vessels	Avg. 2003 GF ($)	Proj. 2005 GF ($)	Average change in GF revenue $	Average change in GF revenue %
Non-whiting vessels															
$21 - $100,000															
Lower 2005 revenue	2	53,932	51,197	-2,735	-5%	4	75,007	49,693	-25,313	-34%	6	67,982	50,195	-17,787	-26%
Higher 2005 revenue	2	81,952	96,838	14,886	18%	36	45,919	105,554	59,635	130%	38	47,815	105,096	57,280	120%
Total	4	67,942	74,017	6,075	9%	40	48,828	99,968	51,140	105%	44	50,565	97,609	47,044	93%
> $100,000															
Lower 2005 revenue	2	125,372	111,587	-13,785	-11%	3	296,524	203,366	-93,158	-31%	5	228,063	166,654	-61,409	-27%
Higher 2005 revenue	3	148,493	169,312	20,819	14%	38	162,722	256,659	93,938	58%	41	161,681	250,268	88,588	55%
Total	5	139,245	146,222	6,977	5%	41	172,512	252,760	80,248	47%	46	168,896	241,180	72,284	43%
All															
Lower 2005 revenue	4	89,652	81,392	-8,260	-9%	7	169,943	115,553	-54,390	-32%	11	140,746	103,131	-37,615	-27%
Higher 2005 revenue	5	121,877	140,322	18,446	15%	74	105,899	183,149	77,250	73%	79	106,910	180,438	73,528	69%
Total	9	107,555	114,131	6,576	6%	81	111,433	177,307	65,874	59%	90	111,046	170,990	59,944	54%
Whiting vessels															
$21 - $100,000															
Higher 2005 revenue	.	.	.	.	.	3	40,036	146,127	106,091	265%	3	40,036	146,127	106,091	265%
> $100,000															
Higher 2005 revenue	.	.	.	.	.	29	240,800	584,223	343,423	143%	29	240,800	584,223	343,423	143%
All															
Higher 2005 revenue	.	.	.	.	.	32	221,978	543,151	321,173	145%	32	221,978	543,151	321,173	145%
Aggregate															
$21 - $100,000															
Lower 2005 revenue	2	53,932	51,197	-2,735	-5%	4	75,007	49,693	-25,313	-34%	6	67,982	50,195	-17,787	-26%
Higher 2005 revenue	2	81,952	96,838	14,886	18%	39	45,466	108,675	63,209	139%	41	47,246	108,098	60,852	129%
Total	4	67,942	74,017	6,075	9%	43	48,214	103,189	54,974	114%	47	49,893	100,706	50,813	102%
> $100,000															
Lower 2005 revenue	2	125,372	111,587	-13,785	-11%	3	296,524	203,366	-93,158	-31%	5	228,063	166,654	-61,409	-27%
Higher 2005 revenue	3	148,493	169,312	20,819	14%	67	196,517	398,441	201,924	103%	70	194,459	388,621	194,162	100%
Total	5	139,245	146,222	6,977	5%	70	200,803	390,080	189,278	94%	75	196,699	373,823	177,124	90%
All															
Lower 2005 revenue	4	89,652	81,392	-8,260	-9%	7	169,943	115,553	-54,390	-32%	11	140,746	103,131	-37,615	-27%
Higher 2005 revenue	5	121,877	140,322	18,446	15%	106	140,942	291,829	150,887	107%	111	140,083	285,004	144,921	103%
Total	9	107,555	114,131	6,576	6%	113	142,738	280,909	138,171	97%	122	140,143	268,606	128,463	92%

TABLE 8-17b. Summary of changes in projected 2005 **limited entry trawl** vessel groundfish revenue from 2003 under **Alternative 1** (with 8 mt canary limit). (Page 1 of 1)

	< 20% change in projected revenue					**> 20% change in projected revenue**					**All vessels**				
Fleet		Avg.	Proj.	Average change in GF revenue			Avg.	Proj.	Average change in GF revenue			Avg.	Proj.	Average change in GF revenue	
Avg. 2003 revenue	# of	2003	2005			# of	2003	2005			# of	2003	2005		
Direction of change	Vessels	GF ($)	GF ($)	$	%	Vessels	GF ($)	GF ($)	$	%	Vessels	GF ($)	GF ($)	$	%
Non-whiting vessels															
$21 - $100,000															
Lower 2005 revenue	3	36,645	34,255	-2,390	-7%	4	75,007	42,960	-32,047	-43%	7	58,566	39,229	-19,337	-33%
Higher 2005	3	69,905	79,354	9,448	14%	34	47,212	95,430	48,219	102%	37	49,052	94,127	45,075	92%
Total	6	53,275	56,804	3,529	7%	38	50,138	89,907	39,770	79%	44	50,565	85,393	34,828	69%
> $100,000															
Lower 2005 revenue	5	170,318	149,942	-20,376	-12%	4	258,869	139,115	-119,754	-46%	9	209,674	145,130	-64,544	-31%
Higher 2005	2	148,552	159,922	11,369	8%	35	159,573	247,818	88,245	55%	37	158,977	243,067	84,090	53%
Total	7	164,099	152,793	-11,306	-7%	39	169,757	236,669	66,912	39%	46	168,896	223,905	55,009	33%
All															
Lower 2005 revenue	8	120,191	106,559	-13,631	-11%	8	166,938	91,037	-75,900	-45%	16	143,564	98,798	-44,766	-31%
Higher 2005	5	101,364	111,581	10,217	10%	69	104,207	172,729	68,522	66%	74	104,014	168,597	64,583	62%
Total	13	112,950	108,491	-4,459	-4%	77	110,724	164,241	53,517	48%	90	111,046	156,188	45,143	41%
Whiting vessels															
$21 - $100,000															
Higher 2005						3	40,036	145,112	105,076	262%	3	40,036	145,112	105,076	262%
> $100,000															
Higher 2005						29	240,800	570,286	329,486	137%	29	240,800	570,286	329,486	137%
All															
Higher 2005						32	221,978	530,426	308,447	139%	32	221,978	530,426	308,447	139%
Aggregate															
$21 - $100,000															
Lower 2005 revenue	3	36,645	34,255	-2,390	-7%	4	75,007	42,960	-32,047	-437%	7	58,566	39,229	-19,337	-33%
Higher 2005	3	69,905	79,354	9,448	14%	37	46,630	99,459	52,829	113%	40	48,376	97,951	49,575	102%
Total	6	53,275	56,804	3,529	7%	41	49,398	93,947	44,548	90%	47	49,893	89,205	39,312	79%
> $100,000															
Lower 2005 revenue	5	170,318	149,942	-20,376	-12%	4	258,869	139,115	-119,754	-46%	9	209,674	145,130	-64,544	-31%
Higher 2005	2	148,552	159,922	11,369	8%	64	196,379	393,936	197,557	101%	66	194,930	386,845	191,915	98%
Total	7	164,099	152,793	-11,306	-7%	68	200,055	378,947	178,892	89%	75	196,699	357,839	161,140	82%
All															
Lower 2005 revenue	8	120,191	106,559	-13,631	-11%	8	166,938	91,037	-75,900	-45%	16	143,564	98,798	-44,766	-31%
Higher 2005	5	101,364	111,581	10,217	10%	101	141,520	286,058	144,538	102%	106	139,626	277,828	138,202	99%
Total	13	112,950	108,491	-4,459	-4%	109	143,386	271,745	128,359	90%	122	140,143	254,349	114,206	81%

TABLE 8-17c. Summary of changes in projected 2005 **limited entry trawl** vessel groundfish revenue from 2003 under **Alternative 2** (with Selective Flatfish Trawl with a 100 fm in line for 3 summer periods). (Page 1 of 1)

	< 20% change in projected revenue					**> 20% change in projected revenue**					**All vessels**				
Fleet				Average change in GF revenue					Average change in GF revenue					Average change in GF revenue	
Avg. 2003 revenue Direction of	# of Vessels	Avg. 2003 GF ($)	Proj. 2005 GF ($)	$	%	# of Vessels	Avg. 2003 GF ($)	Proj. 2005 GF ($)	$	%	# of Vessels	Avg. 2003 GF ($)	Proj. 2005 GF ($)	$	%
Non-whiting vessels															
$21 - $100,000															
Lower 2005	2	53,932	53,435	-497	-1%	2	63,871	48,431	-15,440	-24%	4	58,901	50,933	-7,968	-14%
Higher 2005	4	67,006	72,816	5,810	9%	36	47,812	106,980	59,167	124%	40	49,732	103,563	53,832	108%
Total	6	62,648	66,356	3,708	6%	38	48,658	103,898	55,241	114%	44	50,565	98,779	48,213	95%
> $100,000															
Lower 2005	1	216,301	183,213	-33,087	-15%	3	273,058	164,525	-108,533	-40%	4	258,869	169,197	-89,671	-35%
Higher 2005	5	173,701	193,602	19,900	11%	37	158,520	251,755	93,236	59%	42	160,327	244,832	84,505	53%
Total	6	180,801	191,870	11,069	6%	40	167,110	245,213	78,103	47%	46	168,896	238,255	69,359	41%
All															
Lower 2005	3	108,055	96,695	-11,360	-11%	5	189,383	118,087	-71,296	-38%	8	158,885	110,065	-48,820	-31%
Higher 2005	9	126,281	139,919	13,638	11%	73	103,924	180,359	76,435	74%	82	106,378	175,921	69,542	65%
Total	12	121,725	129,113	7,388	6%	78	109,403	176,367	66,965	61%	90	111,046	170,067	59,021	53%
Whiting vessels															
$21 - $100,000															
Higher 2005						3	40,036	147,642	107,606	269%	3	40,036	147,642	107,606	269%
> $100,000															
Higher 2005						29	240,800	574,478	333,678	139%	29	240,800	574,478	333,678	139%
All															
Higher 2005						32	221,978	534,462	312,484	141%	32	221,978	534,462	312,484	141%
Aggregate															
$21 - $100,000															
Lower 2005	2	53,932	53,435	-497	-1%	2	63,871	48,431	-15,440	-24%	4	58,901	50,933	-7,968	-14%
Higher 2005	4	67,006	72,816	5,810	9%	39	47,214	110,108	62,893	133%	43	49,055	106,639	57,583	117%
Total	6	62,648	66,356	3,708	6%	41	48,027	107,099	59,072	123%	47	49,893	101,898	52,004	104%
> $100,000															
Lower 2005	1	216,301	183,213	-33,087	-15%	3	273,058	164,525	-108,533	-40%	4	258,869	169,197	-89,671	-35%
Higher 2005	5	173,701	193,602	19,900	11%	66	194,673	393,558	198,885	102%	71	193,196	379,476	186,280	96%
Total	6	180,801	191,870	11,069	6%	69	198,081	383,600	185,519	94%	75	196,699	368,262	171,563	87%
All															
Lower 2005	3	108,055	96,695	-11,360	-11%	5	189,383	118,087	-71,296	-38%	8	158,885	110,065	-48,820	-31%
Higher 2005	9	126,281	139,919	13,638	11%	105	139,903	288,276	148,374	106%	114	138,827	276,564	137,737	99%
Total	12	121,725	129,113	7,388	6%	110	142,152	280,541	138,389	97%	122	140,143	265,646	125,503	90%

TABLE 8-17d. Summary of changes in projected 2005 **limited entry trawl** vessel groundfish revenue from 2003 under **Alternative 3** (with Selective Flatfish Trawl, 12 mt Canary Limit and with 100 fm in line for 3 summer periods). (Page 1 of 1)

	< 20% change in projected revenue					**> 20% change in projected revenue**					**All vessels**				
Fleet Avg. 2003 revenue Direction of change	# of Vessels	Avg. 2003 GF ($)	Proj. 2005 GF ($)	Average change in GF revenue $	%	# of Vessels	Avg. 2003 GF ($)	Proj. 2005 GF ($)	Average change in GF revenue $	%	# of Vessels	Avg. 2003 GF ($)	Proj. 2005 GF ($)	Average change in GF revenue $	%
Non-whiting vessels															
$21 - $100,000											Sum	Mean	Mean	Mean	Mean
Lower 2005 revenue	2	54,206	53,882	-324	-1%	2	63,871	48,577	-15,293	-24%	4	59,038	51,229	-7,809	-13%
Higher 2005 revenue	4	66,870	75,715	8,846	13%	36	47,812	109,995	62,182	130%	40	49,718	106,567	56,848	114%
Total	6	62,648	68,437	5,789	9%	38	48,658	106,762	58,104	119%	44	50,565	101,536	50,970	101%
> $100,000															
Lower 2005 revenue	.	.	.	.		3	273,058	176,849	-96,208	-35%	3	273,058	176,849	-96,208	-35%
Higher 2005 revenue	3	171,135	188,802	17,666	10%	40	160,916	254,556	93,640	58%	43	161,629	249,969	88,340	55%
Total	3	171,135	188,802	17,666	10%	43	168,740	249,135	80,395	48%	46	168,896	245,200	76,304	45%
All															
Lower 2005 revenue	2	54,206	53,882	-324	-1%	5	189,383	125,541	-63,842	-34%	7	150,761	105,067	-45,694	-30%
Higher 2005 revenue	7	111,555	124,181	12,626	11%	76	107,341	186,080	78,739	73%	83	107,696	180,859	73,163	68%
Total	9	98,811	108,559	9,748	10%	81	112,405	182,343	69,938	62%	90	111,046	174,964	63,919	58%
Whiting vessels															
$21 - $100,000															
Higher 2005 revenue	.	.	.	.		3	40,036	148,223	108,187	270%	3	40,036	148,223	108,187	270%
> $100,000															
Higher 2005 revenue	.	.	.	.		29	240,800	576,052	335,253	139%	29	240,800	576,052	335,253	139%
All															
Higher 2005 revenue	.	.	.	.		32	221,978	535,943	313,965	141%	32	221,978	535,943	313,965	141%
Aggregate															
$21 - $100,000															
Lower 2005 revenue	2	54,206	53,882	-324	-1%	2	63,871	48,577	-15,293	-24%	4	59,038	51,229	-7,809	-13%
Higher 2005 revenue	4	66,870	75,715	8,846	13%	39	47,214	112,935	65,721	139%	43	49,043	109,473	60,430	123%
Total	6	62,648	68,437	5,789	9%	41	48,027	109,796	61,769	129%	47	49,893	104,516	54,623	109%
> $100,000															
Lower 2005 revenue	.	.	.	.		3	273,058	176,849	-96,208	-35%	3	273,058	176,849	-96,208	-35%
Higher 2005 revenue	3	171,135	188,802	17,666	10%	69	194,490	389,678	195,188	100%	72	193,517	381,308	187,791	97%
Total	3	171,135	188,802	17,666	10%	72	197,764	380,810	183,046	93%	75	196,699	373,130	176,431	90%
All															
Lower 2005 revenue	2	54,206	53,882	-324	-1%	5	189,383	125,541	-63,842	-34%	7	150,761	105,067	-45,694	-30%
Higher 2005 revenue	7	111,555	124,181	12,626	11%	108	141,307	289,743	148,436	105%	115	139,496	279,665	140,169	100%
Total	9	98,811	108,559	9,748	10%	113	143,435	282,477	139,043	97%	122	140,143	269,647	129,505	92%

TABLE 8-18. Impacts to the limited entry fixed gear sablefish fishery under the 2005-06 management Alternatives. (Page 1 of 1)

	2003 (Preseason Estimates)	**No Action:** 2004 OY, Seaward boundary of RCA at 100 fm North of 40o10' and at 150 fm South of 40o10'	**Alt 1A**: Med OY, Seaward boundary of RCA at 100 fm North of 40o10' and at 150 fm South of 40o10'	**Alt 1**: Med OY, Seaward boundary of RCA at 150 fm	**Alt 2**: Med OY, Seaward boundary of RCA at 125 fm	**Alt 3**: Med OY, Seaward boundary of RCA at 100 fm
Seaward RCA line:						
North of C. Mendocino:	100 fm	100 fm	100 fm	150 fm	125 fm	100 fm
South of C. Mendocino:	150 fm	150 fm	150 fm	150 fm	125 fm	100 fm
Total catch allocated (mt)	2,194	2,545	2,536	2,536	2,536	2,536
Landed catch target (mt)	2,019	2,452	2,443	2,426	2,436	2,446
Amount allocated to:						
DTL (mt)	303	368	367	364	365	367
Primary fishery (mt)	1,716	2,084	2,077	2,062	2,070	2,079
% Longline	63.2%	63.1%	63.2%	65.0%	65.0%	65.0%
% Pot	36.9%	36.8%	36.9%	35.0%	35.0%	35.0%
Primary fishery tier limits (lb)						
Tier 1 (28 permits)	53,000	64,300	64,000	63,600	63,800	64,100
Tier 2 (42 permits)	24,000	29,200	29,100	28,900	29,000	29,100
Tier 3 (93 permits)	14,000	16,700	16,600	16,500	16,600	16,600
Total potential ex-vessel value of Landed Catch OY ($,000)[a/]	$8,073	$9,804	$9,770	$9,687	$9,726	$9,765
Difference from 2003 ($,000)	--	$1,731	$1,697	$1,614	$1,653	$1,692
% change from 2003	--	21.4%	21.0%	20.0%	20.5%	21.0%

a/ Assuming total landed catch target is caught and sold at 2003 avg. exvessel sablefish prices ($/lb): Longline $1.76, Pot $1.90.

TABLE 8-19. Relative size and configuration of RCAs under the 2005-2006 management alternatives. (Page 1 of 1)

		No Action		Alt 1		Alt 2		Alt 3		Size of RCA compared with No Action a/		
	Period	in line	out line	in line	out line	in line	out line	in line	out line	Alt 1	Alt 2	Alt 3
Non-Trawl RCA												
N. 40°10'												
WA	All	0	100	0	150	0	125	0	100	+	+	0
OR	All	30	100	30	150	30	125	30	100	+	+	0
N. CA	All	30	100	30	150	30	125	30	100	+	+	0
S. of 40°10'	All	30	150	30	150	30	125	30	100	0	-	-
Trawl RCA												
	1	75	150	75	150	75	150	75	150	0	0	0
	2	60	150	75	150	75	150	75	150	-	-	-
	3	60	150	60	150	100	150	100	150	0	-	-
	4	75	150	60	150	100	150	100	150	+	-	-
	5	75	150	60	150	100	150	100	150	+	-	-
N. 40°10'	6	75	150	75	150	75	150	75	150	0	0	0
	1	75	150	75	150	75	150	75	150	0	0	0
	2	60	150	75	150	75	150	75	150	-	-	-
	3	60	150	60	150	100	150	100	150	0	-	-
	4	75	150	60	150	100	150	100	150	+	-	-
North Selective Footrope Limit	5	75	150	60	150	100	150	100	150	+	-	-
	6	75	150	75	150	75	150	75	150	0	0	0
	1	75	150	75	150	75	150	75	150	0	0	0
	2	75	150	75	150	75	150	75	150	0	0	0
	3	100	150	75	150	100	150	100	150	+	0	0
	4	100	150	75	150	100	150	100	150	+	0	0
	5	75	150	75	150	75	150	75	150	0	0	0
S. of 40°10'	6	75	150	75	150	75	150	75	150	0	0	0

a/ "+" larger RCA, "-" smaller RCA, "0" no change.

TABLE 8-20. Projected groundfish landings by Tribal fleet under the 2005 and 2006 alternatives, displayed against 1998, 2002, 2003 and estimated 2004 landings. (round-weight lbs). (Page 1 of 1)

					2005 Projections			2006 Projections		
Species	1998	2002	2003	2004 est.	Alt 1	Alt 2	Alt 3	Alt 1	Alt 2	Alt 3
Arrowtooth Flounder	255	7,137	49,745							
Dover Sole	4,509	35,417	72,527							
English Sole	1,847	88,684	149,277							
Petrale Sole	3,249	45,479	185,732							
Rex Sole		6,632	10,886							
Rock Sole	2,396	5,833	5,160							
Unsp. Flatfish	38	8,406	6,380							
Unspecified Sanddab		19,655	1,725							
Sand Sole		2,748	62							
Starry Flounder		301								
Butter Sole		605	0							
Flatfish Total	12,294	220,897	481,494	601,868	601,868	601,868	601,868	601,868	601,868	601,868
Canary Rockfish	886	13,285	4,712	6,850	6,850	6,850	6,850	6,850	6,850	6,850
Darkblotched Rockfish	0	3,074	81	0	0	0	0	0	0	0
Pacific Ocean Perch	0	529	2,601	0	0	0	0	0	0	0
Redstripe Rockfish	1		2,333	2,916	2,916	2,916	2,916	2,916	2,916	2,916
Sharpchin Rockfish	1		2,332	2,915	2,915	2,915	2,915	2,915	2,915	2,915
Widow Rockfish	54	75,899	24,670	88,200	88,200	88,200	88,200	88,200	88,200	88,200
Yelloweye Rockfish		5,252	594	5,250	5,250	5,250	5,250	5,250	5,250	5,250
Yellowtail Rockfish	13,711	1,037,741	677,073	1,115,600	1,115,600	1,115,600	1,115,600	1,115,600	1,115,600	1,115,600
Unsp. Shelf Rockfish		19	2,354	2,942	2,943	2,942	2,942	2,942	2,942	2,942
Unsp. Near-shore Rockfish		116	45	56	56	56	56	56	56	56
Unsp. Slope Rockfish		4,121	41,458	51,822	51,822	51,822	51,822	51,822	51,822	51,822
Rockfish Total	79,903	1,140,036	758,341	1,276,561	1,276,552	1,276,552	1,276,552	1,276,552	1,276,552	1,276,552
Spiny Dogfish		2,607	10,760	13,450	13,450	13,450	13,450	13,450	13,450	13,450
Lingcod	5,247	24,264	49,276	55,200	55,200	110,200	220,200	55,200	110,200	220,200
Pacific Cod	4,873	128,530	471,655	589,569	589,569	589,569	589,569	589,569	589,569	589,569
Sablefish	980,719	959,982	1,328,253	1,618,176	1,605,804	1,605,804	1,605,804	1,579,419	1,579,419	1,579,419
Unspecified Skate	2,031	18,635	47,158	58,948	58,948	58,948	58,948	58,948	58,948	58,948
Shortspine Thornyhead	8,105	10,173	12,703	17,137	15,013	15,013	15,013	14,772	14,772	14,772
Other Groundfish Total	1,000,975	1,144,191	1,919,805	2,352,480	2,337,983	2,392,983	2,502,983	2,311,357	2,366,357	2,476,357
Pacific Whiting[a/]	53,984,582	45,867,384	51,673,540	55,066,079	77,161,000	77,161,000	77,161,000			
All Groundfish Species Total	55,077,754	48,372,507	54,833,180	59,296,988	81,377,403	81,432,403	81,542,403	4,189,777	4,244,777	4,354,777

a/ Assuming "medium" Pacific whiting OY under the alternatives for 2005.

TABLE 8-21. Projected groundfish revenue by Tribal fleet under the 2005 and 2006 alternatives, displayed against 1998, 2002, 2003 and estimated 2004 revenue ($ ex-vessel). (Page 1 of 1)

					2005			2006		
Species	1998	2002	2003	2004 est.	Alt 1	Alt 2	Alt 3	Alt 1	Alt 2	Alt 3
Arrowtooth Flounder	26	715	5336							
Dover Sole	1,478	11,335	23219							
English Sole	613	29,289	49792							
Petrale Sole	3,249	46,509	191965							
Rex Sole		2,316	3764							
Rock Sole	791	2,033	1717							
Unsp. Flatfish	13	2,773	2103							
Unspecified Sanddab		5,110	455							
Sand Sole		2,084	47							
Starry Flounder		98								
Butter Sole		206								
Flatfish Total	6,170	102,468	278,398	347,998	347,998	347,998	347,998	347,998	347,998	347,998
Canary Rockfish	327	5,886	2,229							
Darkblotched Rockfish	0	1,139	33							
Pacific Ocean Perch	0	237	1,150							
Redstripe Rockfish	0		920							
Sharpchin Rockfish	0		912							
Widow Rockfish	19	36,431	11,705							
Yelloweye Rockfish		2,327	885							
Yellowtail Rockfish	4,684	489,530	323,272							
Unsp. Shelf Rockfish		8	1,072							
Unsp. Near-shore Rockfish		14,434	21							
Unsp. Slope Rockfish		7	18,325							
Rockfish Total	39,366	549,999	360,944	607,599	607,595	607,595	607,595	607,595	607,595	607,595
Spiny Dogfish		405	1,564							
Lingcod	3,007	18,176	34,597	38,756	38,756	77,372	154,604	38,756	77,372	154,604
Pacific Cod	1,924	63,961	235,241	294,051	294,051	294,051	294,051	294,051	294,051	294,051
Sablefish	1,280,233	1,512,595	2,187,823	2,665,368	2,644,989	2,644,989	2,644,989	2,601,530	2,601,530	2,601,530
Unspecified Skate	136	2,563	6,308							
Shortspine Thornyhead	7,760	8,232	10,605							
Other Groundfish Total	1,285,300	1,605,932	2,476,371	3,034,481	3,015,783	3,086,727	3,228,617	2,981,437	3,052,382	3,194,272
Pacific Whiting[a/]	2,699,229	2,065,122	2,773,686	2,955,788	4,141,779	4,141,779	4,141,779			
All Groundfish Species Total	4,030,065	4,323,521	5,889,399	6,945,865	8,113,154	8,184,099	8,325,989	3,937,029	4,007,974	4,149,864

a/ Assuming "medium" Pacific whiting OY under the alternatives for 2005.

TABLE 8-22. Historical and projected Washington coastal recreational angler trips. (Page 1 of 1)

	Total[a/]						Projected[b/]	
Trip Type	2000	2001	2002	2003	3-Yr Avg.	4-yr Avg.	2005	2006
Groundfish Directed[c/]	26,539	23,765	25,390	22,810	23,988	24,626	23,988	23,988
Groundfish Incidental	100,761	200,749	146,442	174,779	173,990	155,683	173,990	173,990
Total	127,300	224,514	171,832	197,589	197,978	180,309	197,978	197,978

a/ Albacore and Sturgeon trips were excluded due to no groundfish impact

b/ Effort projections for 2005-2006 are the 3-yr average of 2001-2003 due to the somewhat flat trend over that period.

c/ Groundfish Directed includes groundfish and dive trips; Groundfish Incidental includes salmon and halibut trips.

TABLE 8-23. Estimated recreational groundfish effort and total effort under the 2005-2006 management alternatives (thousand angler trips). (Page 1 of 1)

		2003		No Action		Alternative 1		Alternative 2		Alternative 3		Council Adopted	
Area	Fishing Mode	Groundfish Trips	Total Trips	Groundfish Trips	Total Trips	Groundfish Trips	Total Trips	Groundfish Trips	Total Trips	Groundfish Trips	Total Trips	Groundfish Trips	Total Trips
Washington													
	Charter	11	61	12	59	12	59	12	59	12	59		
	Private	11	136	12	139	12	139	12	139	12	139		
	Total	23	198	24	198	24	198	24	198	24	198		
Oregon													
	Charter	32	75	32	75	32	75	32	75	32	75		
	Private	25	315	25	315	25	315	25	315	25	315		
	Total	57	390	57	390	57	390	57	390	57	390		
North and Central California[a/]													
	Charter		148		175								
	Private		1,485		1,199								
	Total		1,633		1,374								
Southern California													
	Charter		574		578								
	Private		1,632		1,769								
	Total		2,206		2,346								
California Total													
	Charter		722		753								
	Private		3,117		2,968								
	Total		3,839		3,720								
West Coast Total													
	Charter		858		887								
	Private		3,569		3,422								
	Total		4,427		4,309								

a/ From Point Conception (34°27') to the Oregon border.

9.0 SUMMARY OF OTHER ENVIRONMENTAL MANAGEMENT ISSUES

Based on the environmental impacts disclosed in Chapters 3 through 8, this chapter summarizes a range of issues that an EIS must address. These issues are identified at 40 CFR 1502.6, describing the analysis of environmental consequences in an EIS. The last two sections in this chapter describe mitigation measures (as required by 40 CFR 1502.1(h)) and identify unavoidable adverse impacts (as required by 40 CFR 1502.16).

9.1 Short-term Uses Versus Long-term Productivity

Section 1.2.1 in Appendix A discusses short-term costs versus long-term risk in setting OYs. As noted there, this tradeoff is possibly the most important tradeoff governing the management of renewable resources. Balancing short-term use and long-term productivity is the essence of the range of harvest specification alternatives. Short-term uses generally affect the present quality of life for the public, in contrast to long-term productivity, which affects the quality of life for future generations, based on environmental sustainability. The proposed action indirectly affects the sustainability of marine resources by constraining fishing mortality to levels that are sustainable. This represents a tradeoff between short-term benefits, reflected in revenue generated from fishing in 2005 and 2006, and long-term productivity of fish stocks, which determines the abundance of fish in the future, and thus future harvests. Managers must respond to changes in resource status, whether a result of harvests or other, environmental factors; this requires effective monitoring of total fishing mortality. A better understanding of the role of environmental and ecological factors play in affecting stock productivity would also enhance managers' ability to predict future stock response to current harvest levels.

Biennial management is based on the framework in the FMP, which dictates how harvest control rules should be set in order to produce sustainable harvests over the long term. While each species' harvest in any one year affects long-term productivity, these harvests are part of an ongoing activity, fishing over many years, which cumulatively affects productivity.

9.2 Irreversible Resource Commitments

An irreversible commitment represents some permanent loss of an environmental attribute or service. The use of non-renewable resources is irreversible; unsustainable renewable resource use may be irreversible if future production is permanently reduced or, at the extreme, is extinguished.

The use of non-renewable energy resources, such as fossil fuel, represents a pervasive irreversible commitment associated with the proposed action, because fishing vessels are mechanically powered. The use of energy is discussed below in Section 9.4.

The proposed action, however, implemented under the alternatives, does not by itself represent an irreversible commitment; because harvest levels under the Council-preferred OYs are specified for each year in the biennium and management measures are projected to constrain total fishing mortality to these levels. Inseason monitoring combined with adjustments to the management measures will be used if catch projections indicate harvest levels may be exceeded during either of the two years in the biennial management period. Cumulatively, past, current, and future specifications could result in an irreversible commitment if a stock were to be extirpated or if population size is reduced to such a degree that even if harvesting stopped completely the stock would not recover. Theoretical work, for example, suggests that ecological factors can inhibit recovery of stocks that are reduced to very low biomass levels (MacCall 2002a; Walters and Kitchell 2001). Although several overfished stocks, such as cowcod, bocaccio, canary rockfish, and yelloweye rockfish, are at low biomasses relative to B_{MSY} (the biomass capable of supporting maximum sustainable yield), there can be considerable uncertainty about the likelihood of recovery. For example, the 2002 bocaccio stock assessment and rebuilding analysis (MacCall 2002b; MacCall and He 2002a), used as the basis for setting harvest specifications for 2003, concluded that the stock was unlikely to recover within the rebuilding framework time period (T_{MAX}) even if fishing mortality was reduced to zero. The 2003 stock assessment and rebuilding analysis (MacCall 2003b; MacCall and He 2002b) paint a quite different picture. Detection of a strong 1999 year class in more recent data sets, along with other factors, resulted in a substantial increase in the 2004 OY in comparison to 2003 (from under 20 mt in 2003 to 250 mt in 2004 under the *Council OY* alternative) for the rebuilding target previously chosen by the Council and based on a rebuilding probability (P_{MAX}) of 70%. Given this variability in assessment results, there is not enough information to determine a definite threshold below which population decline is irreversible.

9.3 Irretrievable Resource Commitments

A resource is irretrievably committed if its use is lost for time, but is not actually or practically lost permanently. The analysis of direct, indirect and cumulative impacts in Chapters 3-8 generally describe irretrievable resource commitments, and in the case of renewable resources these parallel the tradeoff between short-term use and long-term productivity. Alternatives that constrain fish harvests to a level related to the harvest specifications are predicted to allow future sustainable harvests. The fish that are harvested represent an irretrievable resource commitment, as do the inputs in terms of capital and labor (including energy and resources) needed to harvest and market these fish. In addition, the difference between the current sustainable yield for a stock and the long-term maximum sustainable (recognizing this may be only a theoretical optimum) would represent an irretrievable resource commitment.

9.4 Energy Requirements and Conservation Potential of the Alternatives

The proposed action indirectly affects energy use primarily in the form of fossil fuels used to power surveillance craft and fishing vessels. Energy used in at-sea and aerial monitoring and enforcement activities is a direct effect. Change in the level of this type of monitoring is hard to predict because it depends on the types of management measures that will be implemented biennially and inseason. Generally, the Rockfish Conservation Area, which was first implemented in late 2002, would require more surveillance to be effective. However, the vessel monitoring system implemented at the beginning of 2004 will compensate for the increased surveillance need because vessel positions can be remotely monitored. Finally, the availability of ships and aircraft to conduct surveillance, which is partly contingent on U.S. Coast Guard mission priorities, will also dictate the level and the number of patrols, affecting energy use. For these reasons, it is difficult to predict how energy use would change from baseline conditions. The proposed action affects fishing activity, and thus, the consumption of fuel by fishing vessels. Fuel consumption is likely to correlate with projected harvest levels, which are a consequence of the different types of management measures in the alternatives. For example, projected harvest levels under Alternative 1 are lower than under the other alternatives, which could reduce vessel fuel consumption if vessels spent less time fishing. However, there are a variety of other factors that could affect overall energy use and efficient utilization. Changes in fuel prices, for example, could affect the level of fishing vessel operations independent of the constraining effect of management measures under the alternatives.

9.5 Urban Quality, Historic Resources, and the Design of the Built Environment

The direct and indirect impacts on the urban quality, historic resources, and the built environment will be minimal. Cumulative impacts could be greater. Fishing income has already fallen in many coastal communities, both because of declines in groundfish landings and in other fisheries such as salmon.

Cumulative loss of income could lead to a fall in private investment that could curtail maintenance of buildings and other private infrastructure. Public investment, which includes shoreside amenities and marine-related infrastructure such as docks, boat basins, jetties, and navigable channels, is sensitive to changes in tax revenue. By itself, changes in fishing-related revenue may not have an overwhelming impact on local tax revenues, but external factors such as changes in the broader economy could act cumulatively. It is also possible that as private investment shrinks so that, for example, there are fewer fishing vessels using shoreside infrastructure, there will be less political motivation to devote public resources to these uses. In large urban centers, such as Seattle, San Francisco, and the Los Angeles area, the relative impact would be slight and probably not result in changes in urban quality substantially different from the baseline. For small communities, and especially those likely to be more hard hit by declining revenues, the effect on urban quality could be noticeable, especially over the long term (again, depending on external economic factors). These changes could also affect cultural and historic resources as fishing and fishing-dependent activities are supplanted or simply disappear, changing the character of a coastal community. Since the effects described above are speculative, it is not possible to compare the effects of the alternatives beyond projected changes in revenue No direct impacts of the proposed action on cultural historic resources protected under the National Historical Preservation Act are expected. Because indirect or cumulative impacts are too speculative, these impacts cannot be predicted.

9.6 Possible Conflicts Between the Proposed Action and Other Plans and Policies For the Affected Area

Overfished groundfish species are caught incidentally in fisheries managed under other Council FMPs (for salmon, coastal pelagic species, and highly migratory species). More restrictive measures, such as those that would be required to meet the harvest limits under the Alternative 1, are likely to affect these fisheries and thus conflict with some of the objectives of these FMPs. (FMPs try to strike a balance between conservation and utilization, so they include objectives related to resource use.)

9.7 Significant and Unavoidable Adverse Impacts

The EIS must include a discussion of those adverse effects that cannot be avoided (40 CFR 1502.16). This discussion focuses on potentially significant adverse impacts of the proposed action, as implemented by the different alternatives. CEQ regulations at 40 CFR 1508.27 define “significantly” in terms of both context and intensity, and provide ten factors to consider when evaluating the intensity of an impact. NOAA provides agency guidance in determining significant impacts of fishery management actions in administrative order NAO 216-6 at §6.02, which expands on the CEQ definition. These criteria focus on the components of the human environment most likely to be affected by these types of actions. Based on the guidance in these two sources, the proposed action could result in the following *potentially* significant impacts.

The proposed action could *potentially* jeopardize the sustainability of any target or non-target species that may be affected by the action (NAO 216-6 §6.02a & b). The proposed action has two components: establishing harvest specifications (the Council-preferred OY alternative) and implementing management measures to constrain total fishing mortality to this specification (Alternative 1). The harvest specification alternatives represent different levels of precaution in relation to scientific uncertainty associated with scientific assessments of stock status. The harvest specification represents a total fishing mortality limit, which according to the best available science maintains stocks at or rebuild them to a biomass capable of supporting MSY. Although unlikely, scientific error could result in overfishing if the Council-preferred OY alternative actually results in a fishing mortality rate above the MFMT. However, overfishing in those two years alone would not necessarily jeopardize the sustainability of a stock. Although overfishing would reduce stock size below B_{MSY}, or further delay recovery to that level, receipt of new scientific information and analysis, along with remedial management, could still allow stock rebuilding. Therefore, truly jeopardizing the sustainability of a stock is more likely to result from the cumulative effect (NAO 216-6 §6.02f, 40 CFR 1508.27(b)(7)) of overfishing over a longer period than the 2005-2006 management cycle. Past overfishing has resulted in the overfished status for eight groundfish stocks, jeopardizing sustainability. Recurrent overfishing would further jeopardize stocks.

The proposed action also establishes management measures intended to constrain total fishing mortality at or below the OYs established under the Council-preferred OY alternative. Even if the OY alternative represents the correct specification, if the management measures do not effectively constrain fishing mortality within these limits, this would constitute overfishing. As already discussed, overfishing could cumulative jeopardize the continued sustainability of stocks.

The proposed action may potentially impact biodiversity and ecosystem function within the affected area (NAO 216-6 §6.02g). This would result from the cumulative effect of overfishing and fishing-related impacts to physical and biogenic habitat, including EFH. Past overfishing, resulting in stock sizes far below their unfished biomass level, makes prey less available for those organisms that feed on overfished species. Changes in relative abundance could affect overall ecosystem structure, although these effects are not well-understood. Fishing activity can damage or alter benthic habitat, which may be important to MUS and other marine species. However, the proposed action is intended to allow stock rebuilding and keeps fishing well below historic levels. Harvest specifications for future management cycles are likely to continue this policy and have a cumulatively beneficial effect.

By itself, the proposed action does have significant social or economic impacts interrelated with the potential significant natural or physical environmental effects discussed above (NAO 216-6 §6.02h) in that changes in exvessel revenue and personal income are not projected to change substantially in 2005 and 2006 from levels estimated for the recent past and present (2003-2004). Cumulative socioeconomic impacts have been significant, however. Non-whiting groundfish landings averaged 63,345 for the four years 1994-1997 while they averaged 36,397 mt in 1998-2002, a 43% drop (see Table 6-1a in Appendix A).

CEQ regulations also state that "the degree to which the action may establish a precedent for future actions with significant effects or represents a decision in principle about future consideration" (40 CFR 1508.27(b)(6)) should be part of the significance evaluation. With implementation of Amendment 17, the proposed action is the first biennial (two-year) management cycle. This does not fundamentally change the way harvest specifications are set (their scientific basis, for example) or the types of management measures that will be used. However, there may be unforeseen effects of this procedural change. For example, adjustments to management measures will occur through inseason actions over two years rather than the thorough re-visiting that has occurred annually in the past.

9.8 Mitigation

An EIS must discuss "means to mitigate the adverse environmental impacts" stemming from the proposed action (40 CFR 1502.1(h)), even if the adverse impacts are not by themselves significant. Alternatives are mitigative to the degree that management measures constrain fishing mortality to levels below the harvest specifications. Further mitigation measures could address the adverse impacts that would still occur with implementation of any of the action alternatives. Potential mitigation measures are discussed with respect to the components of the human environment potentially affected by the proposed action.

Habitat and ecosystem: Although adverse impacts to overfished species' habitats may be caused by a range of natural events and human activities, mitigation measures within the scope of NMFS authority would address fishing-related impacts. The Rockfish Conservation Area, currently used to reduce overfished species bycatch, also reduces related adverse impacts to benthic habitat within its boundaries, because bottom trawling is prohibited in these areas. In a separate action, NMFS is preparing an EIS to identify and describe groundfish essential fish habitat, and identify habitat areas of particular concern (HAPCs) within EFH. The alternatives in this EIS will include measures to minimize adverse effects on EFH caused by fishing.

<u>Reduction in total fishing mortality below the OY</u>: Management measures implemented through the biennial process could provide additional mitigation if total fishing mortality—especially for overfished species bycatch—is less than the OYs established by the Council-preferred OY alternative. In some cases, this is simply a function of the constraints imposed by the overfished species with the lowest OY. Management measures needed to stay within this OY limit keeps harvests of all co-occurring stocks—including other overfished species—to levels below their OYs. This is not intended mitigation but does have a mitigative effect.

<u>Bycatch reduction</u>: Management measures intended to further reduce bycatch rates below current rates would be explicitly mitigative. (A reduction in the bycatch *rate* means, that for every unit of target species harvested, a smaller increment of the overfished species is caught.) NMFS and the Council released a groundfish bycatch mitigation draft programmatic EIS on February 20, 2004 (NMFS 2004b), which evaluates different bycatch reduction programs for the groundfish fishery. The Council recommended their preferred alternative at their April meeting during the public comment period, which closed on April 27, 2004. The Council-preferred alternative for the bycatch EIS combines elements of the other alternatives in that DEIS, including future consideration of bycatch caps and individual fishing quotas. Effective bycatch monitoring will be an important basis for implementing these types of management measures. A higher level of observer coverage than under the current WCGOP may be necessary. In addition to limiting total mortality, these types of management programs could provide incentives for fishermen to find ways to reduce their bycatch rates, since they would more directly bear the cost of producing bycatch. This preferred alternative will be evaluated in the final EIS schedules for completion in mid-2004. These measures will require additional FMP amendments and/or regulatory actions to implement

<u>Introducing more selective gear</u>: Gear modifications can also reduce bycatch rates. The selective flatfish trawl gear (using a cutback headrope), which has been tested under an EFP, and will be required for fishing shoreward of the RCA north of 40º 10' N. lat. as part of the preferred alternative, is one such example. This type of bycatch-reducing gear could be more widely tested through the exempted fishing permit program authorized under the groundfish FMP.

<u>Socioeconomic sectors</u>: Adverse socioeconomic impacts are attributable to reductions in commercial harvests and recreational fishing opportunities necessary to rebuild stocks. Evaluating these impacts is made difficult because of the tradeoff between short- and long-term costs and benefits. Imposing short-term costs in the form of harvest reductions should result in a long-term net benefit in the form of future MSY harvests. (Note that the MSY concept encompasses both maximum *and* sustainable harvests, so that once rebuilt, these stocks could support an ongoing stream of higher harvests.) One general form of mitigation is to compensate fishermen directly through subsidies or the provision services, such as job retraining programs for displaced workers. The forms of mitigation discussed above for impacts to groundfish stocks are also a form of socioeconomic mitigation if target species harvests can be sustained or increased while reducing overfished species bycatch.

9.9 Environmentally Preferred Alternative and Rationale for Preferred Alternative

NEPA regulations, at 40 CFR 1505.2(b), state that the record of decision (ROD) will identify an alternative or alternatives considered "environmentally preferable." In order to inform the public and facilitate preparation of the ROD, the rationale for identifying the Low OY alternative and management measure Alternative 1 as the environmentally preferable alternatives is summarized here. Guidance, in the form of *Forty Most Asked Questions Concerning CEQ's NEPA Regulations*, states that the environmentally preferable alternative is "the alternative that will promote the national environmental policy as expressed in NEPA's Section 101. Ordinarily, this means the alternative that causes the least damage to the biological and physical environment; it also means the alternative which best protects, preserves, and enhances historic, cultural, and natural resources" (Question 6.A).

This section will be completed after the Council identifies a preferred management measure alternative at their June 2004 meeting.

10.0 CONSISTENCY WITH THE GROUNDFISH FMP AND MAGNUSON-STEVENS ACT NATIONAL STANDARDS

10.1 FMP Goals and Objectives

The groundfish FMP goals and objectives are listed below. The way in which Amendment 16-3 addresses each objective is briefly described in italics below the relevant statement.

Management Goals.

> Goal 1 - Conservation. Prevent overfishing and rebuild overfished stocks by managing for appropriate harvest levels and prevent, to the extent practicable, any net loss of the habitat of living marine resources.
>
> Goal 2 - Economics. Maximize the value of the groundfish resource as a whole.
>
> Goal 3 - Utilization. Achieve the maximum biological yield of the overall groundfish fishery, promote year-round availability of quality seafood to the consumer, and promote recreational fishing opportunities.

Objectives. To accomplish these management goals, a number of objectives will be considered and followed as closely as practicable:

Conservation.

> Objective 1. Maintain an information flow on the status of the fishery and the fishery resource which allows for informed management decisions as the fishery occurs.

The Council preferred alternative employs the same data sources that have been used in past years to monitor groundfish fisheries. In addition, data from the first two years of the NMFS West Coast Groundfish Observer Program (August 2001 to August 2003) was available to develop management measures for the 2005-2006 management cycle. It can be used to project bycatch resulting from different management measures and more accurately predict total fishing mortality. A vessel monitoring system was implemented at the beginning of 2004, providing real-time location information for participating vessels. These information sources would also apply to all of the other alternatives evaluated in this EIS.

> Objective 2. Adopt harvest specifications and management measures consistent with resource stewardship responsibilities for each groundfish species or species group.

The Council OY alternative (preferred alternative) adopts harvest specifications that support rebuilding of overfished and precautionary stocks and sustainable harvest of healthy stocks. The other harvest specification action alternatives fall within the management framework, but represent different tradeoffs between overfishing risk and potential socioeconomic impacts. Management measure alternatives are intended to constrain total fishing mortality at or below the OY for each stock as identified in the Council-preferred alternative.

> Objective 3. For species or species groups which are below the level necessary to produce MSY, consider rebuilding the stock to the MSY level and, if necessary, develop a plan to rebuild the stock.

All of the action alternatives, including the Council OY alternative (preferred alternative), set risk averse harvest levels for overfished species (in that the probability of rebuilding within the specified time frame is greater than 50%).

> Objective 4. Where conservation problems have been identified for nongroundfish species, and the best scientific information shows the groundfish fishery has a direct impact on the ability of that species to maintain its long-term reproductive health, the Council may consider establishing management measures to control the impacts of groundfish fishing on those species. Management measures may be imposed on the groundfish fishery to reduce fishing mortality of a nongroundfish species for documented conservation reasons. The action will be designed to minimize disruption of the groundfish fishery, in so far as consistent with the goal to minimize the bycatch of nongroundfish species, and will not preclude achievement of a quota, harvest guideline, or allocation of groundfish, if any, unless such action is required by other applicable law.

None of the alternatives include new measures intended to control the impacts of groundfish fishing on nongroundfish stocks.

> Objective 5. Describe and identify EFH, adverse impacts on EFH, and other actions to conserve and enhance EFH, and adopt management measures that minimize, to the extent practicable, adverse impacts from fishing on EFH.

The use of groundfish conservation areas (GCAs) under all alternatives will reduce EFH impacts by eliminating most fishing-related impacts in those areas. However, redistribution of effort into open areas could intensify fishing effort in some areas; resulting habitat impacts cannot be predicted at this time. In addition to the GCAs, bottom trawlers are required to use small footropes shoreward of GCAs , lessening impacts to continental shelf and nearshore rocky habitat, a preferred habitat for some overfished groundfish species.

Economics.

> Objective 6. Attempt to achieve the greatest possible net economic benefit to the nation from the managed fisheries.

Calculating net costs and benefits in 2005 and 2006 (including the imputed value of non-market costs and benefits) and the present value of all future net benefits would be the best way to measure net benefit. Although the analysis estimates changes in income associated with the alternatives, there is no directly comparable measure of the conservation benefits of the alternatives (such as net present value of future harvests), so it is not possible to determine which alternative achieves the greatest possible net economic benefit. Furthermore, future best use of resources (in terms of economic return), which would predicate future allocation decisions, cannot be predicted. However, the action alternatives fall within the management framework intended to achieve maximum sustained yield over the long term. This gives greater latitude for future decision making to achieve maximum economic net benefit.

> Objective 7. Identify those sectors of the groundfish fishery for which it is beneficial to promote year-round marketing opportunities and establish management policies that extend those sectors' fishing and marketing opportunities as long as practicable during the fishing year.

All of the alternatives have management measures intended to allow commercial fisheries year-round, bearing in mind that individual fisheries, such as the directed fixed gear sablefish fishery, are seasonally constrained. Given low harvest specifications for some overfished species, however, actual harvests may result in early attainment of a particular specification, necessitating the closure of particular fisheries.

Objective 8. Gear restrictions to minimize the necessity for other management measures will be used whenever practicable.

All the action alternatives would require the use of selective flatfish trawl gear shoreward of the RCA north of 40° 10' N. lat. This gear reduces the catch rate of certain overfished species. . A portion of the OY for certain species is allocated to vessels fishing under exempted fishing permits (EFPs). Some of these EFPs are being used as a means to test new gear configurations that reduce bycatch of overfished species.

Utilization.

Objective 9. Develop management measures and policies that foster and encourage full utilization (harvesting and processing) of the Pacific Coast groundfish resources by domestic fisheries.

There has been no foreign fishing on the West Coast for more than a decade, so all of the alternatives meet this objective.

Objective 10. Recognizing the multispecies nature of the fishery and establish a concept of managing by species and gear or by groups of interrelated species.

As in past years, management measures in all of the alternatives use species groups related to particular fisheries or gear to structure trip limits.

Objective 11. Strive to reduce the economic incentives and regulatory measures that lead to wastage of fish. Also, develop management measures that minimize bycatch to the extent practicable and, to the extent that bycatch cannot be avoided, minimize the mortality of such bycatch. In addition, promote and support monitoring programs to improve estimates of total fishing-related mortality and bycatch, as well as those to improve other information necessary to determine the extent to which it is practicable to reduce bycatch and bycatch mortality.

GCAs are meant to reduce bycatch of overfished species by prohibiting fishing that generates significant bycatch in areas where these species are most abundant. (GCAs are included in all the alternatives.) In addition, trip limits under all the alternatives are set through model projections that include estimated bycatch, based on data derived from the NMFS groundfish observer program. This provides the best estimates of total fishing-related mortality and bycatch currently available.

Objective 12. Provide for foreign participation in the fishery, consistent with the other goals to take that portion of the OY not utilized by domestic fisheries while minimizing conflict with domestic fisheries.

This objective is no longer relevant, since all stocks are fully utilized by domestic fishers.

Social Factors.

Objective 13. When conservation actions are necessary to protect a stock or stock assemblage, attempt to develop management measures that will affect users equitably.

The Council process facilitates input from resource user groups, state and federal agencies, and the general public. This promotes the formulation of equitable management measures.

Objective 14. Minimize gear conflicts among resource users.

Although redistribution of fishing effort because of GCA closures could increase crowding in nearshore areas, this has not emerged as an issue voiced during scoping for this EIS or through other public comment opportunities during Council meetings.

> Objective 15. When considering alternative management measures to resolve an issue, choose the measure that best accomplishes the change with the least disruption of current domestic fishing practices, marketing procedures, and the environment.

Management measures proposed for 2005 and 2006 do not differ substantially in kind from those used in 2004. GCAs have been in use since 2002 and this base of experience has allowed managers to propose configurations that vary less over the course of the year, simplifying their application.

> Objective 16. Avoid unnecessary adverse impacts on small entities.

TBA

> Objective 17. Consider the importance of groundfish resources to fishing communities, provide for the sustained participation of fishing communities, and minimize adverse economic impacts on fishing communities to the extent practicable.

The impacts of all the alternatives on communities are evaluated in Chapter 8.

> Objective 18. Promote the safety of human life at sea.

If smaller vessels traditionally fishing in the areas now part of GCAs or shoreward elect to fish seaward of the GCAs weather-related safety issues could arise. However, this did not come up as an issue during public scoping meetings or other public comment opportunities even though GCAs have been in place since 2002.

10.2 National Standards

An FMP or plan amendment and any pursuant regulations must be consistent with ten national standards contained in the Magnuson-Stevens Act (§301). These are:

National Standard 1 states that conservation and management measures shall prevent overfishing while achieving, on a continuing basis, the optimum yield from each fishery for the United States fishing industry.

The harvest specification action alternatives, including the Council OY alternative (preferred alternative), all include OY values that reflect harvest rates below the overfishing threshold and include precautionary reductions to rebuild overfished stocks and other stocks that, while not overfished, are at a biomass below the level necessary to produce MSY. The No Action alternative is not based on the best available science for all stocks and in some cases would specify harvest limits that are not sufficiently precautionary.

National Standard 2 states that conservation and management measures shall be based on the best scientific information available.

OY values in the harvest specification action alternatives, including the Council-OY alternative, are based on the most recent stock assessments, developed through the peer-review STAR process. This represents the best available science. The No Action alternative OY values are based on stock *assessments conducted before the 2004, the year to which the No Action alternative management measures apply. Given that more recent stock assessments are available, that alternative does not use the best available science.*

National Standard 3 states that, to the extent practicable, an individual stock of fish shall be managed as a unit throughout its range, and interrelated stocks of fish shall be managed as a unit or in close coordination.

Some groundfish stocks are managed as individual units with specific trip limits. However, given the multi-species nature of many groundfish fisheries, other stocks are grouped in stock complexes and managed accordingly. This generally applies to non-target species for which no individual stock assessments have been performed. Until recently many species were not reported individually in groundfish fisheries and nongroundfish fisheries may not report incidental groundfish catches at the species level. This limits the amount of time-series data available for stock assessments on which individual stocks could be managed. However, whenever possible individual stocks are assessed. For example, black rockfish, previously part of the rockfish complex, was first assessed in 2003. This allowed a species-specific OY to be established and used in management decision making for 2004. Stocks are managed throughout the range of that stock (as opposed to the species), although issues do arise in the case of stocks straddling international borders. For this reason allocation of the harvestable surplus of Pacific whiting between the U.S. and Canada is subject to a negotiated agreement.

National Standard 4 states that conservation and management measures shall not discriminate between residents of different states. If it becomes necessary to allocate or assign fishing privileges among various United States fishers, such allocation shall be (A) fair and equitable to all such fishers; (B) reasonably calculated to promote conservation; and (C) carried out in such manner that no particular individual, corporation, or other entity acquires an excessive share of such privileges. The proposed measures will not discriminate between residents of different states.

Management measures are developed through the Council process, which facilitates substantial participation by state representatives. Generally, state proposals are brought forward when alternatives are crafted and integrated to the degree practicable. Decisions about catch allocation between different sectors or gear groups are also part of this participatory process, and emphasis is placed on equitable division while ensuring conservation goals. None of the management measures in the alternatives would allocate specific shares or privileges to one individual or corporation.

National Standard 5 states that conservation and management measures shall, where practicable, consider efficiency in the utilization of fishery resources; except that no such measure shall have economic allocation as its sole purpose.

Management measures in the groundfish fishery are not designed specifically for the purpose of efficient utilization. However, lower OY levels and other restrictions are likely to result in further fleet capacity reduction as fishing becomes economically unviable for more vessels. There is broad consensus that capacity reduction in some sectors is needed to rationalize fisheries. In 2003 a capacity reduction program for the limited entry groundfish trawl fleet retired 92 vessels and associated fishing permits while compensating the vessel owners.

National Standard 6 states that conservation and management measures shall take into account and allow for variations among, and contingencies in, fisheries, fishery resources and catches.

Management measures reflect differences in catch, and in particular bycatch of overfished species, among different fisheries. Because of the low harvest specifications for overfished species, management *measures are proposed for nongroundfish fisheries to minimize bycatch of these species. Each alternative was evaluated in terms of the probable bycatch of overfished species, based on the proposed management measures. (See Chapter 4.) This allows comparison between the proposed OY and a judgement of whether management measures will constrain fisheries sufficiently.*

National Standard 7 states that conservation and management measures shall, where practicable, minimize costs and avoid unnecessary duplication.

The alternatives do not explicitly address this standard. Generally, by coordinating management, monitoring, and enforcement activities between the three West Coast states duplication, and thus cost, is minimized. Necessary monitoring and enforcement programs, such as the use of fishery observers and implementation of a vessel monitoring system, increase management costs. But these efforts are necessary to effective management.

National Standard 8 states that conservation and management measures shall, consistent with the conservation requirements of this Act (including the prevention of overfishing and rebuilding of overfished stocks), take into account the importance of fishery resources to fishing communities in order to (A) provide for the sustained participation of such communities, and (B) to the extent practicable, minimize adverse economic impacts on such communities.

This document evaluates the effects of the alternatives on fishing communities (see Section 8.x.x) and these effects were taken into account in choosing the preferred harvest specification and management measure alternatives. The preferred alternatives represent the Council's judgement of the best tradeoff between the need to conserve and rebuild fish stocks and the economic impacts of the necessary management measures. Generally, this tradeoff is resolved by structuring management measures to allow communities to access healthy, harvestable stocks while minimizing catch of overfished stocks.

National Standard 9 states that conservation and management measures shall, to the extent practicable, (A) minimize bycatch and (B) to the extent bycatch cannot be avoided, minimize the mortality of such bycatch.

Minimizing bycatch, of all species and overfished species in particular, is an important component of the alternatives. GCAs are meant to keep fishing away from areas where overfished species are most abundant, and therefore reduce bycatch. Trip limits are structured to discourage directed and incidental catch of these species, but where bycatch is unavoidable to allow some minimal retention. Integration of observer data into the management process allows more accurate estimates of bycatch rates, and thus total catch estimates.

National Standard 10 states that conservation and management measures shall, to the extent practicable, promote the safety of human life at sea.

GCAs could affect safety if more vessels elect to fish seaward of the closed areas and are more exposed to bad weather conditions. However, this was not raised as an issue during public scoping meetings. Implementation of a vessel monitoring system capable of sending distress calls could mitigate this safety issue.

10.3 Other Applicable Magnuson-Stevens Act Provisions

Harvest specifications are set based on targets established in overfished species rebuilding plans, which conform to Section 304(e)–Rebuild Overfished Fisheries. Rebuilding plans contain the elements required by Section 304(e)(4) and discussed in National Standards Guidelines (50 CFR 600.310).

Chapter 3 in this EIS constitutes an EFH assessment of the proposed action's impacts, as required by 50 CFR 600.920 (e)(3). NMFS is currently preparing an EIS evaluating programmatic measures designed to identify and describe West Coast groundfish EFH, and minimize potential fishing impacts on West Coast groundfish EFH. According to the current schedule, NMFS will publish a draft EIS for this action in February 2005. Publication of the final EIS for this action is scheduled for December 2005, with implementation of any measures pursuant to the EIS occurring in 2006.

11.0 CROSS-CUTTING MANDATES

11.1 Other Federal Laws

11.1.1 Coastal Zone Management Act

Section 307(c)(1) of the federal Coastal Zone Management Act (CZMA) of 1972 requires all federal activities that directly affect the coastal zone be consistent with approved state coastal zone management programs to the maximum extent practicable. The *Preferred Alternative* would be implemented in a manner that is consistent to the maximum extent practicable with the enforceable policies of the approved coastal zone management programs of Washington, Oregon, and California. This determination has been submitted to the responsible state agencies for review under Section 307(c)(1) of the CZMA. The relationship of the groundfish FMP with the CZMA is discussed in Section 11.7.3 of the groundfish FMP. The groundfish FMP has been found to be consistent with the Washington, Oregon, and California coastal zone management programs. The recommended action is consistent and within the scope of the actions contemplated under the framework FMP.

Under the CZMA, each state develops its own coastal zone management program which is then submitted for federal approval. This has resulted in programs which vary widely from one state to the next. Harvest specifications and management measures for 2005-2006 are not expected to affect any state's coastal management program.

11.1.2 Endangered Species Act

NMFS issued Biological Opinions (BOs) under the ESA on August 10, 1990, November 26, 1991, August 28, 1992, September 27, 1993, May 14, 1996, and December 15, 1999 pertaining to the effects of the groundfish fishery on chinook salmon (Puget Sound, Snake River spring/summer, Snake River fall, upper Columbia River spring, lower Columbia River, upper Willamette River, Sacramento River winter, Central Valley spring, California coastal), coho salmon (Central California coastal, southern Oregon/northern California coastal), chum salmon (Hood Canal summer, Columbia River), sockeye salmon (Snake River, Ozette Lake), and steelhead (upper, middle and lower Columbia River, Snake River Basin, upper Willamette River, central California coast, California Central Valley, south-central California, northern California, southern California). During the 2000 Pacific whiting season, the whiting fisheries exceeded the chinook bycatch amount specified in the Pacific whiting fishery BO (December 15, 1999) incidental take statement estimate of 11,000 fish, by approximately 500 fish. In the 2001 whiting season, however, the whiting fishery's chinook bycatch was about 7,000 fish, which approximates the long-term average. After reviewing data from, and management of, the 2000 and 2001 whiting fisheries (including industry bycatch minimization measures), the status of the affected listed chinook, environmental baseline information, and the incidental take statement from the 1999 whiting BO, NMFS determined in a letter dated April 25, 2002 that a re-initiation of the 1999 whiting BO was not required. NMFS has concluded that implementation of the FMP for the Pacific Coast groundfish fishery is not expected to jeopardize the continued existence of any endangered or threatened species under the jurisdiction of NMFS, or result in the destruction or adverse modification of critical habitat. The proposed action is within the scope of these consultations.

11.1.3 Marine Mammal Protection Act

The MMPA of 1972 is the principle federal legislation that guides marine mammal species protection and conservation policy in the United States. Under the MMPA, NMFS is responsible for the management and conservation of 153 stocks of whales, dolphins, porpoise, as well as seals, sea lions, and fur seals; while the U.S. Fish and Wildlife Service is responsible for walrus, sea otters, and the West Indian manatee.

Off the West Coast, the Steller sea lion (*Eumetopias jubatus*) Eastern stock, Guadalupe fur seal (*Arctocephalus townsendi*), and Southern sea otter (*Enhydra lutris*) California stock are listed as threatened under the ESA and the sperm whale (*Physeter macrocephalus*) Washington, Oregon, and California stock, humpback whale (*Megaptera novaeangliae*) Washington, Oregon, and California - Mexico Stock, blue whale (*Balaenoptera musculus*) Eastern north Pacific stock, and Fin whale (*Balaenoptera physalus*) Washington, Oregon, and California stock are listed as depleted under the MMPA. Any species listed as endangered or threatened under the ESA is automatically considered depleted under the MMPA.

The West Coast groundfish fisheries are considered a Category III fishery, indicating a remote likelihood of or no known serious injuries or mortalities to marine mammals, in the annual list of fisheries published in the *Federal Register*. Based on its Category III status, the incidental take of marine mammals in the West Coast groundfish fisheries does not significantly impact marine mammal stocks. The proposed action will affect the intensity, duration, and location of groundfish fisheries through implemented management measures. But these changes would not change the effects of the groundfish fisheries on marine mammals.

11.1.4 Migratory Bird Treaty Act

The Migratory Bird Treaty Act of 1918 was designed to end the commercial trade of migratory birds and their feathers that, by the early years of the 20th century, had diminished populations of many native bird species. The Act states that it is unlawful to take, kill, or possess migratory birds and their parts (including eggs, nests, and feathers) and is a shared agreement between the United States, Canada, Japan, Mexico, and Russia to protect a common migratory bird resource. The Migratory Bird Treaty Act prohibits the directed take of seabirds, but the incidental take of seabirds does occur. The proposed action is unlikely to affect the incidental take of seabirds protected by the Migratory Bird Treaty Act.

11.1.5 Paperwork Reduction Act

The proposed action, as implemented by any of the alternatives considered in this EIS, does not require collection-of-information subject to the Paperwork Reduction Act.

11.1.6 Regulatory Flexibility Act

The purpose of the RFA is to relieve small businesses, small organizations, and small governmental entities of burdensome regulations and record-keeping requirements. Major goals of the RFA are; (1) to increase agency awareness and understanding of the impact of their regulations on small business, (2) to require agencies communicate and explain their findings to the public, and (3) to encourage agencies to use flexibility and to provide regulatory relief to small entities. The RFA emphasizes predicting impacts on small entities as a group distinct from other entities and the consideration of alternatives that may minimize the impacts while still achieving the stated objective of the action. An initial regulatory flexibility analysis (IRFA) is conducted unless it is determined that an action will not have a “significant economic impact on a substantial number of small entities.” The RFA requires that an initial regulatory flexibility analysis (IRFA) include elements that are similar to those required by EO 12866 and NEPA. Therefore, the IRFA has been combined with the RIR and NEPA analyses.

Section 11.3 (below) summarizes the analytical conclusions specific to the RFA and EO 12866.

11.2 Executive Orders

11.2.1 EO 12866 (Regulatory Impact Review)

EO 12866, Regulatory Planning and Review, was signed on September 30, 1993, and established guidelines for promulgating new regulations and reviewing existing regulations. The EO covers a variety of regulatory policy considerations and establishes procedural requirements for analysis of the benefits and costs of regulatory actions. Section 1 of the EO deals with the regulatory philosophy and principles that are to guide agency development of regulations. It stresses that in deciding whether and how to regulate, agencies should assess all of the costs and benefits across all regulatory alternatives. Based on this analysis, NMFS should choose those approaches that maximize net benefits to society, unless a statute requires another regulatory approach.

The RIR and IRFA determinations are part of the combined summary analysis in Section 11.3 of this document.

11.2.2 EO 12898 (Environmental Justice)

EO 12898 obligates federal agencies to identify and address “disproportionately high adverse human health or environmental effects of their programs, policies, and activities on minority and low-income populations in the United States” as part of any overall environmental impact analysis associated with an action. NOAA guidance, NAO 216-6, at §7.02, states that “consideration of EO 12898 should be specifically included in the NEPA documentation for decision-making purposes.” Agencies should also encourage public participation—especially by affected communities—during scoping, as part of a broader strategy to address environmental justice issues.

The environmental justice analysis must first identify minority and low-income groups that live in the project area and may be affected by the action. Typically, census data are used to document the occurrence and distribution of these groups. Agencies should be cognizant of distinct cultural, social, economic, or occupational factors that could amplify the adverse effects of the proposed action. (For example, if a particular kind of fish is an important dietary component, fishery management actions affecting the availability, or price of that fish, could have a disproportionate effect.) In the case of Indian tribes, pertinent treaty or other special rights should be considered. Once communities have been identified and characterized, and potential adverse impacts of the alternatives are identified, the analysis must determine whether these impacts are disproportionate. Because of the context in which environmental justice is developed, health effects are usually considered, and three factors may be used in an evaluation: whether the effects are deemed significant, as the term is employed by NEPA; whether the rate or risk of exposure to the effect appreciably exceeds the rate for the general population or some other comparison group; and whether the group in question may be affected by cumulative or multiple sources of exposure. If disproportionately high adverse effects are identified, mitigation measures should be proposed. Community input into appropriate mitigation is encouraged.

Section 8.5 in Appendix A describes a methodology, using 2000 U.S. Census data, to identify potential “communities of concern” because their populations have a lower income or a higher proportion of minorities than comparable communities in their region. Based on this information, but focusing on more isolated, rural coastal communities, Section 8.5.7 identifies 18 communities of concern in Washington, Oregon, and California and discusses the potential effects of the proposed action on minority and low income populations. It should be noted that fishery participants make up a small proportion of the total population in these communities and their demographic characteristics may be different from the community as a whole. However, information specific to fishery participants is not available. Furthermore, different segments of the fishery-involved population may differ demographically. For example, workers in fish processing plants may be more often from a minority population while deckhands may be more frequently low income in comparison to vessel owners.

Participation in decisions about the proposed action by communities that could experience disproportionately high and adverse impacts is another important principle of the EO. The Council offers a range of opportunities for participation by those affected by its actions and disseminates information to affected communities about its proposals and their effects through several channels. In addition to Council membership, which includes representatives from the fishing industries affected by Council action, the GAP, a Council advisory body, draws membership from fishing communities affected by the proposed action. While no special provisions are made for membership to include representatives from low income and minority populations, concerns about disproportionate effects to minority and low income populations could be voiced through this body, or to the Council directly. Although Council meetings are not held in isolated coastal communities for logistical reasons, they are held in different places up and down the West Coast to increase accessability. In addition, fishery management agencies in Oregon and California sponsored public hearings in coastal communities to gain input on the proposed action. The comments were made available to the Council in advance of their decision to choose a preferred alternative.

The Council disseminates information about issues and actions through several media. Although not specifically targeted at low income and minority populations, these materials are intended for consumption by affected populations. Materials include a newsletter, describing business conducted at Council meetings, notices for meetings of all Council bodies, and fact sheets intended for the general reader. The Council maintains a postal and electronic mailing list to disseminate this information. The Council also maintains a website (www.pcouncil.org) providing information about the Council, its meetings, and decisions taken. Most of the documents produced by the Council, including NEPA documents, can be downloaded from the website.

11.2.3 EO 13132 (Federalism)

EO 13132, which revoked EO 12612, an earlier federalism EO, enumerates eight “fundamental federalism principles.” The first of these principles states “Federalism is rooted in the belief that issues that are not national in scope or significance are most appropriately addressed by the level of government closest to the people.” In this spirit, the EO directs agencies to consider the implications of policies that may limit the scope of or preempt states’ legal authority. Preemptive action having such “federalism implications” is subject to a consultation process with the states; such actions should not create unfunded mandates for the states; and any final rule published must be accompanied by a “federalism summary impact statement.”

The Council process offers many opportunities for states (through their agencies, Council appointees, consultations, and meetings) to participate in the formulation of management measures. This process encourages states to institute complementary measures to manage fisheries under their jurisdiction that may affect federally-managed stocks.

The proposed action does not have federalism implications subject to EO 13132.

11.2.4 EO 13175 (Consultation and Coordination With Indian Tribal Government)

EO 13175 is intended to ensure regular and meaningful consultation and collaboration with tribal officials in the development of federal policies that have tribal implications, to strengthen the United States government-to-government relationships with Indian tribes, and to reduce the imposition of unfunded mandates upon Indian tribes.

The Secretary recognizes the sovereign status and co-manager role of Indian tribes over shared federal and tribal fishery resources. At Section 302(b)(5), the Magnuson-Stevens Act reserves a seat on the Council for a representative of an Indian tribe with federally-recognized fishing rights from California, Oregon, Washington, or Idaho.

The U.S. government formally recognizes the four Washington coastal tribes (Makah, Quileute, Hoh, and Quinault) have treaty rights to fish for groundfish. In general terms, the quantification of those rights is 50% of the harvestable surplus of groundfish available in the tribes' U and A fishing areas (described at 50 CFR 660.324). Each of the treaty tribes has the discretion to administer their fisheries and to establish their own policies to achieve program objectives.

Accordingly, harvest specifications and management measures for 2005-2006 have been developed in consultation with the affected tribe(s) and, insofar as possible, with tribal consensus.

11.2.5 EO 13186 (Responsibilities of Federal Agencies to Protect Migratory Birds)

EO 13186 supplements the MBTA (above) by requiring federal agencies to work with the U.S. Fish and Wildlife Service to develop memoranda of agreement to conserve migratory birds. NMFS is scheduled to implement its memorandum of understanding by January 2003. The protocols developed by this consultation will guide agency regulatory actions and policy decisions in order to address this conservation goal. The EO also directs agencies to evaluate the effects of their actions on migratory birds in environmental documents prepared pursuant to the NEPA.

Chapter 6 in this EIS evaluates impacts to seabirds and concludes that the proposed action will not significantly impact seabirds.

11.3 Regulatory Impact Review and Regulatory Flexibility Analysis

In order to comply with EO 12866 and the RFA, this document also serves as an RIR and an IRFA. A summary of these analyses is presented below.

11.3.1 EO 12866 (Regulatory Impact Review)

EO 12866, Regulatory Planning and Review, was signed on September 30, 1993, and established guidelines for promulgating new regulations and reviewing existing regulations. The EO covers a variety of regulatory policy considerations and establishes procedural requirements for analysis of the benefits and costs of regulatory actions. Section 1 of the Order deals with the regulatory philosophy and principles that are to guide agency development of regulations. It stresses that in deciding whether and how to regulate, agencies should assess all of the costs and benefits across all regulatory alternatives. Based on this analysis, NMFS should choose those approaches that maximize net benefits to society, unless a statute requires another regulatory approach.

The regulatory principles in EO 12866 emphasize careful identification of the problem to be addressed. The agency is to identify and assess alternatives to direct regulation, including economic incentives such as user fees or marketable permits, to encourage the desired behavior. Each agency is to assess both the costs and the benefits of the intended regulation and, recognizing that some costs and benefits are difficult to quantify, propose or adopt a regulation only after reasoned determination the benefits of the intended regulation justify the costs. In reaching its decision agency must use the best reasonably obtainable information, including scientific, technical and economic data, about the need for and consequences of the intended regulation.

NMFS requires the preparation of an RIR for all regulatory actions of public interest; implementation of rebuilding plans includes the publication of strategic rebuilding parameters in federal regulations. The RIR provides a comprehensive review of the changes in net economic benefits to society associated with proposed regulatory actions. The analysis also provides a review of the problems and policy objectives prompting the regulatory proposals and an evaluation of the major alternatives that could be used to solve the problems. The purpose of the analysis is to ensure the regulatory agency systematically and comprehensively considers all available alternatives, so the public welfare can be enhanced in the most efficient and cost-effective way. The RIR addresses many of the items in the regulatory philosophy and principles of EO 12866.

The RIR analysis and an environmental analyses required by NEPA have many common elements and they have been combined in this document. The following table shows where the elements of an RIR, as required by EO 12866, are located.

Required RIR Elements	Corresponding Sections
Description of management objectives	Sections 1.2 & 1.3
Description of the fishery[a/]	Section 8.1 Appendix A, Chapters 6 & 7
Statement of the problem	Section 1.2.2
Description of each alternative considered in the analysis	Chapter 2
An analysis of the expected economic effects of each alternative	Chapter 8

a/ In addition to the information in this document, basic economic information is provided annually in the Council's Stock Assessment and Fishery Evaluation document.

The RIR is designed to determine whether the proposed actions could be considered "significant regulatory actions" according to EO 12866. The EO 12866 test requirements used to assess whether or not an action would be a "significant regulatory action" and the expected outcomes of the proposed management alternative are discussed below. A regulatory program is "economically significant" if it is likely to result in the following effects:

1. Have a annual effect on the economy of $100 million or more or adversely affect in a material way the economy, a sector of the economy, productivity, competition, jobs, the environment, public health or safety, or state, local, or tribal governments or communities.

   <u>No Action alternative:</u>
   <u>Alternative 1:</u>
   <u>Alternative 2:</u>
   <u>Alternative 3:</u>

Risk to Long Term Productivity:

2. Create a serious inconsistency or otherwise interfere with action taken or planned by another agency.

   None identified under any of the alternatives.
3. Materially alter the budgetary impact of entitlement, grants, user fees, or loan programs or the rights and obligations of recipients thereof.

   None identified under any of the alternatives.

4. Raise novel legal or policy issues arising out of legal mandates, the President's priorities, or the principles set forth in this EO.

   None identified under any of the alternatives.

The need for probable short-term closures of commercial and recreational fisheries north and south of Cape Mendocino under Alternative 4 would likely meet the significance criteria enumerated in the Executive Order.

11.3.2 Impacts on Small Entities (Regulatory Flexibility Act, RFA)

The RFA requires government agencies to assess the effects that regulatory alternatives would have on small entities, including small businesses, and to determine ways to minimize those effects. A fish-harvesting business is considered a “small” business by the Small Business Administration if it has annual receipts not in excess of $3.5 million. For related fish-processing businesses, a small business is one that employs 500 or fewer persons. For wholesale businesses, a small business is one that employs not more than 100 people. For marinas and charter/party boats, a small business is one with annual receipts not in excess of $5 million.

The data available for this analysis are based on data sets that have vessel and buyer/processor identifiers. The commercial data are from the PacFIN data system, and the recreational data were provided by the states. The vessel and processor counts are based on unique vessel and buyer/processor identifiers. However, it is known that in many cases a single firm may own more than one vessel, or a buyer/processing facility may include more than one profit center. Therefore, the counts should be considered upper bound estimates. Additionally, businesses owning vessels and/or buyers and processors may have revenue from fisheries in other geographic areas, such as Alaska, or from nonfishing activities. Therefore, it is likely that when all operations of a firm are aggregated, some of the small entities identified here are actually larger than indicated.

Most of the vessels, processors, and related businesses engaged in the West Coast groundfish fishery would be classified as small businesses under these definitions. Table 8-4 in Appendix A shows that of a total 4,588 commercial vessels fishing from West Coast ports, 1,709 vessels had some involvement in West coast groundfish fisheries. Of these, 421 held groundfish limited entry permits, and an additional 771 participated in open access groundfish fisheries and derived more than 5% of total revenue from groundfish. Ninety one limited entry trawl vessels were permanently retired under a recent buyback program. This represents a 35% reduction in the size of the limited entry trawl fleet.

Regarding buyers and processors, Table 7-1 in Appendix A shows that out of a total 1,780 fish buyers on the West Coast, 732 bought at least some groundfish from commercial fishermen. All but 19 of these purchased less than $2 million worth of total harvest during the year 2000.

Table 6-10 in Appendix A shows that in 2001 there were an estimated 753 recreational fishing charter vessels operating in ocean fisheries on the West Coast: 106 in Washington, 232 in Oregon and 415 in California. Recreational fisheries catch widow rockfish incidentally, although Table 6-15 in Appendix A shows significant but declining catches of widow rockfish occurring in Northern California since 1998. There has been a small recreational catch of yelloweye rockfish, primarily in California and Oregon (Table 6-15 in Appendix A). Bocaccio and cowcod are mainly caught in Southern California. Bocaccio is the most important recreational species of the four overfished species considered in this amendment.

Section 603 (b) of the RFA identifies the elements that should be included in the IRFA. These are bulleted below, followed by information that addresses each element.

- A description of the reasons why action by the agency is being considered.

The purpose and need for the proposed action are discussed in Section 1.2.

- A succinct statement of the objectives of, and legal basis for, the proposed rule.

- A description and, where feasible, an estimate of the number of small entities to which the proposed rule will apply.

The economic impact will be shared among groundfish buyers, commercial harvesters, and recreational operators. It is estimated there are about 730 groundfish buyers, 1,700 commercial vessels and 750 recreational charter operators that may be affected by these actions. Although there is some double counting, most of these entities would probably qualify as small businesses under Small Business Administration criteria.

- A description of the projected reporting, record-keeping, and other compliance requirements of the proposed rule, including an estimate of the classes of small entities that will be subject to the requirements of the report or record.

There are no new reporting or record-keeping requirements that are proposed as part of this action.

- An identification, to the extent practicable, of all relevant federal rules, which may duplicate, overlap, or conflict with the proposed rule.

No federal rules have been identified that duplicate, overlap, or conflict with the alternatives. Public comment is hereby solicited, identifying such rules.

- A description of any significant alternatives to the proposed rule that accomplish the stated objectives that would minimize any significant economic impact of the proposed rule on small entities.

12.0 LIST OF PREPARERS

Council Staff

Name	Position	Participation
Mr. Mike Burner	Groundfish Staff Officer	Principal author, Chapter 7; contributing author, Appendix A
Dr. Christopher Kit Dahl	NEPA Staff Officer	Principal author, Executive Summary, Chapters 1, 3, 9-11, Appendix A
Mr. John DeVore	Groundfish Staff Officer	Principal author, Chapters 2, 4-5; contributing author, Chapter 7, Appendix A
Mr. Jim Seger	Staff Economist	Principal author, Appendix B; contributing author, Appendix A
Dr. Ed Waters	Staff Economist	Principal author, Chapter 8, Section 11.3; contributing author, Appendix A

Ms. Kerry Aden was responsible for document production, including proofing and editing.

Groundfish Management Team

The Groundfish Management Team worked with the Council to develop the details of the alternatives and provided catch and bycatch projections. State and tribal representatives put forward proposals for allocations and management measures. Additional contributions are noted below, as appropriate.

Name	Affiliation	Participation
Ms. Deborah Aseltine-Neilson	California Department of Fish and Game	
Ms. Susan Ashcraft	California Department of Fish and Game	
Mr. Merrick Burden	NMFS, Northwest Region	
Mr. Brian Culver	Washington Department of Fish and Wildlife	
Ms. Jamie Goen	NMFS, Northwest Region	
Dr. Xi He	NMFS, Southwest Fisheries Science Center	
Mr. Robert F. Jones	Northwest Indian Fisheries Commission	
Ms. Michele Robinson	Washington Department of Fish and Wildlife	GMT Chair

Name	Affiliation	Participation
Mr. Mark Saelens	Oregon Department of Fish and Wildlife	
Ms. Cyreis Schmitt	Oregon Department of Fish and Wildlife	

Other Contributors

Name	Affiliation	Participation
Dr. Jim Hastie	NMFS, Northwest Fisheries Science Center	Trawl bycatch model; lingcod rebuilding analysis
Ms. Carrie Nordeen	NMFS, Northwest Region	Principal author, Chapter 6

13.0 AGENCIES, ORGANIZATIONS, AND PERSONS TO WHOM COPIES OF THIS STATEMENT WERE SENT

The Council makes both the DEIS and FEIS available on its website, so anyone with computer access may download an electronic copy. Electronic copies on CD-ROM and paper copies are made available upon request. The Council distributes a notice of availability for the DEIS and FEIS through its electronic mailing list, which include state and federal agencies, tribes, and individuals. Copies of the FEIS are sent to anyone who comments on the DEIS. In addition, NMFS distributes copies of the DEIS to the following agencies:

Department of Interior
Department of State
U.S. Coast Guard, Commander Pacific Area
Marine Mammal Commission
Pacific States Marine Fisheries Commission
Washington Coastal Zone Management Program, Shoreline Environmental Assistance, Department of Ecology, Washington State
Ocean-Coastal Management Program, Department of Land Conservation and Development, State of Oregon
California Coastal Commission

14.0 ACRONYMS AND GLOSSARY

ABC	acceptable biological catch. The ABC is a scientific calculation of the sustainable harvest level of a fishery, and is used to set the upper limit of the annual total allowable catch. It is calculated by applying the estimated (or proxy) harvest rate that produces maximum sustainable yield to the estimated exploitable stock biomass (the portion of the fish population that can be harvested).
B_{MSY}	The biomass that allows maximum sustainable yield to be taken.
BO	Biological Opinion
B_o	Unfished biomass; the estimated size of a fish stock in the absence of fishing.
BRD	bycatch reduction device
CalCOFI	California Cooperative Oceanic Fisheries Investigations
CCA	Cowcod Conservation Area
CDFG	California Department of Fish and Game
CEQ	Council on Environmental Quality
CFR	Code of Federal Regulations. A codification of the regulations published in the *Federal Register* by the executive departments and agencies of the federal government. The CFR is divided into 50 titles that represent broad areas subject to federal regulation Title 50 contains wildlife and fisheries regulations.
Council	Pacific Fishery Management Council
CPFV	commercial passenger fishing vessel
CPS	coastal pelagic species. Coastal pelagic species are schooling fish, not associated with the ocean bottom, that migrate in coastal waters. They usually eat plankton and are the main food source for higher level predators such as tuna, salmon, most groundfish, and humans. Examples are herring, squid, anchovy, sardine, and mackerel.
CPUE	catch per unit effort
CRFS	California Recreational Fisheries Survey
CZMA	Coastal Zone Management Act
DBCA	Darkblotched Rockfish Conservation Area
DEIS	draft environmental impact statement
DTS	Dover sole, thornyhead(s), and trawl-caught sablefish complex

EA	environmental assessment. As part of the National Environmental Policy Act (NEPA) process, an EA is a concise public document that provides evidence and analysis for determining whether to prepare an Environmental Impact Statement (EIS) or a Finding of No Significant Impact.
EDCP	Enhanced Data Collection Project
EEZ	Exclusive Economic Zone. A zone under national jurisdiction (up to 200 nautical miles wide) declared in line with the provisions of the 1982 United Nations Convention of the Law of the Sea, within which the coastal state has the right to explore and exploit, and the responsibility to conserve and manage, the living and non-living resources.
EFH	essential fish habitat. Those waters and substrate necessary to fish for spawning, breeding, feeding, or growth to maturity.
EFP	exempted fishing permit
EIS	environmental impact statement. As part of the National Environmental Policy Act (NEPA) process, an EIS is an analysis of the expected impacts resulting from the implementation of a fisheries management or development plan (or some other proposed action) on the environment. EISs are required for all fishery management plans as well as significant amendments to existing plans.
ENSO	El Niño southern oscillation
EO	Executive Order
EPA	Environmental Protection Agency
ESA	Endangered Species Act. An act of federal law that provides for the conservation of endangered and threatened species of fish, wildlife, and plants. When preparing fishery management plans, councils are required to consult with the National Marine Fisheries Service and the U.S. Fish and Wildlife Service to determine whether the fishing under a fishery management plan is likely to jeopardize the continued existence of an ESA-listed species, or to result in harm to its critical habitat.
F	The instantaneous rate of fishing mortality. The term “fishing mortality rate” is a technical fishery science term that is often misunderstood. It refers to the rate at which animals are removed from the stock by fishing. The fishing mortality rate can be confusing because it is an “instantaneous” rate that is useful in mathematical calculations, but is not easily translated into the more easily understood concept of “percent annual removal.”
FEAM	Fisheries Economic Assessment Model
fecundity	The potential to produce offspring.
FEIS	final environmental impact statement
fm	fathom

FMP	Fishery management plan. A plan, and its amendments, that contains measures for conserving and managing specific fisheries and fish stocks.
FONSI	Finding of No Significant Impact. As part of the National Environmental Policy Act (NEPA) process, a finding of no significant impact (FONSI) is a document that explains why an action that is not otherwise excluded from the NEPA process, and for which an environmental impact statement (EIS) will not be prepared, will not have a significant effect on the human environment.
FRFA	Final Regulatory Flexibility Analysis. the FRFA includes all the information from the initial regulatory flexibility analysis. Additionally, it provides a summary of significant issues raised by the public, a statement of any changes made in the proposed rule as a result of such comments, and a description of steps taken to minimize the significant adverse economic impact on small entities consistent with stated objectives.
GAP	Groundfish Advisory Subpanel. The Council established the GAP to obtain the input of the people most affected by, or interested in, the management of the groundfish fishery. This advisory body is made up of representatives with recreational, trawl, fixed gear, open access, tribal, environmental, and processor interests. Their advice is solicited when preparing fishery management plans, reviewing plans before sending them to the Secretary, reviewing the effectiveness of plans once they are in operation, and developing annual and inseason management.
GCA	Groundfish Conservation Area
GMT	Groundfish Management Team. Groundfish management plans and annual and inseason management recommendations are prepared by the Council's GMT, which consists of scientists and managers with specific technical knowledge of the groundfish fishery.
HAPC	habitat areas of particular concern
INPFC	International North Pacific Fishery Commission
IPHC	International Pacific Halibut Commission. A commission responsible for studying Pacific halibut stocks and the halibut fishery. The IPHC makes proposals to the U.S. and Canada concerning the regulation of the halibut fishery.
IRFA	Initial Regulatory Flexibility Analysis. Anytime an agency publishes a notice of proposed rule making and the rule may have a significant impact on a substantial number of small entities, an IRFA is required. It describes the impact of the proposed rule on small entities and includes a description of the action, why it is necessary, the objectives and legal basis for the action, the small entities that will be impacted by the action, and the projected reporting, record-keeping, and other compliance requirements of the proposed rule. Rules that duplicate, overlap, or conflict with the proposed rule are also identified.

ITQ	individual transferrable quota
kg	kilogram
m	meter
Magnuson-Stevens Act	Magnuson-Stevens Fishery Conservation and Management Act. The MSA, sometimes known as the “Magnuson-Stevens Act,” established the 200-mile fishery conservation zone, the regional fishery management council system, and other provisions of U.S. marine fishery law.
MBTA	Migratory Bird Treaty Act
mean generation time	A measure of the time required for a female to produce a reproductively-active female offspring.
MFMT	maximum fishing mortality threshold. A limit identified in the National Standard Guidelines. A fishing mortality rate above this threshold constitutes overfishing.
MHHW	mean high high water
mixed stock exception	In “mixed-stock complexes,” many species of fish swim together and are caught together. This becomes a problem when some of these stocks are healthy and some are overfished, because even a sustainable harvest of the healthy stocks can harm the depleted stock. In order to avoid having to shut down all fisheries to protect one particular overfished stock, the national standard guidelines allow a “mixed-stock” exception to the “overfished” definition. This would allow higher catches of some overfished species than ordinarily allowed in order to avoid severe hardship to fishing communities.
MMPA	Marine Mammal Protection Act. The MMPA prohibits the harvest or harassment of marine mammals, although permits for incidental take of marine mammals while commercial fishing may be issued subject to regulation. (See “incidental take” for a definition of “take”.)
MPA	marine protected area
MRFSS	Marine Recreational Fisheries Statistical Survey
MRPZ	Marine Resources Protection Zone
MSA	Magnuson-Stevens Fishery Conservation and Management Act (see Magnuson-Stevens Act, above).
MSST	minimum stock size threshold. A threshold biomass used to determine if a stock is overfished. The Council proxy for MSST is $B_{25\%}$.
MSY	maximum sustainable yield. An estimate of the largest average annual catch or yield that can be continuously taken over a long period from a stock under prevailing ecological and environmental conditions. Since MSY is a long-term average, it need not be specified annually, but may be reassessed periodically based on the best scientific information available.
mt	metric ton. 1,000 kilos or 2,204.62 pounds.

NAO	NOAA Administrative Order
NEPA	National Environmental Protection Act
NEV	net economic value
NMFS	National Marine Fisheries Service. A division of the U.S. Department of Commerce, National Oceanic and Atmospheric Administration (NOAA). NMFS is responsible for conservation and management of offshore fisheries (and inland salmon). The NMFS Regional Director is a voting member of the Council.
NOAA	National Oceanic and Atmospheric Administration
NOI	Notice of Intent
NRDC	Natural Resources Defense Council
NSG	National Standard Guidelines
NWR	Northwest Region
ODFW	Oregon Department of Fish and Wildlife
overfished	Any stock or stock complex whose size is sufficiently small that a change in management practices is required to achieve an appropriate level and rate of rebuilding. The term generally describes any stock or stock complex determined to be below its overfished/rebuilding threshold. The default proxy is generally 25% of its estimated unfished biomass; however, other scientifically valid values are also authorized.
overfishing	Fishing at a rate or level that jeopardizes the capacity of a stock or stock complex to produce MSY on a continuing basis. More specifically, overfishing is defined as exceeding a maximum allowable fishing mortality rate. For any groundfish stock or stock complex, the maximum allowable mortality rate will be set at a level not to exceed the corresponding MSY rate (B_{MSY}) or its proxy.
OY	optimum yield. The amount of fish that will provide the greatest overall benefit to the Nation, particularly with respect to food production and recreational opportunities, and taking into account the protection of marine ecosystems. The OY is developed on the basis of the MSY from the fishery, taking into account relevant economic, social, and ecological factors. In the case of overfished fisheries, the OY provides for rebuilding to a level that is consistent with producing the MSY for the fishery.
PacFIN	Pacific Coast Fisheries Information Network
PDO	Pacific Decadal Oscillation
PEIS	programmatic environmental impact statement
P_{MAX}	The estimated probability of reaching T_{MAX}. May not be less than 50%.
PMCC	Pacific Marine Conservation Council

POP	Pacific ocean perch
PSMFC	Pacific States Marine Fisheries Commission
QSM	quota species monitoring
RCA	Rockfish Conservation Area
Rebuilding	Implementing management measures that increase a fish stock to its target size.
RecFIN	Recreational Fishery Information Network
RFA	Regulatory Flexibility Act (see IRFA and FRFA above). The Regulatory Flexibility Act (5 U.S.C. 601-612) requires federal agencies to consider the effects of their regulatory actions on small businesses and other small entities and to minimize any undue disproportionate burden.
RIR	Regulatory Impact Review. RIRs are prepared to determine whether a proposed regulatory action is “major.” The RIR examines alternative management measures and their economic impacts.
ROD	Record of Decision
SAFE	Stock Assessment and Fishery Evaluation. A SAFE document is a document prepared by the Council that provides a summary of the most recent biological condition of species in the fishery management unit, and the social and economic condition of the recreational and commercial fishing industries, including the fish processing sector. It summarizes, on a periodic basis, the best available information concerning the past, present, and possible future condition of the stocks and fisheries managed in the FMP.
Secretary	U.S. Secretary of Commerce
SEIS	supplemental environmental impact statement
SFA	Sustainable Fisheries Act (see Magnuson-Stevens Act, above).
SSC	Scientific and Statistical Committee. An advisory committee of the Council made up of scientists and economists. The Magnuson-Stevens Act requires that each council maintain an SSC to assist in gathering and analyzing statistical, biological, ecological, economic, social, and other scientific information that is relevant to the management of Council fisheries.
STAR	Stock Assessment Review Panel. A panel set up to review stock assessments for particular fisheries. In the past there have been STAR panels for sablefish, rockfish, squid, and other species.
STAT	Stock Assessment Team. Stock assessment authors from the National Marine Fisheries Service fisheries science centers.

SWFSC	Southwest Fisheries Science Center (NMFS)
TAC	total allowable catch
T_{MAX}	The maximum time period to rebuild an overfished stock, according to National Standard Guidelines. Depends on biological, environmental, and legal/policy factors.
T_{TARGET}	The target year, set by policy, for a fish stock to be completely rebuilt.
T_{MIN}	The minimum time period to rebuild an overfished stock, according to National Standard Guidelines. Technically, this is the minimum amount of time in which a fish stock will have a 50% chance of rebuilding if no fishing occurs (depends on biological and environmental factors).
U and A	usual and accustomed
USEPA	United States Environmental Protection Agency
USFWS	U.S. Fish and Wildlife Service
VMS	Vessel Monitoring System
WCGOP	West Coast Groundfish Observer Program
WDFW	Washington Department of Fish and Wildlife
WOC	Washington/Oregon/California
YRCA	Yelloweye Rockfish Conservation Area

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Exhibit C.6.a
Attachment 2
June 2004

PROPOSED ACCEPTABLE BIOLOGICAL CATCH AND OPTIMUM YIELD SPECIFICATIONS AND MANAGEMENT MEASURES

FOR THE

2005-2006 PACIFIC COAST GROUNDFISH FISHERY

[PRELIMINARY DRAFT]
DRAFT ENVIRONMENTAL IMPACT STATEMENT

APPENDIX A:
AFFECTED ENVIRONMENT

TABLE OF CONTENTS

LIST OF TABLES

LIST OF FIGURES

1.0 The Management Framework

1.1 The Management Process

1.1.1 Scientific Research and Stock Assessments

1.1.1.1 The Stock Assessment Process

Stock assessments for Pacific Coast groundfish are generally conducted by staff scientists of California Department of Fish and Game, Oregon Department of Fish and Wildlife, Washington Department of Fish and Wildlife, Oregon State University, University of Washington, and the NMFS Southwest, Northwest, and Alaska Fisheries Science Centers. These assessments describe the condition or status of a particular stock and report on its health. This allows biologically sustainable harvest levels to be forecast; scientists can then make management recommendations to maintain or restore the stock. If a stock is determined to be overfished (less than 25% of its unfished biomass), a rebuilding analysis and a rebuilding plan are developed.

For more than 20 years, groundfish assessments have primarily been concentrated on important commercial and recreational species. Table 1-1 summarizes which species have been assessed over the past 10 years. These species account for most of the historical catch and have been the targets of fishery monitoring and resource survey programs that provide basic information for quantitative stock assessments. However, not all groundfish assessments use the same level of information and precision.

Quantitative and nonquantitative assessments are used for groundfish stocks. For stocks that are assessed quantitatively, scientists use life history data to build a biologically realistic model of the fish stock for these stock assessments; they then calibrate the model so that it reproduces the observed fishery and survey data as closely as possible. Recently similar, but more powerful, models using state-of- the-art software tools have been developed. Assessment models and results are independently reviewed by the Council's Stock Assessment Review (STAR) Panels. It is the responsibility of the STAR Panels to review draft stock assessment documents and relevant information to determine if they use the available scientific data effectively to provide an accurate assessment of the condition of the stock. In addition, the STAR Panels review the assessment documents to ensure that they are sufficiently complete and the research needed to improve assessments in the future is identified. The STAR process is a key element in an overall process designed to make timely use of new fishery and survey data, to analyze and understand these data as completely as possible, to provide opportunity for public comment, and to assure the assessment results are as accurate and error-free as possible.

Following review of assessment models by the STAR Panels, and subsequently the Groundfish Management Team (GMT) and Scientific and Statistical Committee (SSC), the GMT uses the reviewed assessments to recommend preliminary allowable biological catch (ABC) and optimum yield (OY) values to the Council.[1/] The SSC comments on the STAR review results and the GMT recommendations. Biomass estimates from an assessment may be for a single year or an the average of the current and several future years. In general, an ABC will be calculated by applying the appropriate harvest policy (MSY proxy) to the best estimate of

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1/ The ABC is calculated by multiplying the default fishing mortality rate to achieve maximum sustainable yield (MSY) biomass (denoted F_{MSY}) by the current biomass. This represents a harvest limit that can be supported without decline in stock size. OY is the harvest guideline, accounting for total fishing mortality (which also includes bycatch), as modified by biological and socioeconomic factors. It must be equal to or less than the ABC and typically represents a precautionary reduction from the ABC for stocks known to be below their MSY biomass or those for which there is limited stock status information.

current biomass. ABCs based on quantitative assessments remain in effect until revised by either a full or partial assessment.

Full assessments provide information on the abundance of the stock relative to historical and target levels, and provide information on current potential yield. Scientists conduct partial assessments when they do not have enough data for a full assessment. Even full assessments can vary widely in reliability because of the amount of data available for modeling. Council-affiliated scientists conduct several assessments each year. Individual stocks may be periodically reassessed as often as every year—currently only the case for Pacific whiting—to every two to four years. However, because of limits on scientific staff and data availability, some species have been assessed only once.

Stocks with ABCs set by non-quantitative assessments typically do not have a recent quantitative assessment, but there may be a previous assessment or some indicators of the status of the stock. Detailed biological information is not routinely available for these stocks, and ABC levels have typically been established on the basis of average historical landings. Typically, the spawning biomass, level of recruitment, or the current fishing mortality rates are unknown.

Many species have never been assessed and lack the data necessary to conduct even a qualitative assessment, such as a general indication in biomass trend. ABC values have been established for only about 26 stocks. The remaining species are incidentally landed and usually are not listed separately on fish landing receipts. Information from fishery-independent surveys is often lacking for these stocks, because of their low abundance or invulnerability to survey sampling gear. Precautionary measures continue to be taken when setting harvest levels (the OYs) for species that have no or only rudimentary assessments. Since implementation of the 2000 specifications, ABCs have been reduced by 25% to set OYs for species with less rigorous stock assessments, and by 50% to set OYs for those species with no stock assessment. At-sea observer data will be available for use in the near future to upgrade the assessment capability or evaluate overfishing potential of these stocks.

1.1.1.2 Rebuilding Overfished Species

In the case of overfished species, stock assessment results form the basis of a rebuilding analysis, which in turn is used to develop rebuilding policies and choose the rebuilding target identified in each rebuilding plan. The elements of rebuilding analyses are described in the SSC Terms of Reference for Rebuilding Analyses (SSC 2001). This guidance has been incorporated into a computer program for conducting rebuilding analyses (Punt 2002b). In the analysis the probability the overfished stock will reach the target biomass defining a rebuilt stock (B_{MSY} or $B_{40\%}$) is determined in the absence of fishing (T_{MIN}) and the maximum permissible rebuilding time under National Standard Guidelines (T_{MAX}). The target rebuilding year (T_{TARGET}) is determined based on these limits and the probability of achieving the target biomass by T_{MAX} (denoted P_{MAX}). Probability statements are an estimate that something may happen (in this case, that stocks will reach a given size in a specified time period) and thus also the level of risk associated with a given action. When interpreting rebuilding analyses it is important to understand how probability statements are derived, distinguish the basic policy choice from those parameters determined by national policy, identify different sources of uncertainty, and appreciate that even "fixed" values can change as the system (or fish stock)—and our understanding of it—change over time.

The rebuilding analysis program uses "Monte Carlo simulation" to derive a probability estimate for a given rebuilding strategy. This method projects population growth many times in separate simulations. It accounts for one source of uncertainty about future stock status by randomly choosing the value of a key variable—in this case total recruitment or recruits per spawner—from a range of values. These values can be specified empirically, by listing some set of historical values, or by a relationship based on a model. The SSC recommends the rebuilding analyses use historical values. Because of this variability in a key input value, each individual simulation, or "case," will show a different pattern of population growth. As a result, a modeled population may reach the target biomass in a different year in each of the cases in the Monte Carlo simulation. Figure 1-1 shows the results of five such cases from a hypothetical rebuilding analysis. (The values do not represent any of the actually overfished species.) The horizontal line at 0.4 represents target biomass. It can be seen that population increases steadily in each case, but at a different rate because of differences in the number of recruits in each future year for each case. Case #1 reaches the target biomass soonest, in 2025, while case #5 takes the longest, reaching the target in 2048.

The number of cases that reach the target biomass in any year can be computed and these values cumulated, or successively added together, starting with the first year set for the simulation and running out to some maximum number of years (which could be the case in which the population took the longest time to reach the target biomass or a predetermined maximum value). This cumulative probability shows the number of cases that have reached the target biomass in all the years up to and including the specified year, which is also an estimate of the probability the stock will rebuild by that year.

Figure 1-2 illustrates this concept of cumulative probability. The percent of simulations reaching the target biomass in each year, for some specified fishing mortality rate, is represented by the vertical bars. The five cases shown in the previous figure are plotted along with the other 995 cases that are part of this Monte Carlo simulation. The years in which the five cases in the previous figure reached the target biomass are highlighted in this figure. Case #3, for example, along with 26 other cases (that weren't plotted in the first figure), make up the bar tallying the number of cases rebuilt in 2032. The ascending solid line sums simulations that have reached the target biomass in any of the preceding years, even if biomass declines below the target in subsequent years. This ascending line represents the rebuilding probability. (It is important to note the calculated cumulative probability includes cases reaching the target biomass in any previous year. Species with highly variable recruitment may achieve the target biomass and subsequently fall below it, even in the absence of fishing. If these cases were excluded, the probability of recovery in any given year would likely be lower, depending on species being modeled.)

This technique can be used first to calculate T_{MIN} in probabilistic terms, which is defined as the time needed to reach the target biomass in the absence of fishing with a 50% probability. (It may be said that the 50% value represents "even odds"; it is equally likely the stock has rebuilt or not rebuilt in this year. In all other years it is either more or less likely the stock has rebuilt.) Thus, in a Monte Carlo simulation with 1,000 cases where the fishing mortality rate (F) is set to 0, the number of cases reaching the target biomass in a given year can be cumulated. In Figure 1-3 T_{MIN} is determined by finding the year in which this cumulative value equals 500 (or 50%). In other words, in half the simulations the target biomass was reached in some year up to and including the computed T_{MIN}. Given T_{MIN}, and assuming that it is greater than or equal to ten years (as is the case with most of the overfished groundfish stocks), T_{MAX} is computed by adding the value of one mean generation time. Figure 1-3 shows a T_{MIN} of 15 years (or 2014 if the stock were declared overfished in 1999). A mean generation time of 17 years is added to compute T_{MAX}.

After determining T_{MAX}, multiple Monte Carlo simulations are conducted, varying the fishing mortality rate. This determines the relationship between F and the probability of the stock being rebuilt by T_{MAX}, which is P_{MAX}. Figure 1-4 displays the results of three hypothetical simulations for fishing mortality rates resulting in P_{MAX} values of 90%, 70% and 50% (the minimum permissible rebuilding probability). Since a higher P_{MAX} probability must be achieved by lowering the fishing mortality rate (other things being equal) there is a tradeoff between fishery harvests and rebuilding speed in probabilistic terms. As we reduce fishing, the likelihood the stock will recover in this maximum time period increases.

Once probability distributions have been computed, like those plotted in Figure 1-4, a corresponding T_{TARGET} can be determined for distributions representing different harvest rates (F) and corresponding P_{MAX} values.

T_{TARGET} is defined as the median year in each probability distribution, which is simply the year by which half of all cases have already rebuilt, and is unique for a given F and P_{MAX}. Figure 1-4 shows how this is computed for the three plotted fishing mortality rates and corresponding P_{MAX} probabilities. As expected, if we apply the lowest of the three plotted fishing mortality rates (in other words, limit fishing the most), the stock will rebuild the fastest (or more accurately, has the highest probability of rebuilding by T_{MAX}). The target year for the lowest fishing mortality is 25 years. (To determine the actual target year, we add this value to the year in which the stock was declared overfished. Continuing with the example above, if the stock was declared overfished in 1999, then the target year is 2024.) Not surprisingly, this strategy also results in the highest P_{MAX}, equal to 90%. The fishing mortality rate associated with the 70% P_{MAX} value gives a later target year: 2028. Finally, T_{TARGET} equals T_{MAX} for the highest allowable fishing since the P_{MAX} value—50%—is the same probability used to determine T_{TARGET}.

From a policymaking standpoint, the essential tradeoff is between a given level of fishing mortality and the probability the stock will be rebuilt within the maximum permissible time period (P_{MAX}), and the related target year. Although computationally there is a prescribed relationship, with P_{MAX} as an input value, policymakers may wish to base their decisions on F, as expressed in the harvest control rule or simply choose a given target year and determine from it the associated P_{MAX} and F. Figure 1-5, taken from the canary rockfish rebuilding analysis, illustrates this tradeoff. It shows the relationship between any OY level in the current year, P_{MAX} and T_{TARGET}.

As the preceding discussion suggests, probability statements about T_{MAX} tell us the likelihood of an outcome based on our understanding of a fish stock and our ability to model how that stock will grow over time. Since our understanding of these population characteristics is imperfect, some sources of uncertainty are not captured in the aforementioned probability statements. First, inputs to the rebuilding analysis are to a greater or lesser degree best estimates of true values. This applies to basic biological parameters, such as fecundity, that are used to model population growth. Population projections also depend on an estimate of the size and age structure of the modeled stock at the outset of the projected time period, derived from the most recent stock assessment. Similarly, the biomass target ($B_{40\%}$) requires an estimate of the equilibrium population size that would be reached in the absence of fishing (see below). In all these cases the best estimate may not coincide with the true value. The Monte Carlo simulation used in the rebuilding analyses only considers uncertainty about future recruitment, so inaccuracy in the estimation of both species and stock-specific variables will not be captured in resulting probability statements. Finally, there is some uncertainty (or variability) inherent to the Monte Carlo simulation because any one simulation will not include all possible outcomes (or cases). This variability can be assessed by performing several simulations and measuring the variation in the output value (fishing mortality for a given T_{MAX} probability) among these simulations (Punt 2002a). This type of assessment can be used to establish a range around a point estimate (the mean value) expressing the likelihood the true value falls within that range.[2/]

New information may result in new estimates of biological and stock parameters, and assessed uncertainty in the Monte Carlo simulation tells us something about the range of possible outcomes. But rebuilding trajectories will also change over time with new stock assessments and as historical data (such as total catch

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[2/] These assessments demonstrates three important points. First, different modeled species will produce different degrees of variability when comparing Monte Carlo simulations because of the underlying variability in the input recruitment data. Second, for a given species and P_{MAX} increasing the number of cases in a simulations decreases uncertainty (or relative variability). But this decrease is not constant; increasing the number of cases in a simulation beyond a certain number produces diminishing returns in terms of reducing uncertainty. Finally, for a given species and number of cases in the Monte Carol simulation, choosing a lower P_{MAX} increases certainty (by decreasing the range of possibly “correct” values for fishing mortality, or OY).

estimates for past years) replace projected values. The time limits and target—T_{MIN}, T_{MAX}, and T_{TARGET}—fall along a time scale that begins when the stock is declared overfished (y_{DECL}).[3/] Because the rebuilding analysis is usually conducted from one to several years after y_{DECL}, a more recent stock assessment may allow population growth to be projected from the most recent year for which stock structure data (such as mortality, weight, and number of animals for each age class in the population) are available. In subsequent analyses (conducted as new stock assessment data become available), the pool of historical recruitment values will likely differ (with addition of the most recent years' data) and the there will be fewer years for which population growth is projected. (This assumes that T_{MAX} is not re-computed because, for example, changes in stock structure produce a different value for mean generation time.) It is highly likely the new analysis will suggest a different level of fishing mortality to achieve the same P_{MAX} and by extension T_{TARGET}. Conversely, if the policymaker wishes to continue with the same harvest policy—a given fishing mortality rate for example—P_{MAX} and T_{TARGET} would likely be different in the new analysis.

Estimation of Unfished Biomass

Target biomass is directly related to B_0, or unfished biomass. (It is expressed as a percentage of this value.) Target biomass in turn affects the rebuilding trajectory described by T_{MIN}, T_{MAX}, and T_{TARGET}. B_0 is rarely known absolutely; instead, it is calculated based on the relationship between the number of spawning fish and resulting recruits to the fishable population. Modelers choose a time period for which data are available and fishing effort has been at a stable and relatively moderate level. However, biologists are not sure of how important environmental conditions are to survival and growth, versus spawning population size. (A hypothesis favoring spawning population size as the determinant of recruitment is called a "density dependent" spawner to recruitment relationship. For groundfish this relationship is believed to be positive: a larger spawning population results in greater total recruitment.) These considerations complicate the choice of the time period used as basis for unfished biomass computations. For Pacific Coast groundfish these two factors have historically had potentially confounding effects. A large-scale regime shift began in 1977; many scientists believe that generally warmer water produced less favorable conditions for groundfish (Hare and Mantua 2000). The period after 1977 also saw a decline in groundfish populations due to increased fishing effort. If an environmental explanation is favored, one would choose a long time series that encompassed recruitment both before and after 1977 in order to account for the impact of the environmental change. However, this will result in a relatively lower value for B_0 than only using recruitment values before 1977 when biomass and recruitment were closer to an unfished state. The SSC also discussed a third approach in its Terms of Reference (SSC 2001), using spawner-recruit models instead of relying solely on empirical data. These models are problematic because they mathematically presuppose a certain spawner-recruit relationship. An overfished species being modeled may not exhibit this relationship because of its particular biology and ecology. The SSC recommended determining B_0 based on the density-dependent hypothesis and, therefore, using earlier data (resulting in relatively large values for B_0). Although, as discussed above, the determination of B_0 is not a policy choice, its value does influence policy choices since other parameters, such as target biomass, are defined in relation to B_0.

1.1.1.3 Research Fisheries

Research fisheries, or resource surveys, are an essential part of the management process. They provide fishery-independent data which—because it is gathered in a uniform, consistent manner—provide "benchmarks" used to track natural and anthropogenic changes in fish abundance. In some cases, a single

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[3/] National Standard guidelines identify the initial rebuilding year, for the purpose of calculating targets, as the year in which rebuilding measures were first implemented. For overfished Pacific groundfish this would be the year in which interim rebuilding plan measures were implemented as part of the annual management process. In most cases this was either y_{DECL} or the following year.

survey or a short time series can be directly calibrated to absolute abundance. An annual survey will most closely track natural biological fluctuations and smooth out apparent fluctuations caused by environmental effects on catchability. However most current surveys involve catching fish, adding to total fishing mortality. For overfished stocks with low OY values, the research take can represent a significant proportion of the harvest specification.[4/] At the same time, the reduction in fishery catches means less data are available from this source, making it even more difficult to determine abundance, measure stock recovery, and estimate potential yields.

Long-term groundfish survey efforts include:

- Acoustic and midwater trawl survey: A coastwide survey that has been conducted triennially (1977-2003) for Pacific whiting. Recent surveys have been coordinated with the Canadian acoustic survey to assure adequate coverage in northern areas.

- Shelf survey: A bottom trawl survey conducted triennially in midsummer, with sufficient coastwide coverage for most target species. Areas south of Point Conception were not surveyed until recently, however. The survey covers bottom depths of 30 fm to 275 fm using two large (125 foot) chartered vessels.

- Slope survey: A bottom trawl survey conducted nearly annually in mid-autumn, covering bottom depths of 100 fm to 700 fm. This survey began in 1998 and 1999.

- Nearshore survey: Scuba and hook-and-line surveys for various nearshore rockfish off California conducted by California Department of Fish and Game (CDFG).

- Mark-recapture survey: A Washington Department of Fish and Wildlife (WDFW) survey targeting black rockfish and lingcod.

- Shelf rockfish recruitment survey: A midwater trawl survey off Central California by Southwest Fisheries Science Center (SWFSC) for age zero rockfish.

- California Cooperative Oceanographic Fisheries Investigation (CalCOFI): A multi-species, multi-disciplinary oceanographic and egg and larvae survey off Southern California, which is currently conducted quarterly.

- International Pacific Halibut Commission annual survey: This survey using longline vessels is important for management of Pacific halibut. However, it catches groundfish incidentally.

1.1.2 The Management Cycle and Council Decision-making

1.1.2.1 Periodic Management

Groundfish management is mainly implemented through a framework in the groundfish fishery management plan (FMP), which allows the Council to recommend new fishing regulations, as long as these measures fall within the range of the principles and policies described in the FMP. Through 2004 this type of "seasonal"

[4/] Submersible surveys, where fish are counted and measured photographically, need to be developed. These may be especially appropriate for depleted rockfish species that occur in discrete habitats such as reefs and rock piles.

management was implemented through regulations promulgated annually, covering a fishing year, which corresponds to the calendar year. This annual process presented a number of problems, not the least of which was the inability to complete the necessary regulatory processes before the start of the new year. A 2001 lawsuit (*Natural Resources Defense Council* v. *Evans*, 2001 168 F. Supp. 2d 1149 [N.D. Cal. 2001]) requires NMFS to complete notice and comment rulemaking before implementing management measures. Because the agency is unable to complete these regulatory procedures after Council decision-making is finished and the new fishing season (calendar year) begins, it had to implement management measures for the first two months of the year in 2003 and 2004 through an emergency rule. This allowed the fishing season to commence while comment continued on the final rule, which covered the remaining 10 months of the year (March-December). Promulgating both rules resulted in a procedurally complex and administratively burdensome process. The difficulty of an annual process is compounded by the fishing industry's strong desire for the fishing season to stay open through the full calendar year in order to assure consistent supply to processors and markets. As management becomes more complex, there is not enough time in a one-year cycle to complete all of the required components, starting with completed stock assessments and ending with annual regulations. In recent years management measures (primarily bag limits and seasons) have also been applied to recreational fisheries, adding to this complexity. In addition to these procedural problems, the complexity of the annual cycle left little time for fishery managers to work on other initiatives to improve the management regime.

For these reasons, a biennial management cycle was implemented pursuant to Amendment 17 to the groundfish FMP, approved by the Council November 2002. Starting in 2005 and 2006, harvest specifications (ABCs and OYs) and management measures are established for two years. (Separate ABCs and OYs are identified for each year in the two-year cycle, however. That is, two one-year OYs are specified for each managed stock or stock complex.) This new cycle extends Council decision-making over three meetings. At its November meeting 14 months before the start of the biennium the Council identifies preliminary ABCs and OYs. At the following April and/or March meeting, the Council finalizes these harvest specifications and identifies a preliminary range of management measures. The Council makes its final decisions on these management measures at the June meeting preceding the next a biennium. This schedule allows enough time for NMFS to publish a proposed rule in the *Federal Register* and take public comment before its final decision on whether to approve the Council recommendations. More time is also available to meet the procedural and documentary requirements of the National Environmental Policy Act (NEPA). Finally, this cycle accommodates an “off-year” during which the Council and NMFS would be less occupied with ongoing management of the groundfish fishery and could spend more time on long-term initiatives such as developing better assessment models and surveys.

To ensure the Council could respond to significant changes in a fishery, the Council also included in Amendment 17 a process for reviewing fishing levels during the two-year management period. Harvest levels could be changed in response to new science or assessment information in order to prevent overfishing and rebuild overfished species. The Council has asked the GMT (in consultation with the SSC and Groundfish Advisory Subpanel, or GAP) to develop thresholds for determining whether mid-process changes are necessary.

1.1.2.2 Measures Currently Used to Manage Groundfish Fisheries

The alternatives in the 2003 and 2004 groundfish harvest specifications and management measures EISs (PFMC 2003b; PFMC 2004) describe the types of measures currently used to manage groundfish fisheries. Based on the most recent stock assessments, and for overfished species, rebuilding analyses and plans, the Council chooses harvest levels for stocks and stock complexes. Management measures are intended to keep total fishing mortality (landed catch plus bycatch) within these harvest levels, or OYs. Allocating harvest opportunity among different fishery sectors is an integral part of the management process. Some stocks, such as sablefish and Pacific whiting, have fixed or "hard" allocations: management measures must be structured so that particular sectors have the opportunity to catch a fixed percentage of the OY. Allocations for the majority of groundfish species are determined as part of the process of developing management measures, however. In these cases, rather than a hard allocation, the Council develops management measures, evaluates the likely allocations resulting from those measures, and then—if necessary—modifies the proposed measures until a *de facto* allocation acceptable to all sectors have been achieved. This is particularly true in deciding harvest allocations between commercial and recreational sectors. As described in Section 1.1.3.2, three Indian tribes in Washington state are allocated a share of the OYs for groundfish species taken in their fisheries. Based on their allocations, the tribes then oversee the prosecution of their fisheries separate from the management of other groundfish fishery sectors.

The main management measures used over the past two years for commercial and recreational fisheries are summarized below. Measures subject to periodic change within the framework established by the FMP are described. More permanent features of the management regime, such as licence limitation, are not discussed here.

Commercial Fishery Management Measures

Seasons: Most fisheries are managed to achieve a year round season; in fact, this is one of the key objectives expressed in the groundfish FMP because buyers and processors regard a continuous and consistent supply of fish as essential to maintaining markets. In the last two years managing fisheries to prevent OYs from being exceeded before the end of the year has become increasingly difficult because of the low harvest limits for some overfished species, and some fisheries have been closed early. A few groundfish fisheries are managed according to shorter seasons. The Pacific whiting fishery is probably the most significant example in terms of the volume of landings. It usually begins on April 1 and runs until the OY has been caught, usually by late October. The limited entry fixed gear sablefish fishery is also limited to a "primary season" from April 1 to October 31. (Sablefish may be caught by other sectors and fisheries at other times of the year, but the allocation and catch limits are smaller.)

Cumulative trip limits: Trip limits have been a feature of groundfish management since the inception of the FMP; over time the regime has become more complex, covering a wider range of species and fishery sectors. The basic concept is to set a limit on the how much of a given species (or multi-species complex[5/]) an individual vessel may land in a fixed time period. Originally, these limits were on a per trip basis; today the limits are for a two-month cumulative limit period, in order to reduce the likelihood of regulatory discards. Cumulative trip limits are separately established for the limited entry trawl, limited entry fixed gear, and open access sectors. (For a description of these sectors, see Section 6.) For each of these sectors separate limits are established for U.S. waters north and south of 40° 10' N latitude (approximately Cape Mendocino, California). The Pacific whiting fishery is a significant exception to trip limit management. As noted above, it occurs during a season whose length is determined by how quickly the OY is taken. (The OY is allocated according to fixed percentages between shore-based, at sea mothership, at-sea catcher/processor, and tribal fleets.) Within a given whiting fleet, participants coordinate fishing behavior to determine how long the season will last.

5/ Many less commercially important or less frequently caught species are combined in stock complexes for the purposes of management. These species may not be differentiated in reported landings and most have not been assessed; these factors make it impossible to manage these species individually. Multi-species complexes currently in use include the minor rockfish (additionally separated into several sub-categories), other flatfish, and other fish categories.

Management Areas: For the purposes of fisheries management the West Coast exclusive economic zone (EEZ) is divided into several, sometime overlapping, areas, shown in Figure 1-6. The five named areas (Vancouver, Columbia, Eureka, Monterey, and Conception) were originally devised by the International North Pacific Fishery Commission (INPFC) as statistical areas for cataloguing fish catch. Although still occasionally referred to as "INPFC areas," this organization is defunct and "management area" is the preferred term. Landings continue to be reported by these areas in the groundfish SAFE document and these boundaries are some times used to demarcate the application of different management measures. The 40° 10' N latitude line (near the Eureka-Monterey boundary) is more significant in this respect; as noted above, for example, trip limits differ north and south of this boundary. Other boundaries in use for management include latitude lines at significant coastal landmarks, such as Point Reyes and Point Conception. The latter represents an important marine biogeographic boundary and is used to distinguish some sub-specific stocks (such as sablefish) as well as management measures.

Groundfish Conservation Areas: Three different closed areas have been implemented to limit bycatch of overfished species. A relatively small Yelloweye Rockfish Conservation Area (YRCA) closes a "hotspot" off the Washington coast. Recreational fishing is prohibited within the YRCA and the area is a designated as a voluntary closure for the limited entry fixed gear sablefish fleet and salmon trollers. The YRCA was first implemented in 2003. The are two areas off the southern California coast designated Cowcod Conservation Areas (CCAs), intended to protect cowcod. Recreational and commercial fishing are prohibited within the CCAs, except that rockfish and lingcod fishing is permitted shoreward of 20 fathoms. The CCAs were first implemented in 2001. Rockfish Conservation Areas (RCAs) are by far the most extensive and complex closed areas. First implemented in late 2002 as part of an inseason management action, they extend from the Canadian to the Mexican border of U.S. waters. The RCAs were implemented to reduce bycatch of overfished species. These species are more frequently caught within certain depth ranges and, based on analysis of logbook data, the boundaries of the RCAs have been set to prohibit fishing within a range of depths. (In order to make enforcement possible, in most cases the actual isobaths—lines of equal depth—have been approximated by straight lines between published waypoints.) The depths covered by RCAs vary by season, latitude, and regulatory sector. (Boundaries for limited entry trawl vessels are different than those for the limited entry fixed gear and open access sectors.) Figure 1-7, taken from the 2004 harvest specifications and management measures environmental impact statement (EIS), shows the extent of RCAs under the different alternatives in schematic form. In this case the No Action Alternative represents the configurations used in 2003.

Gear Restrictions: Although various gear restrictions were a key feature of groundfish management even before the FMP was implemented, perhaps the most important current measures distinguish between large and small footrope gear. This refers to the size of the roller gear affixed to the bottom leading edge of a bottom trawl net. Large footrope gear allows the net to be fished over rougher ground. In nearshore and inner continental shelf areas rocky habitat is important to a range of organisms, including several overfished rockfish species. The Council has developed measures to discourage fishing on these rock piles. Beginning in 2003, vessels using small footrope trawl gear at any time in a cumulative limit period are subject to lower trip limits for Dover sole, thornyheads, and sablefish (DTS species) for the entirety of that period. Small footropes are more commonly used in areas inshore of RCAs; but if this gear is used, the lower trip limits act as a penalty by limiting the amount of fish that can be caught in deeper water with either small or large footrope trawl gear. (Large footrope gear is preferred when trawling on the soft bottom areas offshore where DTS species are found.) This is meant to encourage vessels to fish exclusively seaward of the RCA, using large footrope gear, thereby avoiding bycatch of overfished groundfish species (particularly canary rockfish) found on the continental shelf. In some nongroundfish fisheries, such the pink shrimp fishery, bycatch reduction devices (BRDs) are required. These devices are added to the trawl net and divert finfish out of the codend of the net, where the catch is accumulated.

Recreational Fishery Management Measures

Recreational fisheries typically occur closer inshore than most commercial fisheries and are actively managed by the states. Thus management measures, although developed through the Council process, tend to differ state-to-state. The main recreational management measures are season limitations and bag limits, which restrict the number of groundfish an angler may land, and size restrictions. Since some overfished species are frequently caught in recreational fisheries, species-specific sublimits may be applied within the overall bag limit. Closed seasons have also been imposed in response to overfishing. The most recent response to recreational catches of overfished species has been to established areal restrictions. Although similar in intent to the RCAs, these measures restrict fishing to depths less than a specified value and boundaries defined by waypoints are not developed.

1.1.2.3 FMP Amendments

Annual management allows adaptation to short-term changes in the status of stocks and the fisheries exploiting them (tied to long-term targets in the case of stocks below the target biomass). Broader changes to the management regime require FMP amendments. (Regulations also may be amended to effect such a change. Generally speaking, the FMP governs the management regime while regulations specify public conduct—in this case, what fishermen may or may not do.) Council Operating Procedure 11 describes the process for amending the FMP (PFMC 2000a). An issue identified by advisory bodies or the public is taken up at the first meeting where the need for action is considered, along with possible alternatives. A draft amendment package is then prepared for Council review at a second meeting. During this meeting the Council selects a preferred alternative, if possible, and adopts the draft amendment for public review. Staff then prepare a final draft amendment, which is made available for public comment. Public hearings are held during a third Council meeting and the Council adopts the final amendment for implementation by the Secretary of Commerce (Secretary).[6/] After the third meeting, Council staff make any needed non-substantive additions and changes and transmit the document to NMFS for review. The Secretary may then disapprove, approve or partially approve the amendment. If disapproved or partially approved, the Council may revise the proposal, addressing concerns raised by the Secretary, and resubmit the amendment. Given this process, aside from any staff time needed to prepare the analyses and supporting documentation, Council decision-making can take six to eight months. This is the minimum time within which three meetings could occur given the Council meeting schedule. For example, about six month would elapse if initial consideration occurred at the April meeting, then the June and September meetings were used to complete the process. Of course, the Council may not be able to consider an action during three successive meetings because of the total time available for the meeting agenda or because requisite document drafts are incomplete. This would lengthen the schedule still further. Additional time is also needed after the Council's final decision to prepare the NEPA document submitted to NMFS to start the agency review process, which results in implementation if the amendment is approved.

1.1.3 Federal, State, and Tribal Roles and Responsibilities in Management

1.1.3.1 State/Federal Jurisdiction under the Magnuson-Stevens Act

Under the Magnuson-Stevens Act, NMFS manages the groundfish fishery in the Exclusive Economic Zone, which starts at the seaward boundary of the state waters (3 nm from shore) and extends 200 miles offshore. The states retain jurisdiction to manage fisheries in state waters (within 3 nm of shore). A state can also

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6/ The MSA identifies the Secretary of Commerce as the decision maker. In practice, the authority is delegated to the appropriate NMFS Regional Administrator.

regulate vessels registered under the laws of that state in federal waters if the state's laws and regulations are consistent with the FMP and applicable federal law.

In practice, the states and federal government manage the groundfish fishery consistently and cooperatively. For the groundfish fishery, the states, the responsible federal agencies, and the Pacific Fishery Management Council coordinate closely. Each state has a representative of its fishery agency as a voting member on the Council. NMFS has a voting member on the Council, and the U.S. Coast Guard, U.S. Fish and Wildlife Service, and the Pacific States Marine Fisheries Commission have non-voting members on the Council. The states and NMFS also have representatives on the Council management and scientific committees that help develop the management measures. In short, there is very close coordination between the states and NMFS.

Management measures—including catch limits, bag limits, and size limits—apply to vessels operating in the EEZ (50 CFR 660.301). However, these limits, which apply to vessels that fish in the EEZ, also include fish caught between 0 and 3 miles from shore (50 CFR 660.323(a)). Therefore, if a vessel fishes in both state and federal waters, any fish caught count toward the limits in the federal groundfish regulations, no matter whether the fish were caught in state or federal waters. In addition, because the regulations have been developed cooperatively through the Council process, the States of Washington, Oregon, and California adopt regulations under their own authority that are the same as the federal regulations. For area closures, the federal regulations implement closed areas in federal waters, and state regulations implement closed areas in state waters.

1.1.3.2 Treaty Indian Fishing Rights

Treaties between the United States and numerous Pacific Northwest Indian tribes reserve to these tribes the right of taking fish at usual and accustomed grounds and stations ("u & a grounds") in common with all citizens of the United States. See U.S. v. Washington, 384 F. Supp. 312, 349-350 (W.D. Wash. 1974).

NMFS recognizes four tribes as having u & a grounds in the marine areas managed by the Pacific Coast groundfish FMP: the Makah, Hoh, and Quileute tribes, and the Quinault Indian Nation. The Makah Tribe is a party to the Treaty of Neah Bay, Jan. 31, 1855, 12 Stat. 939. See 384 F. Supp. at 349, 363. The Hoh and Quileute tribes and the Quinault Indian Nation are successors in interest to tribes that signed the Treaty with the Quinault, *et al.* (Treaty of Olympia), July 1, 1855, 12 Stat. 971. See 384 F. Supp. at 349, 359 (Hoh), 371 (Quileute), 374 (Quinault). The tribes' u&a grounds do not vary by species of fish. U.S. v. Washington, 157 F. 3d 630, 645 (9th Cir. 1998).

NMFS recognizes the areas set forth in the regulations cited below as marine u&a grounds of the four Washington coastal tribes. The Makah u&a grounds were adjudicated in U.S. v. Washington, 626 F.Supp. 1405, 1466 (W.D. Wash. 1985), aff'd 730 F.2d 1314 (9th Cir. 1984); see also Makah Indian Tribe v. Verity, 910 F.2d 555, 556 (9th Cir. 1990); Midwater Trawlers Co-op. v. Department of Commerce, 282 F.3d 710, 718 (9th Cir. 2002). The u&a grounds of the Quileute, Hoh, and Quinault tribes have been recognized administratively by NMFS. See, e.g., 67 Fed. Reg. 30616, 30624 (May 7, 2002) (u&a grounds for salmon); 50 CFR 660.324(c) (u&a grounds for groundfish); 50 CFR 300.64(I) (u&a grounds for halibut). The u&a grounds recognized by NMFS may be revised as ordered by a federal court.

The treaty fishing right is generally described as the opportunity to take a fair share of the fish, which is interpreted as up to 50% of the harvestable surplus of fish that pass through the tribes' u&a grounds. Washington v. Washington State Commercial Passenger Fishing Vessel Association, 443 U.S. 658, 685-687 (1979) (salmon); U.S. v. Washington, 459 F. Supp. 1020, 1065 (1978) (herring); Makah v. Brown, No. C85-160R, and U.S. v. Washington, Civil No. 9213 - Phase I, Subproceeding No. 92-1 (W.D. Wash., Order on Five Motions Relating to Treaty Halibut Fishing, at 6, Dec. 29, 1993) (halibut); U.S. v. Washington, 873 F.

Supp. 1422, 1445 and n. 30 (W.D. Wash. 1994), aff'd in part and rev'd in part, 157 F. 3d 630, 651-652 (9th Cir. 1998), cert. denied, 119 S.Ct. 1376 (1999) (shellfish); U.S. v. Washington, Subproceeding 96-2 (Order Granting Makah's Motion for Summary Judgment, etc. at 4, November 5, 1996) (Pacific whiting). The court applied the conservation necessity principle to federal determinations of harvestable surplus in Makah v. Brown, No. C85-160R/ United States v. Washington, Civil No. 9213 - Phase I, Subproceeding No. 92-1, Order on Five Motions Relating to Treaty Halibut Fishing, at 6-7, (W.D. Wash. Dec. 29, 1993); Midwater Trawlers Co-op. v. Department of Commerce, 282 F.3d 710, 718-719 (9th Cir. 2002).

The treaty right was originally adjudicated with respect to salmon and steelhead. However, it is now recognized as applying to all species of fish and shellfish within the tribes' u&a grounds.[7/] U.S. v. Washington, 873 F.Supp. 1422, 1430, aff'd 157 F. 3d 630, 644-645 (9th Cir. 1998), cert. denied, 119 S.Ct. 1376; Midwater Trawlers Co-op. v. Department of Commerce, 282 F.3d 710, 717 (9th Cir. 2002).

In 1994, the U.S. government formally recognized that the four Washington Coastal Tribes (Makah, Quileute, Hoh, and Quinault) have treaty rights to fish for groundfish, and concluded that, in general terms, the quantification of those rights is 50% of the harvestable surplus of groundfish available in the tribes' u&a grounds. In 1996, NMFS promulgated a "framework rule" on treaty Indian fishing rights to groundfish. This rule is codified at 50 CFR 660.324. The rule establishes procedures for implementing treaty rights, and provides that rights will be implemented either through an allocation of fish that will be managed by the tribes, or through federal regulations that apply specifically to tribal fisheries. Under 50 CFR 660.332(a), tribal allocations are subtracted from the species OY before limited entry and open access allocations are derived.

The tribal allocation of Pacific whiting has been based on a methodology originally proposed by the Makah Tribe in 1998. The methodology is an abundance-based sliding scale that determines the tribal allocation based on the level of the overall U.S. OY, up to a maximum 17.5% tribal harvest ceiling at OY levels below 145,000 mt.

The sliding scale methodology used to determine the treaty Indian share of Pacific whiting is the subject of ongoing litigation. In United States v. Washington, Subproceeding 96-2, the Court held that the methodology is consistent with the Magnuson-Stevens Act, and is the best available scientific method to determine the appropriate allocation of whiting to the tribes. United States v. Washington, 143 F.Supp.2d 1218 (W.D. Wash. 2001). This ruling was reaffirmed in July 2002. Midwater Trawlers Cooperative v. Daley, C96-1808R (W.D. Wash.) (Order Granting Defendants' Motion to Supplement Record, July 17, 2002). Additional briefing will occur in this case. However, at this time NMFS remains under a court order in Subproceeding 96-2 to continue use of the methodology unless the Secretary finds just cause for its alteration or abandonment, the parties agree to a permissible alternative, or further order issues from the court. Therefore, NMFS is obliged to continue to use the methodology unless one of the events identified by the court occurs. Since NMFS finds no reason to change the methodology, it has been used to determine the 2003 tribal whiting allocation.

For some species on which the tribes have a modest harvest, no specific allocation has been determined. Rather than try to reserve specific allocations for the tribes, NMFS establishes trip limits recommended by the tribes and the Council to accommodate modest tribal fisheries.

7/ "The term "fish" as used in the Stevens Treaties encompassed all species of fish, without exclusion and without requiring specific proof (citations omitted)".

1.1.4 Public Involvement

The Council process offers a range of forums for public participation. Council members are meant to represent a range of stakeholders (although some argue that representation is insufficiently diverse). Council advisory bodies involved in groundfish management include the GMT, with representation from state, federal, and tribal fishery scientists; and the GAP, whose members are drawn from the commercial and recreational fishery, processing, and conservation sectors. The Ad Hoc Allocation Committee, a subpanel of the Council, provides advice on allocating harvest opportunity among the various fishery sectors. The GAP reflects the perceptions and opinions of representatives of industry, recreationalists and other constituents on the committee; consensus statements from this body can directly influence Council members' decisions. (Technical bodies, such as the GMT and SSC, similarly promote consensus on scientific issues.) Meetings of these bodies are open to the public, allowing limited participation by nonmembers and, at a minimum, public scrutiny of discussion and decisions. Comments from the public at large, through letters to the Council in advance of meetings and during comment periods at meetings can be collectively influential. The public also has the chance to lobby members of advisory bodies and the Council during meetings, but outside established, formal public comment periods. Once the Council passes on its decisions to NMFS, as recommendations, there are opportunities for the submission of written comments during the rulemaking process. The most visible, and formalized, venues for public participation through commenting are associated with decision-making (either by the Council or NMFS). More complex decision processes (for example, involving multiple stages of review and revision by advisory bodies and the Council) generally afford more opportunity for public comment.

1.1.5 Monitoring and Enforcement

Traditional fishery monitoring techniques include air and surface craft surveillance, declaration requirements, landing inspections, and analysis of catch records and logbooks.

The U.S. Coast Guard and state enforcement entities use ships, helicopters, and fixed wing aircraft to patrol offshore areas, including one large 210-foot Coast Guard cutter, and smaller Coast Guard and state enforcement vessels. Only the aircraft and large cutter are suitable for patrolling the more distant seaward boundaries of the Rockfish Conservation Area. The availability of Coast Guard assets depends on their use in other missions, such as homeland security and search and rescue. State enforcement ability may be affected by budget cutbacks.

State-enforced declaration requirements have been used to increase the efficiency of at-sea patrols and improve enforcement, particularly in areas closed to certain gear types or fishing strategies. Under declaration programs a vessel operator planning to enter a closed area must report his intention to state enforcement authorities beforehand. This requirement is generally reserved for vessels that would otherwise appear to be fishing illegally when seen by an at-sea patrol craft.

The size, irregular configuration and offshore extent of the RCA makes enforcement by air and surface craft more difficult. Therefore, NMFS is requiring all vessels registered to a groundfish limited entry permit to be equipped with a vessel monitoring system (VMS) transmitter, beginning in 2004 (68 FR 62374). VMS, in contrast, allows continuous monitoring of vessels' positions. A unit on the vessel periodically transmits location information via satellite to a processing center on shore. Enforcement officers are then be able to determine if vessels are operating in the RCA and take appropriate action to confirm a potential infraction. VMS must be coupled with declaration systems to distinguish vessels allowed to fish in the RCA and those transiting through it from vessels fishing illegally. In some instances air and/or sea surveillance may be necessary to confirm a vessel's disposition. For these reasons, VMS dramatically enhances, rather than replaces, traditional techniques. However, there are several issues related to the implementation of VMS in a fishery, including the variety of equipment types and associated costs, vessels' ability to carry VMS, VMS operating requirements, VMS vessel coverage, and integration of VMS with traditional enforcement techniques. As part of the process of developing the regulations to implement the West Coast groundfish VMS, NMFS prepared an environmental assessment (EA), which discusses these issues in greater detail (NMFS 2003b).[8/] This document also describes the range of fishery monitoring alternatives considered, and their associated costs and environmental impacts. Who will bear the cost of purchasing, installing and operating VMS transmitters was a significant issue in developing the program. Although the federal government has subsidized some of the costs of other VMS programs (such as for fisheries in Alaska), no such subsidy is currently part of the West Coast groundfish VMS program. In addition to purchase and installation costs, regular transmission charges apply for satellite use. Purchase costs are also a function of the types of VMS units NMFS approves for use. New type-approvals could allow the use of lower cost units. The current list of approved VMS equipment was published in the *Federal Register* on November 17, 2003, and additional equipment may be approved at a later date.

Shoreside recreational and commercial vessel inspections complement declaration programs and at-sea monitoring and enforcement activities by ensuring compliance with landing limits, gear restrictions, and seasonal fishery closures. State agencies are increasingly using dockside sampling to assess groundfish catch in recreational fisheries, which when combined with state and federal enforcement patrols at boat launches and marinas, ensures compliance with bag limits and fishery closures. Commercial landings are routinely checked when landed or delivered to buying stations or processing plants; they also can be tracked through fishticket and logbook records.

1.2 Key Management Issues

1.2.1 Considering Short-term Costs versus Long-term Risk in Setting OYs

Short-term uses generally affect the present quality of life for the public, in contrast to long-term productivity, which affects the quality of life for future generations, based on environmental sustainability. This tradeoff is perhaps the most important consideration governing the management of renewable resources, such as fish. At any given time, the current set of management measures indirectly affects the sustainability of marine resources by constraining fishing mortality to levels that are thought to be sustainable. This represents a tradeoff between short-term benefits, reflected in revenue generated from fishing in the present, and long-term productivity of fish stocks, which determines the abundance of fish in the future, and thus future harvests. Within the management framework, the limits of this tradeoff are established by the concept of overfishing. In simple terms, overfishing describes a situation where current harvest levels, if continued, will result in a decline in the size of the stock from the biomass thought to produced MSY, and thus the size of future yields. However, managers must also respond to changes in resource status resulting from environmental factors, which may be unpredictable. Shifts in the North Pacific ocean regime, which affect biological productivity, have been discovered relatively recently (Hare and Mantua 2000). Setting harvest levels based on stock performance in the past, without an appreciation of the effect of these conditions, may have contributed to past overfishing of groundfish. A better understanding of the role of environmental and ecological factors

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[8/] This document, the final rule, and a list of approved equipment, can be found at the website of NMFS Northwest Region Sustainable Fisheries Division (www.nwr.noaa.gov/1sustfsh/groundfish/VMS/index.html). Additional information at the site, specifically for vessel owners, includes a guide for complying with the VMS program, instructions for installation and activation of transmitting units, and worksheets to help users navigate an automated phone declaration system.

play in affecting stock productivity would enhance managers' ability to predict future stock response to current harvest levels.

If fishery managers had perfect information about the size and status of a fish stock, setting current harvest levels to ensure MSY on a continuing basis would be comparatively easy.[9/] However, marine fish are widely dispersed in an inaccessible environment, making it difficult to sample and monitor their populations. Furthermore, accurately monitoring total fishing mortality (that is, both the landed component of the catch and fish caught be the gear but not landed—primarily at-sea discards) is expensive and procedurally complex. The diversity of both the fisheries and species involved makes catch monitoring in West Coast groundfish fisheries especially difficult. For these reasons, the long-term environmental consequences current management measures is often subject uncertainty. Walters (1986) classifies uncertainty in three broad categories; Mace and Sissenwine (2002) identify an additional two management-related sources of uncertainty. These five sources of uncertainty are:

- Natural variation in the environment, including that caused by other, non-fishing human activities. Natural variability in recruitment is probably the most germane factor for estimating sustainable yields.

- Observation errors, including measurement error—an inaccurate temperature reading for example—and sampling error, or the difference between the distribution of values in a set of measurements and the actual frequency and range of values in the population or phenomenon being measured.

- Model mis-specification, or the accuracy of abstract representations of reality (models) in terms of causal relationships and system dynamics.

- Translation of scientific advice into management measures. Scientists may express uncertainty by bracketing a value with a range or confidence interval. Managers may be tempted to choose a value at the high end of the range if there is no more specific information about the risk (versus short-term benefit) of such an action.

- Imperfect implementation of management measures. The most common implementation error stems from inaccurate monitoring of the fishery. If fishing mortality is not accurately measured on a reasonably "real time" basis total catch may exceed the harvest specification.

Groundfish management (like many other management regimes) is subject to these sources of uncertainty:

- Regime shifts, or meso-scale climate variability influences stock productivity.

- Fishing and non-fishing impacts to habitat may be demonstrably damaging, but currently it is not possible to quantify the effect on stock productivity or precisely specify the relationship between habitat impacts and productivity. The effect of changes in trophic structure is also uncertain.

9/ Traditionally, MSY has been viewed as an OY or target harvest level; but the precautionary approach and National Standards Guidelines treat MSY as a limit rather than a target. Therefore, harvest levels for populations below MSY must be adjusted downward to allow rebuilding to the MSY biomass. Further, although fishery managers view MSY dynamically by specifying fishing mortality rates (versus constant catch), population productivity (recruitment) can vary due to environmental factors such as regime shifts. Over the long term these environmental factors need to be accounted for or the population size can move away from the MSY level. Finally, even if the biological system were perfectly specified, society may value resources in complex ways, by attaching non-consumptive value to some proportion of the resource, for example.

- Observation error comes into play in all cases where fishery-dependent and independent data are gathered. Measurement error is common to much fishery-dependent data; bycatch estimates represent one crucial source of error of this type. Although measurement error is more easily reduced in survey work, sampling error is almost always present. For example, random stratified assignment of fishery observers allows partial coverage to be representative of what occurs in a fishery as a whole, but some, albeit quantifiable, level of uncertainty exists.

- Model error is unavoidable and not always transparent. Careful review of stock assessments by a range of experts and interested parties may reduce risk (even if sources of uncertainty are not formally addressed) through a shared understanding about the state of nature being modeled and described.

- Mistranslation and misapplication in the management process are ongoing issues. Mistranslation—the choice of "over-optimistic" harvest levels, for example—are reduced somewhat through the procedures such as the rebuilding analyses now used to determine harvest specifications for overfished species. In contrast to a point estimate bounded by a confidence interval, a rebuilding analysis can specify the risk for any value within a range (see Section 1.1.2, above). Misapplication is still a major problem, one that overlaps with observation error. Timely and accurate estimates of recreational catches are currently a major challenge to effective inseason management. Since bocaccio were declared overfished, for example, actual catches have sometimes exceeded harvest specifications, largely for this reason.

Bayesian statistics are another way to deal with scientific uncertainty; the methods have been gaining popularity in natural resource management arena recently. A recent Pacific ocean perch stock assessment (Hamel *et al.* 2003) and an analytical framework being developed in support of the Pacific Coast Groundfish essential fish habitat (EFH) EIS (MRAG Americas Inc. and TerraLogic GIS Inc. 2003) use Bayesian methods.

Greater uncertainty about the outcome of a particular action or event generally increases the level of risk, depending on how many possible outcomes would be undesirable. Risk analysis evaluates the likelihood that a given action will produce an undesirable outcome, often using statistical methods to specify the probability of certain outcomes. The rebuilding analyses that underlie the range of harvest specifications for overfished species use these methods to compute the probability of a population rebuilding to B_{MSY} within the specified time period if a given level of harvest is allowed. This is a form of risk analysis; the residual probability value expresses the risk of the population not reaching B_{MSY}. But the rebuilding analyses only evaluate recruitment variability, one component of the many sources of uncertainty about future stock performance. These analyses do, however, present managers with a more explicit measure of risk on which to base their decisions.

Uncertainty and risk are also translatable into socioeconomic impacts, an issue not explored by Mace and Sissenwine. Very broadly, mis-specification of harvest levels involves the assumption of either short-term or long-term risk. Short-term risk accords with under-harvest, if harvests are set below a level that is both sustainable in the long term and below some social optimum (representing a mix of consumptive market and non-consumptive, non-market values). Long-term risk is usually expressed as the potential of over-harvest compromising future returns from the fishery; it involves the tradeoff of short-term benefit (harvests now) against long-term gain (potentially higher harvests in the future). This returns us to the central issue introduced here. To a large degree the management process implicitly plays off these two types of risk. However, current analytical capability precludes effective quantification of the tradeoff.

1.2.2 Rebuilding Overfished Species as a Constraint on Harvests of Other Stocks

Although different West Coast groundfish fisheries may be distinguished by the species they nominally target, a wider range of species is likely caught in any one haul, set, or trip. Although some of these species may be desirable (in terms of marketability), multi-species catches are equally a function of the selectivity of the gear—or lack thereof—and the diversity of the fish stocks occurring in the habitat being fished. For these reasons some incidental catch is unavoidable, and for either economic or regulatory reasons some of the catch is discarded, becoming what the Magnuson-Stevens Fishery Conservation and Management Act (MSA) defines as bycatch. Managing multi-species or "mixed-stock" fisheries can be difficult in the best of circumstances because it is essentially impossible to optimize harvests—achieve MSY—for all stocks caught in these fisheries. MSY harvest of one stock may result in under-harvest or over-harvest of another stock. Under-harvest is less of a concern from a biological management standpoint; if the fish are marketable it represents and economic impact in terms of forgone revenues. Over-harvest of a co-occurring species is of much greater concern. This problem has become acute with the declaration of nine West Coast groundfish fishery management unit (FMU) species as overfished.[10/] Harvest levels for overfished species must be reduced substantially in order to allow them to recover to a target biomass capable of supporting MSY. Fisheries must then be managed based on the constraint imposed by low harvest levels. Thus, even if one of these species is not the target in a particular fishery, they may be caught incidentally. Since groundfish fisheries are generally not managed directly, by means of species-specific quotas for example, limits have to be imposed on the harvest of healthy stocks. The number of overfished species and their occurrence in different areas and habitats means that virtually all groundfish fisheries have to be managed in ways that constrain the harvest of other healthy stocks. For this reason, overfished species are sometimes referred to as "constraining stocks." A forthcoming paper (Hilborn *et al.* in press), in which the authors modeled different approaches to managing West Coast groundfish fisheries, found that managing fisheries to prevent overfishing on any stock (termed "weak stock management") is likely to require forgoing substantial potential harvests—perhaps by as much as 90%—to prevent overfishing of any of the 12 stocks they evaluated. The authors restricted the evaluation to 12 species based on the availability of stock assessments; "had assessments been available for all 83 species included in the Groundfish Fishery Management Plan, at least one would be classified overfished each year, either due to natural variation or stock assessment error." Technological solutions, if available, could improve the terms of this tradeoff between preventing overfishing and maximizing socioeconomic benefits. For example, more selective gear or fishing practices—by avoiding overfished species while catching healthy stocks—would allow higher harvests. The Groundfish Conservation Areas (primarily the RCA, see Section 1.1.2.2) are a management response along these lines. They allow higher cumulative trip limits while preventing fishing in depth ranges were incidental catch of overfished species is most likely to occur. They thus force a change in fishing behavior intended to change the "selectivity"—or more accurately, the catch rates—of overfished species.

National Standard Guidelines, pursuant to the MSA, applicable to rebuilding overfished stocks (50 CFR 600.310), identify a "mixed stock exception" to the requirement to rebuild an overfished stock to its target biomass (50 CFR 600.310(d)(6)). This exception allows overfishing of one stock in a mixed-stock complex to continue is there is a demonstrable long-term net benefit to the nation in doing so. The Council considered applying this exception when evaluating rebuilding plan alternatives for canary rockfish, but chose not to invoke it (PFMC 2003a).

[10/] Pursuant to the MSA, the Secretary of Commerce declares a species overfished when stock biomass has fallen below a minimum stock size threshold defined in the management framework. The nine overfished groundfish species are bocaccio (*Sabastes paucispinis*), canary rockfish (*S. pinniger*), cowcod (*S. levis*), darkblotched rockfish (*S. crameri*), Pacific ocean perch (*S. alutus*), widow rockfish (*S. entomelas*), yelloweye rockfish (*S. rebuerimus*), lingcod (*Ophiodon elongatus*), and Pacific whiting (*Merluccius productus*). However, the most recent Pacific whiting stock assessment reveals that this species is not currently overfished and may never have been overfished. Its overfished status was due to error in a previous assessment.

1.2.3 Minimizing Bycatch

As noted above, bycatch refers to species, which, although caught, are not landed and/or marketed. More specifically, the MSA defines bycatch as “fish which are harvested in a fishery, but which are not sold or kept for personal use, and includes economic and regulatory discards” but excludes fish released alive in a recreational catch and release program. As implied by the definition, fish may be discarded for economic reasons—the costs of landing the fish exceed revenue earned by their sale—or regulatory constraints—such as prohibitions on retaining or landing a particular species, or landing more than a specified amount of a species. National Standard 9 in the MSA establishes requirements to minimize bycatch and bycatch mortality, and to accurately monitor fishing mortality resulting from bycatch.

In West Coast groundfish fisheries bycatch management is closely related to the overfished species issue. All of the currently overfished species are marketable; bycatch mainly results from regulatory discards. For the past few years cumulative trip limits for these species have been set very low, or retention may be entirely prohibited for all or part of the year. Fishing vessels may exceed the cumulative limit for one of these species before they have reached the limit for species they are targeting. They may continue to fish, but discard catch of species for which they have exceeded the cumulative limit, since the trip limits are based on landings, not actual catch.

Once bycatch becomes a large fraction of total fishing mortality for a given species, accurate monitoring of these discards becomes essential for effective management. In the absence of a full accounting of discards, managers have attempted to estimate bycatch. Assumed or estimated bycatch rates are an essential component in predicting total fishing mortality and have been a source of contention in the management process. Historically, NMFS and the Council applied an estimated discard rate to a given species’ optimum yield (OY, equivalent to the total allowable catch) to derive a landed catch OY. Starting with the development of harvest specifications and management measures for the 2002 fishing year, NMFS and the Council have been using a more sophisticated modeling approach to estimate bycatch. This tool produces estimates of total fishing mortality based on the landed catch likely to result from a given set of trip limits (Hastie 2001; Hastie 2003; Hastie [2003]). Initially, the bycatch rates used in the model were derived from previous studies and monitoring projects. As part of the 2002 harvest specifications process, the Council considered different bycatch rates that could be reasonably presumed from the available data and chose a mix of rates for different stocks and fishing strategies (PFMC 2001). To date this model has only been used to estimate bycatch in the limited entry trawl sector. (Section 6 describes the different groundfish fishery sectors.)

NMFS has also implemented the West Coast Groundfish Observer Program, beginning in August 2001, specifically to more accurately estimate bycatch (NMFS 2003e). This program covers a fraction of groundfish vessels at any given time, but is designed to produce a statistically representative sample of fleet behavior and bycatch activity. As with the bycatch estimation model, the observer program initially covered only the limited entry trawl sector, because these vessels account for the bulk of groundfish landings. After a full year of data from the observer program had been collected and processed it was made available for management, in early 2003. The Council directed NMFS to incorporate bycatch rates derived from observer data into the trawl model, beginning inseason in 2003 and thereafter. Observer-derived bycatch rates were deemed more accurate and current than the rates then in use. The observer program was subsequently expanded to other sectors and data on the fixed gear sector was released in early 2004. Using these data, the bycatch model will be updated and expanded so that estimates of total fishing mortality can be made for both trawl and fixed gear fisheries.

1.2.4 License Limitation, Capacity Reduction, and Fleet Rationalization

Marine fish are "common pool" resources with access and use stemming from the public trust doctrine. It is difficult to exclude people from using a common pool resource, because of the physical characteristics of these resources (Ostrom 1990). Fish are a relatively mobile, "fugitive" resource, making it impossible for any one individual to precisely know their location or control their distribution. A fish stock is also "subtractable," meaning that exploitation by any one person diminishes the total amount available to others. Under the common law public trust doctrine, resources in ocean areas under U.S. jurisdiction are believed to be held in trust by government to satisfy a broadly-defined public interest (Committee to Review Individual Fishing Quotas 1999). This doctrine also makes a legally defensible exclusive property right to fishery resources difficult or impossible (at least before fish are harvested).

These resource characteristics underlie another key management issue, variously described as "the race for fish" or "the tragedy of the commons"—this second phrase derived from the title of a seminal work on the subject (Hardin 1968). In a resource regime where no individuals or groups have a defensible right to exclude others from access to the resource, the incremental benefit to any one user outweighs the collective decline in benefits from the resource. Hardin used the village commons as an analogy. As farmers graze more livestock, the amount of grass available per head declines, as does the rate of growth of each cow. Each farmer will continue pasturing more livestock on the commons, however, as long as the weight gain in his cattle outweighs what he could realize from pasturing elsewhere even if better growth rates could be obtained with fewer cattle overall on the commons. The race for fish expresses this same concept in a different resource context. Put simply, no fisherman will voluntarily limit harvest knowing that some other fisherman will step in and take any forgone harvest. More abstractly, in such resource regimes there is a tendency for the number of users to increase until an equilibrium is reached. At this "open access" equilibrium, none of the participants are making an economic profit–defined as the total revenue net of opportunity cost. Put another way, economic rent, resulting from an exclusive right to some economic good, is dissipated. Although this equilibrium may coincide with any point on the surplus yield curve for a renewable resource, depending on the variable costs incurred by the user and the characteristics of the resource, typically it occurs at some yield on the low biomass limb of the yield curve.

Resources regimes where there is no mechanism for excluding users are usually termed open access. Public resources do not necessarily fall into this category because the government can establish measures to limit the number of people allowed to exploit the resource. License limitation programs serve this function. Groundfish FMP Amendment 6, adopted in 1992, established a "limited entry" program for certain sectors of the fishery. The amendment responded to concerns about declining harvests, excess harvest capacity, the potential for still more vessels to harvest groundfish if target stocks in other fisheries declined, and increasing complexity of regulations if no limited entry program were implemented. Events in the subsequent 14 years suggest that it failed in its overall goal of improving the stability and economic viability of all groundfish fisheries and was modestly effective in limiting capacity, if not reducing it. The efficacy of limited entry programs is usually compromised—as in the groundfish case—because they are implemented when there is already overcapacity in the subject fisheries and excluding any active participant when the program is implemented is politically too difficult. As a result, over capacity may be institutionalized; even if some vessels stop fishing because of declining yields, they may persist as "latent capacity" poised to re-enter the fishery when conditions improve. Groundfish limited entry has been further confounded because of continued declines in certain key stocks and the declaration of overfished stocks.

Furthermore, the limited entry program applies only to certain gear types when used to catch groundfish (trawl, longline, and fishpot), although these sectors represented the vast majority of groundfish landings at the time of implementation. This was necessary because there are a wide range of fisheries that catch groundfish incidentally while targeting other stocks, which need to be exempted from the license limitation requirement. (In fact, many of these so-called “open access” vessels possess limited entry permits for the target fisheries they participate in, such as Oregon shrimp trawl and salmon troll vessels.) In addition, a small fleet of vessels targeting groundfish remained outside the program at its inception. These were fixed gear vessels that had made relatively modest groundfish landings. More recently, new participants in the open access sector have been targeting groundfish with unconventional gear types. The so-called live fish fishery in the California coastal zone is notable in this regard. (Section 6.1.3 describes this fishery.) This open access sector is managed separately under its own set of management measures and based on the *de facto* allocation of harvest opportunity between sectors (for species without fixed allocations). Although the open access sector continues to represent a relatively small fraction of total groundfish landings, it represents a capacity pool competing for what has been, until very recently at least, a shrinking pie because of constraints imposed by overfished species and declining yields of other target stocks.

Amendment 9 to the FMP, implemented in 1997, added a further refinement to the limited entry program, establishing additional limits on the economically valuable fixed gear sablefish fishery. It requires vessels with a fixed gear limited entry permit to possess an additional endorsement to participate in the primary fixed gear sablefish fishery (April 1 to October 31). Amendment 14, implemented in 2001, establishes a fairly complicated system to reduce capacity in this fishery by establishing a “permit stacking” system. This allows a vessel owner with a sablefish-endorsed fixed gear permit to acquire up to two additional permits and use them in combination on one vessel. Based on the catch history of the vessels originally fishing under the permits, the vessel with the stacked permits is assigned to one of three tiers, each tier having a different landing limit. Once assigned to a tier, the vessel is eligible for the landing limit associated with that tier for each permit assigned to the vessel. Thus, a vessel with three permits would be eligible to land up to three times as much fish as another vessel in the same tier possessing only one permit. As of 2002, 83 of the approximately 164 sablefish-endorsed permits were registered to vessels holding more than one permit. Of the vessels with multiple sablefish-endorsed permits, 25 had two permits and 11 had three permits (PFMC 2003b). In terms of capacity reduction, the main effect is to remove fishing opportunity in other limited entry fixed gear fisheries that these permits confer (since once stacked, they only confer elegibility in the primary sablefish season). Vessels surrendering permits may shift to other non-permit-limited fisheries, if a viable opportunity exists. In addition to possible capacity reductions, the endorsement and permit stacking regime has also eliminated the characteristics of a “derby fishery” that plagued this fishery. Derby fisheries result when excess capacity combines with catch or landing limits so that fishing is concentrated in a very short fishing season, established to indirectly limit harvests. By 1995 the primary sablefish season was only a week long. (This was followed by a landing-limit-managed “mop up” period to allow harvests to reach the established limit or allocation.) Permit stacking essentially gives each vessel a fixed quota, which can be caught at any time during the six-month primary season. Although not a freely tradable quota, the stacking mechanism does allow harvest opportunity to be more efficiently allocated among permit holders through permit purchases. The seller also captures some economic rent in the sales price of the permit.

Similar capacity reduction and efficiency gains have not been realized in the trawl sector. A strategic planning effort by the Council recognized excess capacity as an ongoing problem (Ad-Hoc Pacific Groundfish Fishery Strategic Plan Development Committee 2000), sparking an initiative to purchase and retire trawl vessels and associated limited entry permits. This effort came to fruition in 2003 when Congress appropriated $10 million dollars to help underwrite purchases and authorized the federal government to provide an additional $36 million 30-year loan, to be repaid by remaining fishery participants. Repayment will occur through fees levied on landings. Because of this structure, the program required approval through a referendum by permit holders. With its passage, 92 trawl vessels and 240 associated permits (including those for other, state-managed fisheries for Dungeness crab and pink shrimp fisheries) were retired late in 2003 (68 FR 62435). The program stipulates that retired vessels cannot be used for fishing anywhere (not just in West Coast groundfish fisheries) to prevent shifting of this capacity into other fisheries.

Limiting participation in fisheries, even if accompanied by some form of capacity reduction, only goes part way towards achieving greater economic efficiency in the use of common pool resources.[11/] As outlined above in the description of the permit stacking regime in the fixed gear sablefish fishery, assigning a fixed harvest opportunity, or quota, to a vessel can increase efficiency because this guarantee allows individual fishermen to harvest fish in the most economical way, rather than in response to controls—essentially induced inefficiencies—established in the regulatory regime. The next step is to make individually held quota tradable. Once scientists have determined the total allowable catch (or optimum yield) for the fishing season, fractions of this potential catch are allocated among fishery participants through market-like mechanisms. This further promotes efficiency because it allows more technically efficient, or lower cost, producers to accumulate additional quota. As noted above, the seller also realizes some economic rent, reflecting the economic profit associated with the right to a fixed and scarce resource. An individual tradable quota regime also allows producers to align inputs (harvest potential) with costs and market conditions. (The term individual fishing quota, or IFQ, seems to have greater currency in descriptions of these regimes.) The sablefish permit stacking regime has a tradable element through the opportunity to purchase permits, which then confer a set amount of harvest opportunity. However, the input units are fairly "lumpy"; there is no provision to finely divide both the amount and timing of quota purchases. An IFQ regime, in contrast, puts fewer restrictions on the specifics of quota transfer. (For a comprehensive treatment of IFQs, see Committee to Review Individual Fishing Quotas (1999)). IFQs have been controversial, however, largely because of equity concerns. More efficient producers (which are often larger firms) may buy up available quota, raising concerns that small-scale fishermen will be "squeezed out," although they should be fully compensated through the sale of quota.[12/] Fish processors have also raised concerns about market power and wealth shifting to producers, who would have greater control over inputs—fish—purchased by processors. And economists have found some empirical evidence supporting these claims (Matulich 1996; Matulich and Clark 2003). In response to these concerns, Congress enacted a prohibition on implementing IFQ programs. This ban expired in 2002, which has renewed interest in this approach on the West Coast.

Now that a substantial amount of capacity has been wrung out of the limited entry trawl sector, there is increasing interest in implementing an IFQ program for this sector. In September 2003, the Council established a Groundfish Trawl Individual Quota Committee to explore how such a program could be structured and implemented. The Committee held its first meeting in October 2003. With the availability of additional funding, the Council expects to move forward on the FMP and regulatory amendment processes necessary to implement an IFQ program. Because of its complexity and the contentious issues surrounding IFQs, this is likely to be a long process; if a such a management regime is implemented, it would be in several years.

1.2.5 The Effect of Management on Vessel Safety

National Standard 10 in the Magnuson-Stevens Act calls for conservation and management measures to promote the safety of human life at sea to the extent practicable. Nevertheless, commercial fishing consistently ranks as one of the most hazardous occupations in the United States. Commercial fishing is inherently dangerous; however, repeated efforts to increase marine safety regulation and compliance have failed. While recreational fishing vessels also encounter safety risks, their risks are considerably different

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[11/] Capacity reduction can also include limiting the fishing power or technical efficiency of fishing vessels. Even if the number of permits is limited, fishermen may respond by increasing the fishing capacity of the permitted vessel (by using a larger vessel, for example) so that there is no actual net reduction in fishing capacity. The limited entry program addresses this issue with vessel length permit endorsements. However, other technical improvements that increase harvesting efficiency or capacity are not restricted.

[12/] In theory at least, the sales price should be a function of the market's assessment of the net present value of the stream of future profits resulting from fishing the quota share.

than those encountered by commercial vessels. Recreational vessel safety is discussed at the end of this section.

1.2.5.1 Commercial Vessel Safety

The 1999 report of the U.S. Coast Guard's Fishing Vessel Casualty Task Force (FVCTF), *Living to Fish, Dying to Fish* (FVCTF 1999) describes attempts to legislate safety in the commercial fishing industry. It describes casualty characteristics and presents recommendations for improving safety in the fishing industry. The report notes that much opposition to more stringent safety requirements has come from the fishing industry itself, both for cultural and economic reasons.

The Commercial Fishing Industry Vessel Safety Act of 1988 was one of the first successful attempts to legislate safety in the commercial fishing industry. The Act led to a set of regulations and a voluntary inspection program for commercial fishing vessels. While safety has improved since the Act went into effect, the Coast Guard report notes that "the level of fishing safety standards is analogous to *requiring* parachutes for an airplane crew, but only *marketing* voluntary measures to *encourage* a mechanically sound aircraft and a competent pilot and crew" (page 1). At present, certain safety gear such as EPIRBs (emergency position indicating radio beacons), radios, survival suits, fire protection equipment, life preservers, and life rafts are required on board commercial fishing vessels (requirements vary by the size and range of the vessel). Past efforts to implement safety regulations have attempted to address stability and seaworthiness, construction, licensing of skippers and crew, safety training, flooding detection, dewatering systems, prohibition of alcohol and drug use when engaged in commercial fishing operations, and related matters. These requirements have yet to be enacted. Currently, dockside safety inspections are strictly voluntary. (Different rules apply to recreational and charter boats. Regulations for charter boats vary depending on the size of the boat and where the boat is used.)

The Coast Guard reports that unsafe conditions on commercial fishing vessels are not exclusively created by mariners themselves. Systemic failures, such as regulations, pressure applied by owners, managers, and insurance companies, and larger market forces all contribute to the safety problems in the industry.

The Coast Guard report lists four solutions to the safety problem. These are *seaworthy boats, adequate survival gear, competent crews*, and *safety-conscious resource and industry management regimes*. This section provides a brief overview of the current state of these four areas and discusses other factors that affect safety.

Seaworthy Boats: Poor vessel or equipment condition is a primary cause of fishing casualties. Equipment may be used beyond its intended service life, used in ways that were not originally intended, poorly designed, or improperly installed. Even in the best of times, many boat owners put off needed replacements, maintenance, and repairs. This neglect arises from personal beliefs and values, economic reasons, lack of regulation, a culture that de-emphasizes safety concerns, and other factors. The Coast Guard report notes that "many fishers have strongly opposed standards that might save their own lives" (FVCTF 1999, page 1). This tendency to put off maintenance has been exacerbated during the past several years, as fishing regulations have grown increasingly stringent, and revenues have declined. Many commercial fishers have put off maintenance, hoping for better times.

Adequate Survival Gear: As noted above, the Coast Guard requires commercial fishing vessels to have certain survival equipment, such as EPIRBs, life rafts, and survival suits. This equipment is expensive and requires regular upkeep and inspection in order to function properly. For example, EPIRBs must be tested and registered, registration must be kept current, and batteries must be replaced. Life rafts must be inspected and repacked every year (after the first two years) at a cost of approximately \$600 to \$750 (Markle 2000).

Immersion suits cost nearly $500.[16] They must also be inspected and tested regularly; batteries for the attached lights must be renewed periodically. Alarm systems must be tested and maintained. Many accidents have been caused by people neglecting these inspections or using equipment improperly. Finally, crew must know how to properly use and maintain these different types of safety equipment.

Competent Crews: As revenues in the fishing industry decline, vessel owners and captains report it has become more difficult to find, hire, and keep qualified crew. While there are many skilled and capable crew members working on West Coast commercial fishing boats, many who once would have been attracted to the industry are discouraged by increasing regulations and by the apparent lack of a promising future. Conversely, the industry attracts people who are unable to find work elsewhere, and who lack the requisite skills and training. Some are itinerant, and do not stay long enough to be fully trained or invested in vessel operations—including safety (Gilden and Conway 2000). The Coast Guard report (FVCTF 1999) notes that inadequate training to respond to emergencies or use survival gear, lack of awareness of stability issues, and ignoring stability issues contributed to several recent marine accidents. Unskilled or untrained skippers and crew can also cause accidents by loading vessels improperly or modifying vessels, creating unsafe conditions.

At present, there are no specific licensing requirements for captains or crew of commercial fishing vessels under 200 gross tons—the vast majority of domestic fishing vessels. “John Doe” crew licenses also make it impossible to track or contact crew members, which increases the difficulty of conducting outreach and education campaigns.

Even the most skilled crew can be affected by fatigue and lack of sleep. Fisheries management measures that require captains to drive long distances or compete in “derby” fisheries can lead to levels of fatigue that compromise safety. An analysis of marine vessel casualties by the National Transportation Safety Board cites fatigue as a cause in 16% of accidents (NTSB 1999).

Lastly, because many safety measures are currently voluntary, “competence” must include a willingness to be educated and comply with these measures.

Safety-conscious Resource and Industry Management Regimes: Management decisions can have a strong impact on safety. For example, measures that increase competition or restrict people to limited seasons and catch quotas can force people to venture out in extreme weather or take other undue risks. Intense harvesting effort concentrated in limited areas can cause safety problems by increasing the chance of collisions. Management measures such as inshore closures can force boats into areas where they are unsafe or far from assistance.

Other Factors Affecting Safety: On the West Coast as elsewhere, weather and ocean conditions pose a significant safety risk to fishing operations—both commercial and recreational. Groundfish vessels mainly operate from coastal ports that have potentially hazardous bar crossings, and fishing grounds are in ocean waters primarily three miles to 50 miles offshore. Wind and sea state conditions can be dangerous and bar conditions extremely hazardous. Numerous marine advisories are issued by the National Weather Service each year. While icing, hurricanes, and other extreme weather conditions are rarely factors off the West Coast, water temperatures are low enough to quickly cause hypothermia when people who are not wearing survival suits fall overboard or have a boat sink under them.

The Coast Guard’s “Rescue 21" system is expected to improve the safety of marine vessels. This system, which has yet to go into effect on the West Coast, will serve as a “911" system for coastal waters. By increasing detection and localization of distress calls and eliminating known VHF radio coverage gaps, it will

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16/ Stearns Immersion Suit with Harness, $490.99 at MARSARS Water Rescue Systems, Inc.

minimize the time search and rescue teams spend looking for people in distress. This system will be implemented first in the Northeast, then nationwide. Among other things, it increases channel capacity and uses Global Positioning System (GPS) technology to help locate distressed vessels.

1.2.5.2 Recreational Vessel Safety

The rate of recreational boating fatalities has been decreasing during the past ten years. Nevertheless, 519 recreational boaters drowned in the United States in 2000, and the Coast Guard estimates that half would have survived had they been wearing life jackets. The Coast Guard also reports that nearly one-third of these fatalities involved alcohol. Because of its long coastline, large population, warmer weather, and popular recreational fisheries, California had a higher number of recreational vessel accidents in 2000 than Oregon or Washington. That year, boaters off California experienced 900 accidents and 49 fatalities. Of the accidents, 338 were caused by collisions with other vessels. Off Oregon, the statistics were 97 accidents and 14 fatalities, and in Washington, 131 accidents and 22 fatalities (FVCTF 2001).

Recreational and charter vessels face some of the same safety risks as commercial vessels. However, recreational vessels do not face the same risks associated with the use of heavy equipment, and they tend to operate in better weather and stay closer to shore. At the same time, the operators of private recreational boats have widely varying levels of ability and are often less familiar with currents, tides, hidden obstacles, and other safety risks than professional charter captains or commercial captains. Operating close to shore creates a new set of safety risks associated with groundings and obstacles.

Fewer safety regulations pertain to small recreational boats than to commercial or charter vessels. Some states apply additional regulations to recreational boats operating within the three-mile limit. Regulations for charter vessels tend to be more stringent than for either recreational or commercial vessels; generally, the more passengers a vessel can carry and the farther it goes out to sea, the more stringent the regulations become. Unlike the other vessel categories, charter operators must be tested and licensed.

TABLE 1-1. Stock assessments over the last 10 years, year based on publication in SAFE. (Page 1 of 1)

	First Assessed (before 1994)	1994	1995	1996	1997	1998	1999	2000	2001	2002	2003	2004
Arrowtooth Flounder	1993											
Bank Rockfish		X*						X				
Black Rockfish	1993						X				X	
Blackgill Rockfish						X*						
Bocaccio	1990			X			X			X	X	
Cabezon												X*
Canary Rockfish	1984	X		X			X			X		
Chilipepper Rockfish	1992					X						
Cowcod							X*					
Darkblotched Rockfish				X*				X		X	X**	
Dover Sole	1984	X	X		X			X				
Lingcod	1986	X			X		X	X				X
Pacific Ocean Perch	1972		X					X		X	X	
Pacific Whiting	1982	X	X	X	X			X**		X		X
Petrale Sole	1984						X					
Remaining Rockfish-Sebastes				X*								
Sablefish	1984	X			X	X			X	X**		
Splitnose Rockfish		X*										
Thornyheads (2 spp.)		X			X							
Thornyhead-Shortspine	1990					X			X			
Widow Rockfish	1989	X**			X			X			X	
Yelloweye Rockfish									X*		X	
Yellowtail Rockfish	1980			X	X			X			X	

* First assessment (1994-2004)

** Assessment update

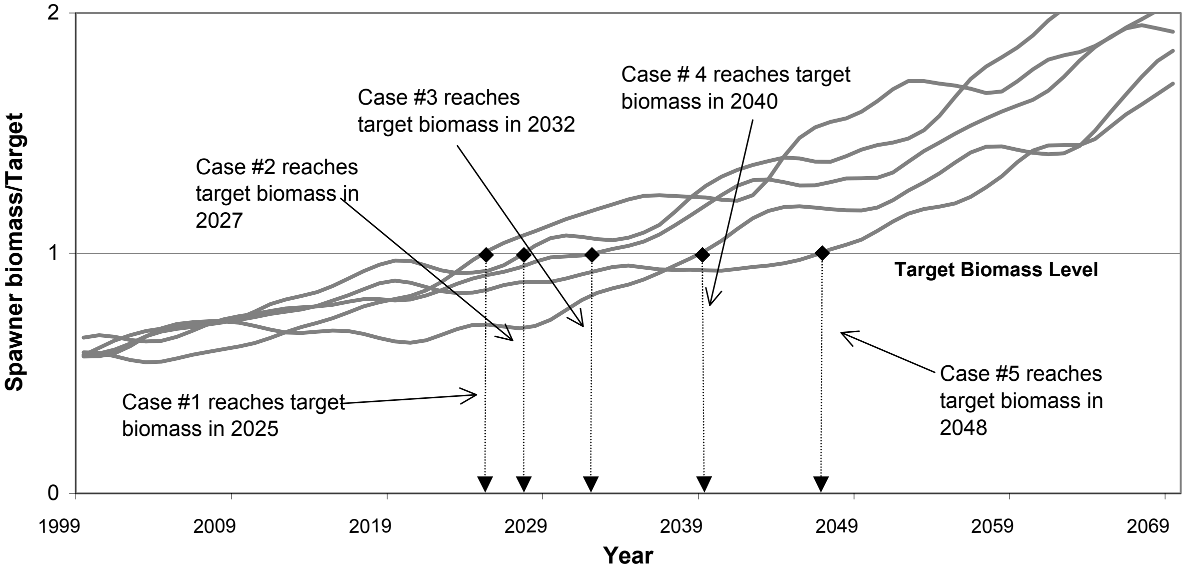


FIGURE 1-1. Example of five cases from a Monte Carlo simulation.

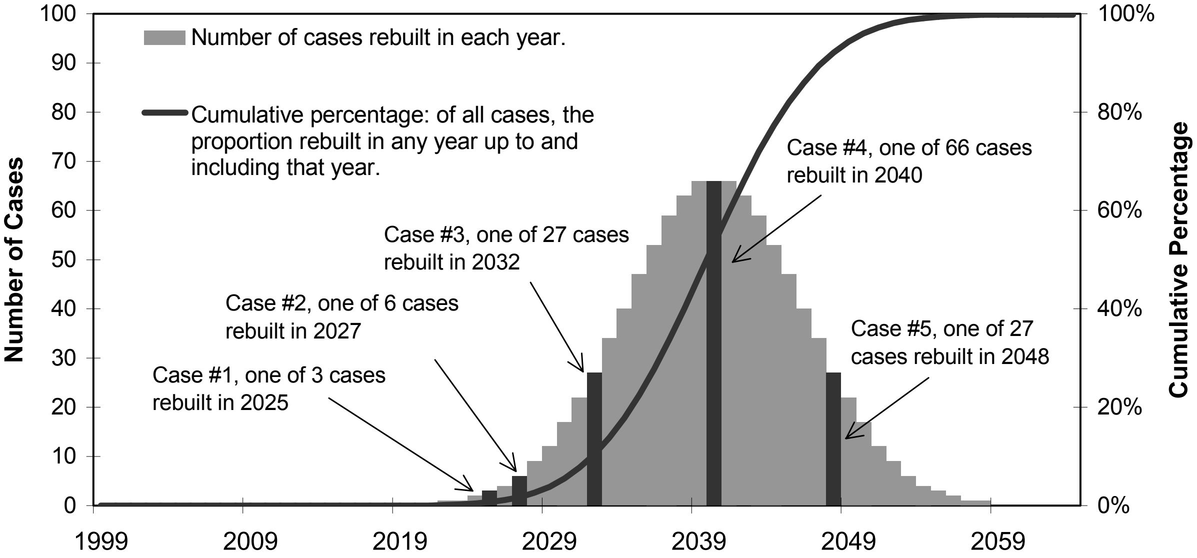
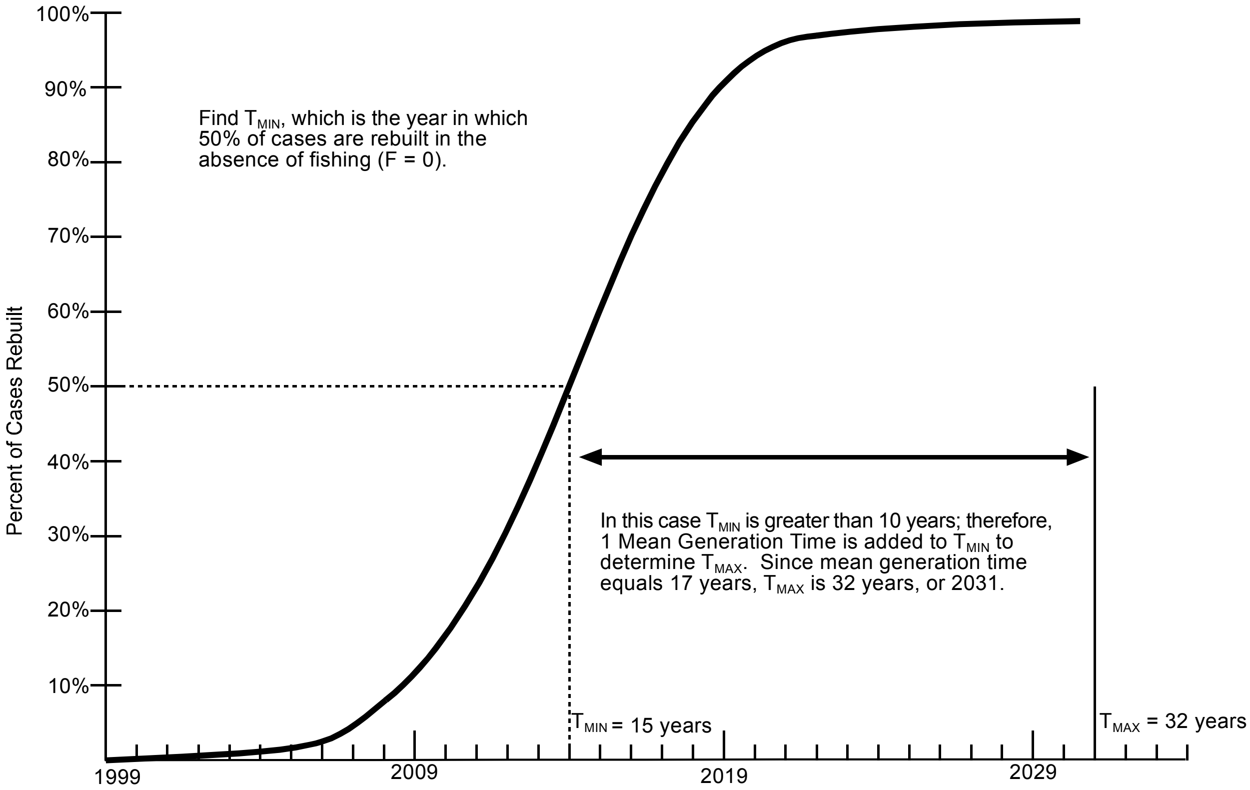


FIGURE 1-2. How cumulative probability is calculated in a Monte Carlo simulation.


Find T_{MIN}, which is the year in which 50% of cases are rebuilt in the absence of fishing (F = 0).

In this case T_{MIN} is greater than 10 years; therefore, 1 Mean Generation Time is added to T_{MIN} to determine T_{MAX}. Since mean generation time equals 17 years, T_{MAX} is 32 years, or 2031.

FIGURE 1-3. Calculation of the minimum rebuilding time, T_{MIN}.

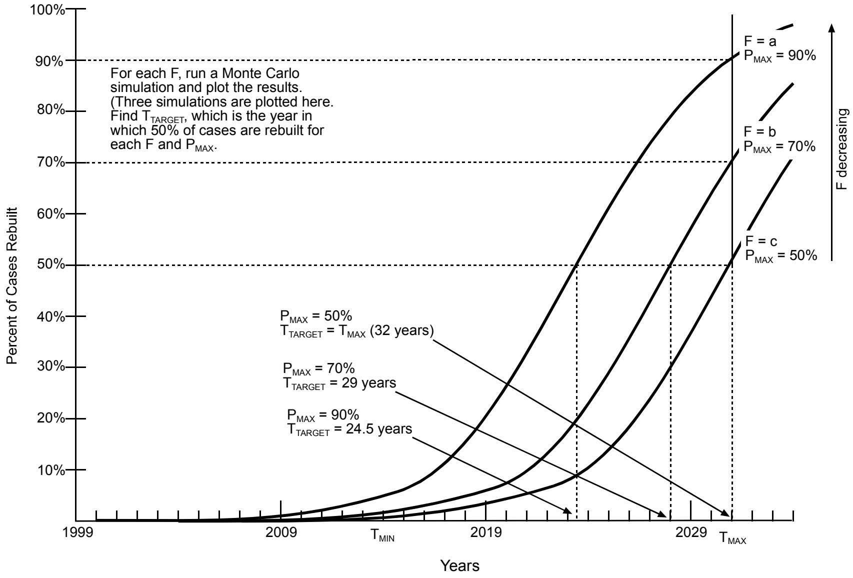

For each F, run a Monte Carlo simulation and plot the results. (Three simulations are plotted here. Find T_{TARGET}, which is the year in which 50% of cases are rebuilt for each F and P_{MAX}.

FIGURE 1-4. Computation of the rebuilding probability (P_{MAX}) and the median rebuilding year (T_{TARGET}).

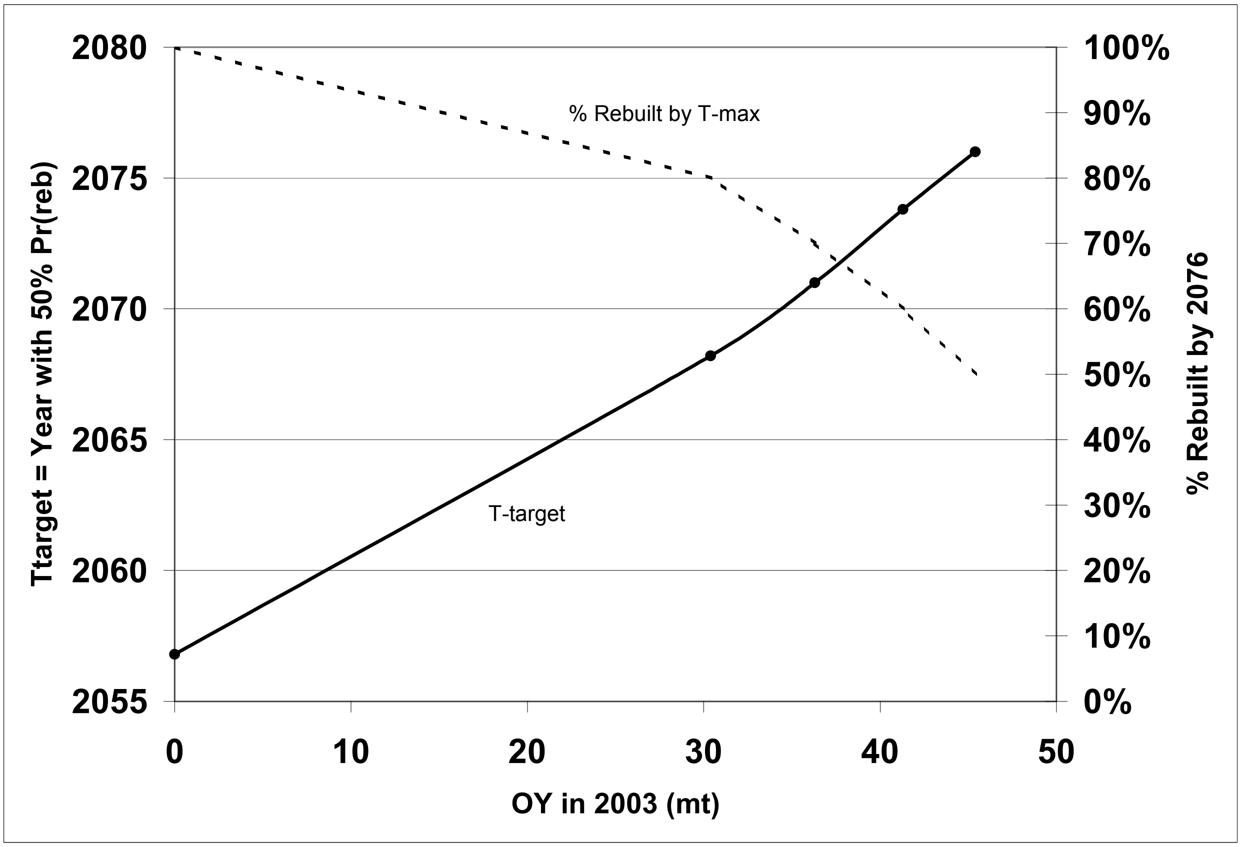


FIGURE 1-5. Tradeoff between OY in 2003, T_{TARGET}, and T_{MAX} from the canary rockfish rebuilding analysis (Methot and Piner 2002).

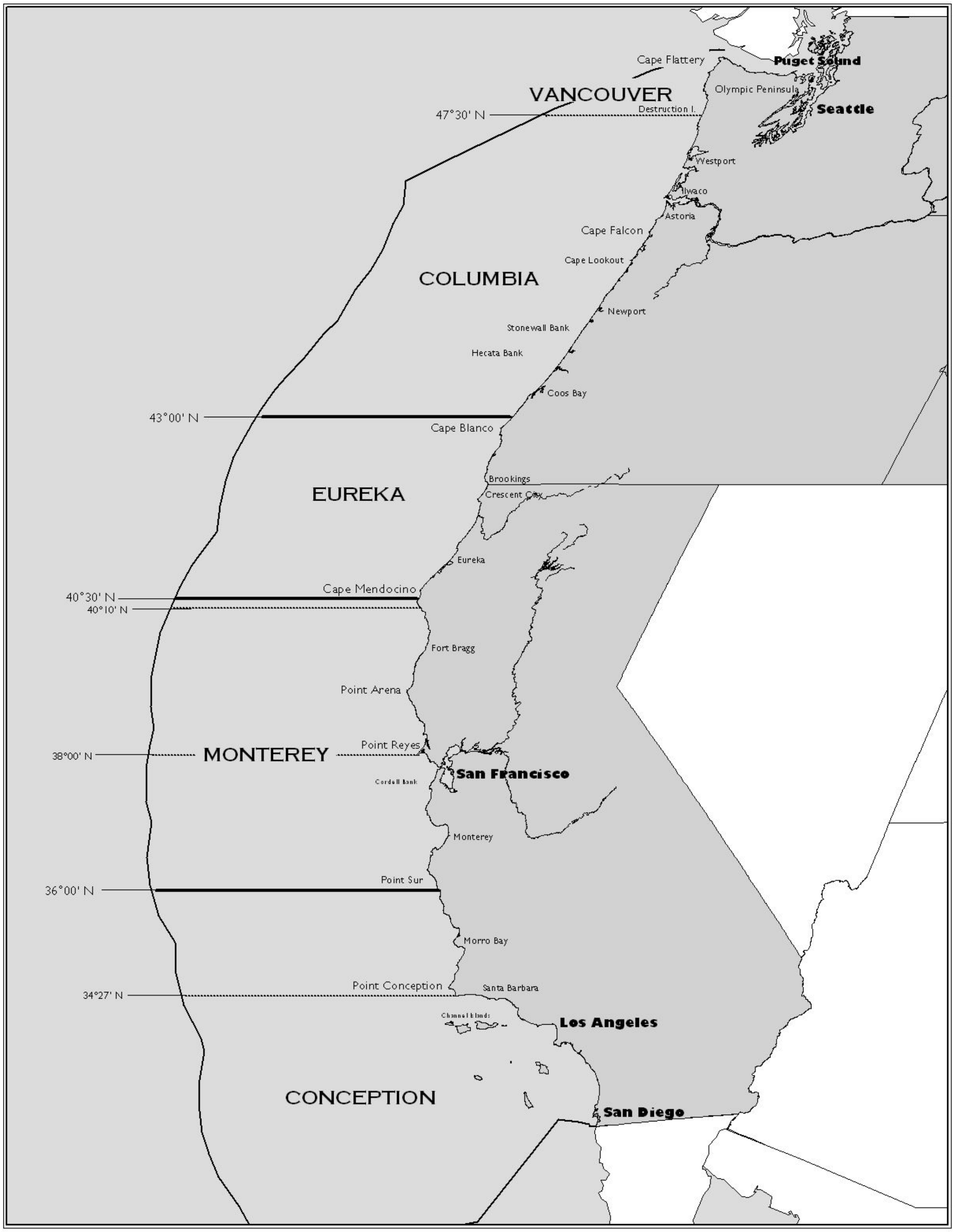
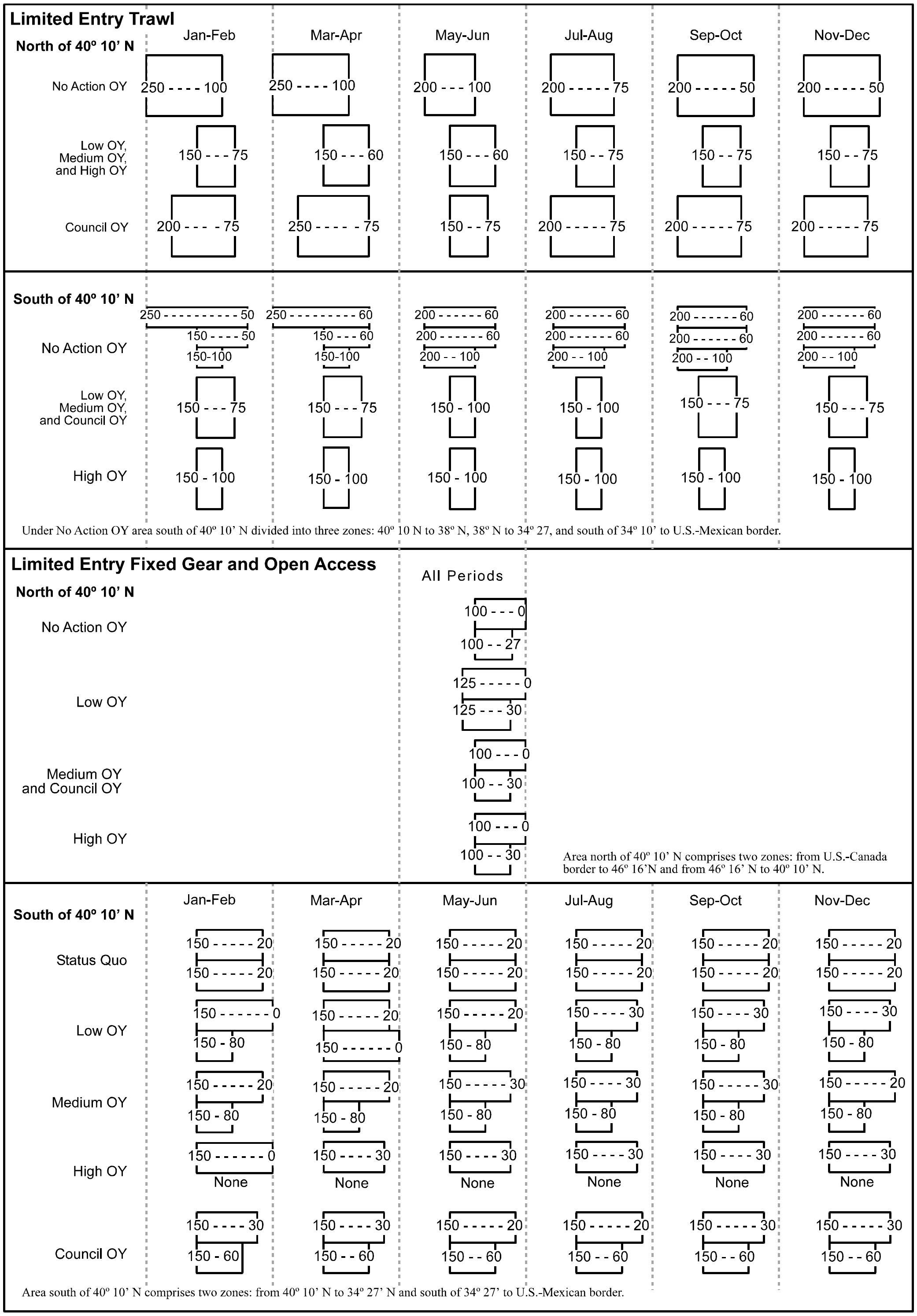


FIGURE 1-6. Management lines and zones and West Coast ports.



Limited Entry Trawl

North of 40º 10' N

	Jan-Feb	Mar-Apr	May-Jun	Jul-Aug	Sep-Oct	Nov-Dec
No Action OY	250 - - - - 100	250 - - - - 100	200 - - - 100	200 - - - - - 75	200 - - - - - 50	200 - - - - - 50
Low OY, Medium OY, and High OY	150 - - - 75	150 - - - 60	150 - - - 60	150 - - 75	150 - - 75	150 - - 75
Council OY	200 - - - - 75	250 - - - - - 75	150 - - 75	200 - - - - - 75	200 - - - - - 75	200 - - - - - 75

South of 40º 10' N

	Jan-Feb	Mar-Apr	May-Jun	Jul-Aug	Sep-Oct	Nov-Dec
No Action OY	250 - - - - - - - - - - 50 150 - - - - 50 150-100	250 - - - - - - - - - 60 150 - - - 60 150-100	200 - - - - - - 60 200 - - - - - - 60 200 - - 100	200 - - - - - - 60 200 - - - - - - 60 200 - - 100	200 - - - - - - 60 200 - - - - - - 60 200 - - 100	200 - - - - - - 60 200 - - - - - - 60 200 - - 100
Low OY, Medium OY, and Council OY	150 - - - 75	150 - - - 75	150 - 100	150 - 100	150 - - - 75	150 - - - 75
High OY	150 - 100	150 - 100	150 - 100	150 - 100	150 - 100	150 - 100

Under No Action OY area south of 40º 10' N divided into three zones: 40º 10 N to 38º N, 38º N to 34º 27, and south of 34º 10' to U.S.-Mexican border.

Limited Entry Fixed Gear and Open Access

North of 40º 10' N

	All Periods
No Action OY	100 - - - 0 100 - - 27
Low OY	125 - - - - - 0 125 - - - 30
Medium OY and Council OY	100 - - - 0 100 - - 30
High OY	100 - - - 0 100 - - 30

Area north of 40º 10' N comprises two zones: from U.S.-Canada border to 46º 16'N and from 46º 16' N to 40º 10' N.

South of 40º 10' N

	Jan-Feb	Mar-Apr	May-Jun	Jul-Aug	Sep-Oct	Nov-Dec
Status Quo	150 - - - - - 20 150 - - - - - 20	150 - - - - - 20 150 - - - - - 20	150 - - - - - 20 150 - - - - - 20	150 - - - - - 20 150 - - - - - 20	150 - - - - - 20 150 - - - - - 20	150 - - - - - 20 150 - - - - - 20
Low OY	150 - - - - - - 0 150 - 80	150 - - - - - 20 150 - - - - - - 0	150 - - - - - 20 150 - 80	150 - - - - 30 150 - 80	150 - - - - 30 150 - 80	150 - - - - 30 150 - 80
Medium OY	150 - - - - - 20 150 - 80	150 - - - - - 20 150 - 80	150 - - - - - 30 150 - 80	150 - - - - 30 150 - 80	150 - - - - - 30 150 - 80	150 - - - - - 20 150 - 80
High OY	150 - - - - - - 0 None	150 - - - - 30 None	150 - - - - 30 None	150 - - - - 30 None	150 - - - - 30 None	150 - - - - 30 None
Council OY	150 - - - - 30 150 - 60	150 - - - - 30 150 - - 60	150 - - - - - 20 150 - - 60	150 - - - - - 20 150 - - 60	150 - - - - - 30 150 - - 60	150 - - - - - 30 150 - - 60

Area south of 40º 10' N comprises two zones: from 40º 10' N to 34º 27' N and south of 34º 27' to U.S.-Mexican border.

FIGURE 1-7. Schematic showing closed area boundaries under the different alternatives.

2.0 The Fishery Management Unit

2.1 Areas and Stocks Involved

Groundfish fisheries regulated under the FMP occur on the continental shelf and upper slope off Washington, Oregon, and California. The continental shelf is rather narrow, varying in width from less than a mile off the Monterey Peninsula in California to as much as 37 miles over Heceta Bank off southern Oregon. The total shelf area (0 to 100 fathoms) is about 30,000 square miles. By comparison, the area of the central and eastern Bering Sea shelf is an order of magnitude larger, extending approximately 200 miles from shore. The relatively limited continental shelf and upper slope habitat off the West Coast results in recent average groundfish yields of 268,085 mt within the U.S. EEZ in comparison to recent average groundfish yields in the Eastern Bering Sea and Aleutian Islands of 1,775,600 mt within the U.S. EEZ (NMFS 1999, p. 6). Nonetheless, productivity in West Coast waters is high, and groundfish resources in the region sustain fisheries of major importance to the U.S.

The fishery is prosecuted over a wide range of depths, from 20 fathoms for English sole and sanddabs to as deep as 700 fathoms for Dover sole and sablefish. Similarly, fishing may occur on smooth mud/sand substrates, rocky reefs, pinnacles and canyons.

A wide variety of groundfishes are harvested in the Washington-Oregon-California fishery. Table 2-1 lists fishes managed under the groundfish FMP, showing their distribution. West Coast groundfish range from semi-pelagic types like Pacific whiting, shortbelly rockfish, and widow rockfish to demersal types like Dover sole, lingcod, and thornyheads. Most species primarily inhabit the continental shelf, but Dover sole, thornyheads, rex sole, petrale sole, and some others occur in greatest abundance on the continental slope. The basic character of the fishery and the composition of landings are distinctive in each management area (see Figure 1-7). The close spatial relationship of certain species in any given area often results in large catches of non-target species, creating a multi-species fishery. This is particularly true in the case of bottom trawl catches. For example, vessels targeting on Dover sole in the Columbia area also may catch thornyheads, sablefish, and darkblotched rockfish. Several species of rockfish may be caught in a single trawl tow or gillnet set, the species composition of which may change from north to south. Historically, widow, yellowtail, and canary rockfish were particularly important in rockfish catches in the Vancouver and Columbia areas, while bocaccio and chilipepper rockfishes have been significant components in the Monterey and Conception areas. Fishermen can exercise some control over the proportions of various species in catches by bathymetric and area shifts in effort as well as modifying the manner in which gear is fished. However, it is often impossible to avoid the catch of some non-target species totally. The fishery's multispecies nature is further complicated by seasonal changes in fish availability, by weather, and by market conditions (prices and poundage limits)—factors which may cause a trawler to fish on several species assemblages in a single fishing trip. Many gear types are used in the fishery, including trawl nets, gillnets, traps, and longlines. However, trawl nets (both bottom and midwater types) account for a major portion of the groundfish catch.

2.2 History of Exploitation

Trawling began on the Pacific coast in 1876 (Scofield 1948), when the paranzella net, or two-boat trawl, was introduced in San Francisco Bay and towed by lateen-rigged sailing vessels. The method successfully produced catches which were larger than those by other fishing gear of the era, and trawling within the Bay became prevalent.

During the 1880s, steam-powered vessels began replacing sailing vessels. By 1888, paranzella gear was fished exclusively by paired steam trawlers. In 1906, San Francisco Bay was closed to trawling because of declining fish stock abundances. By this time paranzella fishing had expanded to open ocean areas outside the Bay. In 1884 a small schooner began fishing with a beam trawl (Harry and Morgan 1963). This was the first type of trawl gear used off the Oregon-Washington coasts. The beam trawl was an effective fishing gear which could be towed by a single vessel. The otter trawl was introduced as early as 1908 but was not used on a regular basis until 1926, when two vessels began fishing the protected waters of Puget Sound. Diesel engines became available during the 1920s as did other technological advances stimulated rapid growth and expansion of the trawl fishery. World War II created a high demand for food fish and for shark livers used in the production of vitamin A. The trawl fishery expanded to many productive offshore grounds off California, Oregon, and Washington, and by 1944 Washington trawlers were fishing as far north as Queen Charlotte Sound, Canada. In 1978 large productive trawl grounds in British Columbia, Canada were closed to U.S. fishermen. This action forced Washington fishermen to fish exclusively in U.S. waters, primarily off Washington. Foreign fishing fleets have also operated in the Washington, Oregon, and California area. The Soviet Union operated a large trawl fleet as early as the mid-1960s for rockfish and Pacific whiting. Poland, the German Democratic Republic, the Federal Republic of Germany, and the Republic of Korea also sent vessels, primarily trawlers/processors, to fish in this area prior to the implementation of the Magnuson Fishery Conservation Magnuson Act (MFCMA, and subsequently renamed the Magnuson-Stevens Fishery Conservation Magnuson Act, or MSA). Foreign trawl fleets were one of the principal causes for the depletion of the Pacific ocean perch stock.

In the late 1970s and early 1980s the creation of the 200 mile EEZ as part of the MFCMA, the availability of federal low-interest vessel construction funds, significant improvements in electronic navigation and fish-finding equipment, gear advancements, and the growth of a directed widow rockfish fishery helped fuel a broad expansion of the trawl fleet. For example, California's trawl fleet grew from 126 groundfish vessels in 1977 to 195 trawlers in 1983 (Korson 1984; Korson 1988). Similar expansions occurred in the Oregon and Washington trawl fleets. Investment in fishing vessels was aided by the federal Capital Construction Fund, which provided concessionary loans for the purchase of vessels and equipment. The, perhaps foreseeable, result of the “open access” management regime in place during this period was overcapitalization: “too many boats chasing too few fish.” (Section 1.2.4 discusses this issue.) By 1984, fleet over-capitalization had precipitated a substantial (25%) decline in fleet size, yet the remaining vessels still possessed tremendous fishing power. In response, the Council implemented a license limited entry program for trawl and fixed gear groundfish vessels in order to stem the increase in fishing capacity. FMP Amendment 6 accomplished this in 1992 (PFMC 1992).

At the same time that harvesting capacity was increasing, many groundfish stocks were steadily declining. Widow rockfish is a good example for tracking developments in the trawl sector, demonstrating both the increase in fishing capacity, and harvests, and subsequent decline in the stock. Caught with mid-water trawl nets, the advent of joint-venture fishing, in which catcher vessels use mid-water trawl gear, spurred the discovery that large catches could be made with relative ease. Rockfish schools had heretofore gone undetected because, unlike other rockfish, they aggregate at night but disperse during daylight hours. Given a large standing stock, landings rapidly escalated—from 1,107 mt in 1978 to a peak of 26,938 mt in 1981 (He *et al.* 2003a). With implementation of the groundfish FMP and imposition of harvest limits, landings fell to around ten thousand metric tons annually for most of the remainder of the decade. After an initial stock assessment in 1989, a harvest guideline of 12,100 mt was implemented. Subsequent assessments resulted in further reductions in harvest limits during the first part of the 1990s. Landings fluctuated somewhat above 6,000 mt annually during this period. Passage of the Sustainable Fisheries Act amendment to the MSA in 1996 required Councils to establish frameworks for preventing overfishing and rebuilding overfished stocks. In response, the Council adopted groundfish Amendment 11, which among other things established a minimum stock size threshold of 25% of unfished biomass to identify overfished stocks. A 2000 stock assessment (Williams *et al.* 2000) found that the stock had fallen just below this threshold, triggering declaration that the stock was overfished and requiring the Council to adopt a rebuilding plan. Landings in 2002 were a mere 263 mt while the 2004 harvest limit (optimum yield, or OY) adopted by the Council is 284 mt. Stock declines and resulting overfished species declarations in the late 1990s and 2000 exacerbated the problem of overcapacity in the groundfish trawl sector, which the limited entry program only partly addressed. An October 2000 strategic plan developed by the Council notes "...the number of vessels in most [groundfish] fishery sectors will have to be reduced by at least 50%.... Fishing fleet overcapitalization has been a major factor in fish stock depletion, and the industry and coastal communities are facing an economic and social crisis" (Ad-Hoc Pacific Groundfish Fishery Strategic Plan Development Committee 2000, p. 1). In 2003 Congress authorized grant and loan monies to established a groundfish limited entry trawl vessel and permit buyback program, which was implemented near the end of that year. Some 92 vessels and 240 associated permits (including those for other fisheries) were permanently retired. Section 1.2.4 describes this program in more detail.

Two other gear types, longline and trap (or pot), historically have participated in the groundfish fishery, primarily harvesting sablefish. Other hook-and-line gear are a minor constituent of the fishery not discussed here. Longline gear has been utilized for sablefish since the late 19th century. Longline fleet size has varied considerably over the years, but unfortunately accurate records of these vessels in the Washington, Oregon, and California area were unavailable until 1987. In 1987, 137 sablefish longline vessels landed in the Washington, Oregon, and California area. Anecdotal information suggests that longline fleet size increased during the late 1980s as a result of robust foreign sablefish demand, the use of very efficient circle hooks, and reduced halibut and sablefish fishing opportunities in Alaskan waters. In 1995, the second year of the groundfish limited entry program, 195 vessels holding limited entry permits made landings with hook and line gear. In 2001, 178 vessels with fixed gear permits (which would also include pot gear, discussed below) made landings. Of these, 158 landed sablefish.

Sablefish traps were developed for commercial use by fishermen and NMFS scientists in the early 1970s and quickly found widespread use by 1974. They proved to be effective and species-specific—they are used almost exclusively to target sablefish—and produce a high quality product. The pot sablefish fleet quickly grew from 60 to 207 vessels in 1979, primarily in response to strong market demand for sablefish in Japan as well as high availability of sablefish along the West Coast. In 1980, sablefish prices in foreign markets dropped sharply and many trap vessels left the fishery as a consequence. The fleet declined in size continually to a low of 26 vessels in 1987 (Korson 1984; Korson 1988). Vessel counts from the first half of the 1990s, however, show between 169 and 216 pot gear vessels making landings in the years 1990 to 1995 (Silverthorne 1996, p. EC 10). But the limited entry fleet that came into being in 1994 is a fraction of that number: less than 50 limited entry vessels using pot gear made landings in the first two years of license limitation.

Vessels targeting sablefish with longline and pot gear also suffered from over capacity and by the early 1990s the fishery was a "derby" managed by very short seasons of two weeks or less. Limited entry did not solve the problem completely and short seasons continued. Amendment 9, requiring an permit endorsement to participate in the primary sablefish fishery, and Amendment 14, introducing permit stacking, have helped to alleviate the symptoms of over capacity in the fixed gear sablefish fishery, effectively eliminating the short, derby season. Section 1.2.4 describes these changes in more detail.

Another significant development during the 1980s was the transition of the Pacific whiting fishery from a predominantly foreign to domestic fishery. Pacific whiting are caught and processed on an industrial scale; prior to passage of the MFCMA, large foreign catcher-processors harvested this resource. Passage of the Act in 1976 encouraged development of domestic fisheries. Joint-venture fisheries served as an intermediate step. In a joint-venture, U.S. trawl vessels catch the fish but deliver them to a foreign vessel, either a catcher-processor or mothership, which acts solely as an at-sea processor. After 1979 foreign catches began declining, from 114, 910 mt in that year to no foreign catches in 1983. However, foreign catches occurred from 1984 to 1998 under a renewed directed fishery by Polish vessels. The joint-venture fishery grew steadily during this period, from a mere 856 mt in 1978 to a peak of 203,578 mt in 1989. During the 1980s between 70% and 90% of whiting catches were attributable to joint-ventures and domestic landings. In 1989 and 1990, with no foreign trawl fishery for whiting, the groundfish fishery off Washington, Oregon, and California was 100% domestic, as intended by the authors of the Magnuson-Stevens Act. (Joint-venture catches are counted toward domestic landings.) In 1991, foreign processing of whiting at sea by joint ventures was replaced by the expanding domestic processing industry, predominantly the at-sea processing fleet that had been built primarily to harvest pollock in Alaska. (Technological advances allowing whiting to be turned into surimi underwrote this transformation.) The fishery has been prosecuted by domestic vessels since that time. Fishing opportunity is allocated among three sectors: catcher-processors, motherships, and shoreside processors. Like the foreign vessels they supplanted, catcher-processors are able to both harvest and process the catch at sea. Motherships take deliveries from trawl vessels, which also provide fish to shoreside processing plants.

2.3 The Fishery Ecosystem and Marine Biodiversity in Relation to Groundfish Management

2.3.1 The Fishery Ecosystem

Ecosystem and habitat, discussed below, are closely related concepts. Ecosystems embody both the relationships between species, represented by the flow of material and energy through a network of relationships, and the sum total of the species comprising the system within a given physical setting. This overlaps with habitat as the physical and biological attributes to the space occupied by a particular species. The ecosystem concept is reflected in groundfish management through the use of biogeographic zones and species complexes to distinguish the application of management measures. These ecological divisions have both a north south component, with Cape Mendocino representing an important break in the distribution of many groundfish species (particularly rockfish), hence the use of the 40°10' N. line of latitude (or alternatively, 40°30' N latitude). Point Conception represents another important biogeographic boundary considered when crafting management measures. A second, and perhaps more influential, ecological demarcation depends on distance from shore, or depth. Groundfish are managed based on distinction between nearshore, continental shelf, and continental slope species. Distinct species assemblages characterize these zones; in addition, there are differences between the zones based on possible vertical distribution of species. Finally, particular species may exhibit seasonal migrations, producing some annual variation in the characteristics of these different ecological zones. The nearshore, shelf, and slope ecosystems can be characterized by combinations of the habitat composites described below, the species assemblages particular to these ecosystems, and the trophic relationships between these species. More specific information on trophic relationships may be found in the managed species descriptions in Section 2.4.

Bathymetry and physical topography helps determine habitat, by influencing its physical structure, and also the co-occurrence of species. The U.S. West Coast is characterized by a relatively narrow continental shelf. The 200 m depth contour shows a shelf break closest to the shoreline off Cape Mendocino, Point Sur, and in the Southern California Bight; and widest from Central Oregon north to the Canadian border, as well as off Monterey Bay. Deep submarine canyons pocket the EEZ, with depths greater than 4,000 m south of Cape Mendocino (Figure 2-1).

As on land, climate is another important ecological determinant. However, in the ocean's fluid medium, currents are the predominant expression of this broad environmental influence. Not only do currents influence water temperature, vertical mixing and movement can bring nutrient-rich, deep-bottom water into the photic zone, strongly influencing biological productivity. In the North Pacific Ocean, the large, clockwise-moving North Pacific Gyre circulates cold, subarctic surface water eastward across the North Pacific, splitting at the North American continent into the northward-moving Alaska Current and the southward-moving California Current (Figure 2-2). Along the U.S. West Coast, the surface California

Current flows southward through the U.S. West Coast EEZ. The California Current is known as an eastern boundary current, meaning it draws ocean water along the eastern edge of an oceanic current gyre. The northward-moving California Undercurrent flows along the continental margin and beneath the California Current. Influenced by the California Current system and coastal winds, waters off the U.S. West Coast are subject to major nutrient upwelling, particularly off Cape Mendocino (Bakun 1996). Shoreline topographic features such as Cape Blanco and Point Conception, and bathymetric features such as banks, canyons, and other submerged features, often create large-scale current patterns such as eddies, jets, and squirts. For example, a current jet off Cape Blanco drives surface water offshore, which is replaced by upwelling sub-surface water (Barth *et al.* 2000). One of the better known current eddies off the West Coast occurs in the Southern California Bight between Point Conception and Baja, California (Longhurst 1998), wherein the current circles back on itself by moving in a northward and counterclockwise motion just within the Bight.

While the seasonal environmental effects of the California Current and related lesser current patterns are easily observable (Lynn and Simpson 1987), the influence of longer period cycles has only been appreciated recently. The effect of El Niño-Southern Oscillation (ENSO) events on climate and ocean productivity in the northeast Pacific is relatively well-known. In the past decade a still longer period cycle, termed the Pacific Decadal Oscillation or PDO, has been identified. Although similar in effect, instead of the one-year to two-year periodicity of ENSO, PDO events affect ocean conditions for 15 years to 25 years (Mantua in press). The PDO shifts between warm and cool phases. The warm phase is characterized by warmer temperatures in the northeast Pacific (including the West Coast) and cooler-than-average sea surface temperatures and lower-than-average sea level air pressure in the central North Pacific; opposite conditions prevail during cool phases. Because the effects are similar, "in-phase" ENSO events (e.g., an El Niño during a PDO warm phase) can be intensified. (However, aside from these phase effects, PDO conditions, although of much longer duration than ENSO events, are milder. It is also important to note that—while the fundamental causes of PDO are not fully understood—they are known to be different from those driving ENSO events. And while ENSO has its primary effect on the tropical Pacific, with secondary effects in colder regions, the opposite is true of PDO; its primary effects occur in the northeast Pacific.) The ecosystem effects of PDO conditions are pervasive. Climate conditions directly affect primary production (phytoplankton abundance), but ecosystem linkages ensure these changes influence the abundance of higher trophic level organisms, including fish populations targeted by fishers (Francis *et al.* 1998). Scientists have identified four regime shifts during the twentieth century, with the most recent occurring in 1976/1977, when a warm phase began. This has produced less productive ocean conditions off the West Coast and more favorable conditions around Alaska. For example, Hare *et al.* (1999) document the inverse relationship between salmon production in Alaska and the Pacific Northwest and relate this to PDO-influenced ocean conditions. Researchers have identified similar relationships between meso-scale climate regimes and the productivity of other fish populations, including groundfish (see Francis *et al.* 1998 for a review). Researchers have recently identified a second regime shift, occurring in 1989 (Hare and Mantua 2000), which apparently resulted in a further decline in the productivity of some fish populations in the northeast Pacific, including some groundfish species (McFarlane *et al.* 2000). (Pacific whiting and sardine populations, in contrast, showed increases.) Hare and Mantua (2000) hypothesize that a still longer, 50 year to 70 year oscillation may combine with the 15 year to 25 year PDO to produce shifts that vary in their characteristics, as do the 1977 and 1989 phenomena. However, a shift to a more favorable PDO cold phase may have occurred in the late 1990s, as evidenced in recent measurements of sea surface temperature (Bernton 2000).

The influence of ocean conditions, and in particular meso-scale climate regimes that can rapidly shift phases, is an important issue for annual management. As Hare and Mantua (2000) point out, current assessment models do not account for these changes in environmental conditions, which may lead to under- or over-estimation of population productivity. In turn, the range of OY values in the harvest level alternatives are derived from these assessments. Unfortunately, the inability to predict regime shifts and determine the precise correlation between environmental conditions and population productivity, preclude the incorporation of such measurements into assessment models. In contrast, fishers' direct empirical evidence (albeit unquantified) of recent increases in productivity (visible in 2002, for example, in the abundance of juvenile bocaccio due to a strong year class) causes some to distrust scientific assessments that lead to further reductions in harvest specifications. (These issues are closely related to the nature of scientific uncertainty in the management process, discussed in Section 1.2.1)

2.3.2 Biodiversity of Managed Fish Stocks

Biodiversity, shorthand for biological diversity, is a measure of the number of coexisting species and variability or genetic diversity within a population. The biodiversity concept may also be used to evaluate other aspects of variation and complexity, such as ecosystem diversity or species provenance—distinguishing between native and invasive species, for example. Biodiversity is, therefore, another way of thinking about ecosystem structure, which can be an important factor in population productivity. This link is reflected in the similarity between guidance by the Council on Environmental Quality (CEQ) for biodiversity (CEQ 1993) and those found in a recent panel report on ecosystem-based fishery management (EPAP 1999). Fishery harvests primarily affect local or regional species abundance rather than being directly implicated in species extinctions, although nationally a few marine fish species have been listed under the ESA (including numerous salmon runs on the West Coast, see Section 5.0). Overfished species are the most salient biodiversity concern in the context of groundfish management, because substantially reduced stock sizes could correlate with changes in the range or distribution of a species (implying local or temporary "extinctions").

Biological characteristics of species, combined with physiographic features, are important determinants of changes in distribution. More mobile and schooling species—such as Pacific whiting—may vary in location *en masse* as they move in response to environmental conditions and prey availability. Current regimes may also control the distribution of larvae, helping to determine the location of adult populations. The duration of larval and juvenile phases, and the degree to which they are pelagic and subject to current dispersal, also influences recruitment to a particular area or region. In fact, processes of dispersion and isolation contribute to speciation. For example, two rougheye rockfish forms, which may be cryptic species, are found in the Gulf of Alaska and the Aleutian Islands. A current gyre in the Gulf of Alaska may control larval dispersal, isolating the two populations from one another (Love *et al.* 2002, p. 14). The effect of local depletion on long-term abundance is thus influenced by a variety of often not well-understood processes: recruits may be transported from elsewhere to repopulate the area, and the concept of local depletion may have little meaning when considering a highly mobile species. Conversely, sedentary species—like cowcod—may be quite vulnerable to local extinction, especially if juvenile recruitment is wholly local. Ecological factors can also "tip the balance" for depleted populations. Researchers are beginning to identify cultivation/depensation effects that run counter to traditional ideas of density-dependent population response (Pauly *et al.* 2002). Adults of a given species may control the abundance of species preying on their juveniles. If the number of adults is reduced below some level, this predation is unchecked, leading to serial recruitment failure. This process is hypothesized for large-sized rockfish species; declines in several of these species are correlated with increases in the abundance of smaller-sized rockfish species. The latter may be preying on the former's juveniles (Piner 2001).

2.3.3 Current Research on the Fishery Ecosystem

In 2002 the NMFS Northwest Fisheries Science Center established a new ecosystem-based management research group–Science for Ecosystem-based Management Initiative (SEMI). This group will perform research on the ecological interactions and processes necessary to sustain ecosystem composition, structure and function in the environments in which fish and fisheries exist. SEMI will investigate interactions of a target fish stock with predators, competitors, and prey, effects of weather and climate on target species and their ecological communities, effects of fishing on marine ecosystems and fish habitat, interactions between fishes and their habitat, and Marine Protected Areas as a fisheries conservation and management tool. NMFS Northwest Region is also current preparing a comprehensive EIS evaluating impacts to essential fish habitat (see Section 4.5.) There are also numerous academic research projects underway focusing on fishery ecosystem dynamics in the northeast Pacific.

2.4 Life History Characteristics, Distribution, Status of FMU Stocks, and Harvest Policy

There are over 80 species of groundfish managed under the groundfish FMP. These species include over 60 species of rockfish in the family *Scorpaenidae*, 7 roundfish species, 12 flatfish species, assorted shark, skate, and a few miscellaneous bottom-dwelling marine fish species. Management of these groundfish species is based on principles outlined in the MSA, groundfish FMP, and national standard guidelines, which provide guidance on the 10 national standards in the MSA. Stock assessments are based on resource surveys, catch trends in West Coast fisheries, and other data sources. Section 1.1.1 describes, in general terms, how stock assessments are conducted and reviewed before they are applied in West Coast groundfish management. Table 2-1 depicts the latitudinal and depth distributions of groundfish species managed under the groundfish FMP.

The passage of the Sustainable Fisheries Act in 1996 incorporated current conservation and rebuilding mandates into the Magnuson-Stevens Act. These mandates—including abundance-based standards for declaring a stock overfished, in a “precautionary” status, or at levels that can support MSY (healthy or “rebuilt”)—were subsequently incorporated in the groundfish FMP with adoption of Amendments 11 and 12. The abundance-based reference points for managing West Coast groundfish species are relative to an estimate of “virgin” or unexploited biomass of the stock, which is denoted as B_0 and is defined as the average equilibrium abundance of a stock’s spawning biomass before it is affected by fishing-related mortality. The Magnuson-Stevens Act and national standard guidelines employ the MSY concept to frame management objectives. MSY represents a theoretical maximum surplus production from a population of constant size; national standard guidelines define it as “the largest long-term average catch or yield that can be taken from a stock or stock complex under prevailing ecological and environmental conditions.” Thus, for a given population, and set of ecological conditions, there is a biomass that produces MSY (denoted as B_{MSY}), which is less than the equilibrium size in the absence of fishing (B_0). (Generally, population sizes above B_{MSY} are less productive, because of competition for resources.) The harvest rate used to specify harvest levels designed to achieve or sustain B_{MSY} is referred to as the Maximum Fishing Mortality Threshold (MFMT, denoted as F_{MSY}). There are two harvest specification reference points defined in the groundfish FMP, a total catch OY and an ABC. The OY is typically the management target and is usually less than the ABC, based on the need to rebuild stocks to B_{MSY} (see the following discussion). The ABC, which is the maximum allowable harvest, is calculated by applying an estimated or proxy F_{MSY} harvest rate to the estimated abundance of the exploitable stock.

The Council-specified proxy MSY abundance for most West Coast groundfish species is 40% of B_0 (denoted as $B_{40\%}$). The Council-specified threshold for declaring a stock overfished is when the stock’s spawning biomass declines to less than 25% of B_0 (denoted as $B_{25\%}$). The Magnuson-Stevens Act and national standard guidelines refer to this threshold as the Minimum Stock Size Threshold or MSST. A rebuilding plan that specifies how total fishing-related mortality is constrained to achieve an MSY abundance level within the legally allowed time is required by the MSA and groundfish FMP when a stock is declared overfished.

Stocks estimated to be above the overfishing threshold, yet below an abundance level that supports MSY, are considered to be in the “precautionary zone.” The Council has specified precautionary reductions in harvest rate for such stocks to increase abundance to $B_{40\%}$. The methodology for determining this precautionary reduction is described in the groundfish FMP and is referred to as the 40-10 adjustment. As the stock declines below $B_{40\%}$, the total catch OY is reduced from the ABC until, at 10% of B_0, the OY is set to zero. However, in practice the 40-10 adjustment only applies to stocks above $B_{25\%}$ (the MSST) because once a stock falls below this level, an adopted rebuilding plan supplants it. Most stocks with an estimated abundance greater than $B_{40\%}$ are managed by setting harvest to the ABC. Figure 2-3 presents this framework graphically.

Sections 2.4.1 through 2.4.3 describe groundfish stocks according to the categories just described: overfished, precautionary zone, and healthy. However, it is important to realize that of the more than 80 species in the management unit only a portion are individually managed. Thus, Section 2.4.3, covering stocks at or above target stock size, describes five species managed under separate harvest specifications. The remaining species are managed and accounted for in groupings or stock complexes because individually they comprise a small part of the landed catch and insufficient information exists to develop the stock assessments necessary to set an OY based on yield estimates. (The groundfish FMP identifies the OY for these species as an average of historical catch, based on the assumption that this is below MSY.)

2.4.1 Overfished Species

2.4.1.1 Bocaccio

Distribution and Life History

Bocaccio (*Sebastes paucispinis*) is a rockfish species that ranges from Krozoff and Kodiak Islands in the Gulf of Alaska to central Baja California, Mexico (Hart 1988; Miller and Lea 1972b). Love, *et al.* (Love *et al.* 2002) and Thomas and MacCall (Thomas and MacCall. 2001) describe bocaccio distribution and life history. Bocaccio are historically most abundant in waters off central and southern California. Juveniles settle in nearshore waters after a pelagic stage that last several months. Adults are most commonly found at 100-150 m over the outer continental shelf (Allen and Smith 1988). The southern bocaccio stock is most prevalent at the 54-82 fm depth zone (Casillas *et al.* 1998).

Bocaccio are found in a wide variety of habitats, often on or near bottom features, but sometimes over muddy bottoms. They are found both nearshore and offshore (Sakuma and Ralston 1995). Larvae and small juveniles are pelagic (Garrison and Miller 1982) and are commonly found in the upper 100 m of the water column, often far from shore (MBC 1987). Large juveniles and adults are semi-demersal and are most often found in shallow coastal waters over rocky bottoms associated with algae (Sakuma and Ralston 1995). Adults are commonly found in eelgrass beds, or congregated around floating kelp beds (Love *et al.* 1990; Sakuma and Ralston 1995). Young and adult bocaccio also occur around artificial structures, such as piers and oil platforms (MBC 1987). Although juveniles and adults are usually found around vertical relief, adult aggregations also occur over firm sand-mud bottoms (MBC 1987). Bocaccio move into shallow waters during their first year of life (Hart 1988), then move into deeper water with increased size and age (Garrison and Miller 1982).

Bocaccio are ovoviviparous (live young are produced from eggs that hatch within the female's body) (Garrison and Miller 1982; Hart 1988). Love et al. (1990) reported the spawning season to last nearly an entire year (>10 months). Parturition occurs during January to April off Washington, November to March off Northern and Central California, and October to March off Southern California (MBC 1987). Fecundity ranges from 20,000 to 2,300,000 eggs. In California, two or more broods may be born per year (Love *et al.* 1990). The spawning season is not well known in northern waters. Males mature at three to seven years, with about half maturing in four to five years. Females mature at three to eight years, with about half maturing in four to six years (MBC 1987).

Maximum age of bocaccio was radiometrically determined to be at least 40 and perhaps more than 50 years. Bocaccio are difficult to age, and stock assessments used length measurements as a proxy for age. MacCall *et al.* (MacCall *et al.* 1999) estimated that the instantaneous rate of natural mortality of 0.20 (82% adult annual survival when there is no fishing mortality).

Larval bocaccio eat diatoms, dinoflagellates, tintinnids, and cladocerans (Sumida and Moser 1984). Copepods and euphausiids of all life stages (adults, nauplii and egg masses) are common prey for juveniles (Sumida and Moser 1984). Adults eat small fishes associated with kelp beds, including other species of rockfishes, and occasionally small amounts of shellfish (Sumida and Moser 1984). Bocaccio are eaten by sharks, salmon, other rockfishes, lingcod, albacore, sea lions, porpoises, and whales (MBC 1987). Adult bocaccio are often caught with chilipepper rockfish and have been observed schooling with speckled, vermilion, widow, and yellowtail rockfish (Love *et al.* 2002). They compete with chilipepper and widow rockfish, yellowtail, and shortbelly rockfishes for both food and habitat resources (Reilly *et al.* 1992).

Stock Status and Management History

There are two separate West Coast bocaccio populations. The southern stock exists south of Cape Mendocino and the northern stock north of 48° N latitude in northern Washington (off Cape Flattery). It is unclear whether this stock separation implies stock structure. The distribution of the two populations and evidence of lack of genetic intermixing suggests stock structure, although MacCall (2002) sees some recent evidence for limited genetic mixing of the two populations. Nonetheless, assessment scientists and managers have treated the two populations as independent stocks north and south of Cape Mendocino.

Bocaccio have long been an important component of California rockfish fisheries. Catches increased to high levels in the 1970s and early 1980s as relatively strong year-classes recruited to the stock. The Council began to recommend increasingly restrictive regulations after an assessment of the southern stock in 1990 (Bence and Hightower 1990) indicated that fishing rates were too high. The southern stock has been assessed six times (Bence and Hightower 1990; Bence and Rogers 1992; MacCall 2002; MacCall 2003b; MacCall *et al.* 1999; Ralston *et al.* 1996b) and has suffered poor recruitment during the warm water conditions that have prevailed off Southern California since the late 1980s. The 1996 assessment (Ralston *et al.* 1996b) indicated the stock was in severe decline. NMFS formally declared the stock overfished in March 1999 after the groundfish FMP was amended to incorporate the tenets of the Sustainable Fisheries Act. MacCall et al. (1999) confirmed the overfished status of bocaccio and estimated spawning output of the southern stock to be 2.1% of its unfished biomass and 5.1% of the MSY level. The northern stock of bocaccio has not been assessed.

While previous assessments only used data from central and northern California, an assessment in 2002 (MacCall and He 2002) also included data for southern California. While relative abundance increased slightly from the last assessment (4.8% of unfished biomass), potential productivity appears lower than previously thought, making for a more pessimistic outlook. The Council assumed a medium recruitment scenario for the 1999 year class, which was not assessed (MacCall *et al.* 1999). The 2002 assessment revealed the 1999 year class experienced relatively lower recruitment. Therefore, although the 1999 year class contributed a substantial quantity of fish to the population, it did not contribute as much to rebuilding as was previously thought.

The 2003 bocaccio assessment differs greatly from the 2002 assessment. It is driven by the strength of the incoming 1999 year class that had not recruited into the indices used for the 2002 assessment and by a revised lower estimate of natural mortality (MacCall 2003b). In addition to the 2001 Triennial Survey data, the 2003 assessment used larval abundance data from recent CalCOFI surveys as well as length and catch-per-unit-effort (CPUE) data from recreational fisheries. In calculating the recreational CPUE information, a new method was used that identifies relevant fishing trips by species composition and adjusts the catch history for regulatory changes that effect the level of discard and avoidance. The results of these calculations suggest that recreational CPUE has increased dramatically in recent years and is at a record high level in central California north of Pt. Conception. The STAR Panel recommended the use of two assessment models as a means of bracketing uncertainty from the very different signals between the Triennial Survey and the recreational CPUE data. Following the STAR Panel meeting, MacCall presented a third "hybrid" model that incorporated the data from all of the indices. The SSC recommended and the Council approved the use of this third modeling approach. This resulted in modest improvement in estimated stock size, but significantly affected the estimated productivity of the stock. These results had substantial effects on the rebuilding outlook for bocaccio which, under the 2002 assessment, was not expected to rebuild within T_{MAX} even with no fishing related mortality. Total mortality in 2003 fisheries was restricted to less than 20 metric tons as a means of conserving the stock while minimizing adverse socioeconomic impacts to communities. The current rebuilding analysis (MacCall 2003a), using the "hybrid" model, suggests the stock could rebuild to B_{MSY} within 25 years while sustaining an OY of approximately 300 metric tons in 2004 (see Table 2-2).

2.4.1.2 Canary Rockfish

Distribution and Life History

Canary rockfish (*Sebastes pinniger*) range from northern Baja California, Mexico, to southeastern Alaska (Boehlert 1980; Boehlert and Kappenman 1980; Hart 1988; Love 1991; Miller and Lea 1972b; Richardson and Laroche 1979). There is a major population concentration of canary rockfish off Oregon (Richardson and Laroche 1979). Canary rockfish primarily inhabit waters 91 m to 183 m (50 fm to 100 fm) deep (Boehlert and Kappenman 1980). In general, they inhabit shallow water when they are young, and deep water as adults (Mason 1995). Adult canary rockfish are associated with pinnacles and sharp drop-offs (Love 1991) and are most abundant above hard bottoms (Boehlert and Kappenman 1980). In the southern part of their range, canary rockfish appear to be associated with reefs (Boehlert 1980). In Central California, newly settled canary rockfish are first observed at the seaward sand-rock interface and farther seaward in deeper water (18 m to 24 m).

Canary rockfish off the West Coast exhibit a protracted spawning period from September through March, probably peaking in December and January off Washington and Oregon (Hart 1988; Johnson *et al.* 1982). Female canary rockfish reach sexual maturity at roughly eight years of age. Like many members of *Sebastes*, canary rockfish are ovoviviparous, whereby eggs are internally fertilized within females, and hatched eggs are released as live young (Bond 1979; Golden and Demory 1984; Kendall and Lenarz 1986). Canary rockfish are a relatively fecund species, with egg production being correlated with size (e.g., a 49-cm female can produce roughly 0.8 million eggs, and a female that has realized maximum length (approximately 60 cm) produces approximately 1.5 million eggs (Gunderson 1971)).

Very little is known about the early life history strategies of canary rockfish. The limited research that has been conducted indicates that larvae are strictly pelagic (near the ocean surface) for a short period of time and begin to migrate to demersal waters during the summer of their first year of life. Larvae develop into juveniles around nearshore rocky reefs, where they may congregate for up to three years (Boehlert 1980; Sampson 1996). Evaluations of length distributions by depth developed from NMFS shelf trawl survey data generally supported other research that suggests this species is characterized by an increasing trend in mean size of fish with depth (Archibald *et al.* 1981; Boehlert 1980). Female canary rockfish generally grow faster and reach slightly larger sizes than males, but do not appear to live longer than males.

Love et al. (Love *et al.* 2002) and Williams and Adams (Williams and Adams 2001) described canary rockfish life history. The maximum age of canary rockfish is believed to be 84 years. Maximum size is 76 cm (30 in) and 7.9 kg (17 lb). A 1999 assessment estimated that the instantaneous rate of natural mortality was 0.06 (94% adult annual survival when there is no fishing mortality). Mature females may have higher natural mortality rates, and tend to be larger than males of the same age. Female canary rockfish reach 90% of their expected maximum size at 15 years.

Little is known about ecological relationships between canary rockfish and other organisms. Adult canary rockfish are often caught with bocaccio, sharpchin, yelloweye, and yellowtail rockfishes, and lingcod. Researchers have also observed canary rockfish associated with silvergray and widow rockfish. Young of the year feed on copepods, amphipods, and young stages of euphausiids. Adult canary rockfish feed primarily on small fishes, as well as planktonic creatures, such as krill and euphausiids (Love 1991; Phillips 1964). Small canary rockfish are consumed by seabirds, chinook salmon, and marine mammals.

Stock Status and Management History

Canary rockfish have long been an important component of rockfish fisheries. The Council began to recommend increasingly restrictive regulations after an assessment in 1994 (Sampson and Stewart 1994) indicated that fishing rates were too high.

From 1983 through 1994, canary rockfish were managed as part of the *Sebastes* complex, with various trip limits imposed over this period. In 1995, a cumulative monthly landing limit of 6,000 pounds was imposed specifically on canary rockfish, and commercial vessels were expected to sort the canary rockfish from the mixed species categories such as the *Sebastes* complex. For 1998, catches of canary rockfish were regulated using a two-month cumulative landing limit of 40,000 pounds for the Sebastes complex, of which no more than 15,000 pounds (38%) could be composed of canary rockfish. From 1998 to present, commercial groundfish fishing for canary rockfish has been drastically reduced, and the only significant take is that from incidental bycatch. Canary rockfish has become a limiting factor for other nongroundfish fisheries on the West Coast continental shelf.

A 1999 stock assessment showed the stock had declined below the overfished level ($B_{25\%}$) in the northern area (Columbia and U.S. Vancouver management areas, Crone *et al.* 1999) and in the southern area (Conception, Monterey, and Eureka areas, Williams *et al.* 1999). The stock was declared overfished in January 2000. The first rebuilding analysis (Methot 2000a) used results from the northern area assessment to project rates of potential stock recovery. The stock was found to have extremely low productivity, defined as production of recruits in excess of the level necessary to maintain the stock at its current, low level. Rates of recovery were highly dependent upon the level of recent recruitment, which could not be estimated with high certainty. The initial rebuilding OY for 2001 and 2002 was set at 93 mt based upon a 50% probability of rebuilding by the year 2057, a medium level for these recent recruitments, and maintaining a constant annual catch of 93 mt through 2002.

In 2002, a coastwide assessment of canary rockfish was conducted, treating the stock as a single unit from the Monterey management area north through the U.S. Vancouver area. This was a departure from the methodologies of past assessments (Methot and Piner 2002c). Although there is some evidence of genetic separation of the northern and southern stocks (Boehlert and Kappenman 1980; Wishard *et al.* 1980), the observed variability in growth rate by sex and area was not significantly different at small versus large spatial scales. The assessment by Williams et al. (Williams *et al.* 1999) suggested that at least some recruitment to the southern area may come from fish to the north. The areas of highest canary rockfish density were shown to be off headlands that separate management areas, which would tend to bias results if the assessment were stratified by area. No research has been done on the relationship between canary rockfish off Washington and British Columbia.

Another critical uncertainty in canary rockfish assessments is the lack of older, mature females in surveys and other assessment indices. The are two competing explanations for this observation. Older females could have a higher natural mortality rate, resulting in their disproportionate disappearance from the population. Alternatively, survey and fishing gears may be less effective at catching them, perhaps because older females hide in places inaccessible to the gear. If this is the case, then these fish (which, because of their higher spawning output may make an important contribution to future recruitment) are part of the population, but remain un-sampled. Methot and Piner (2002a) combined these two hypotheses in a single age-structured version of the SSC-endorsed stock synthesis assessment model (Methot 2000b) by allowing female natural mortality to increase with the maturity function, but also allowing selectivity to be domed-shaped (the model determines the selectivity of survey and fishery gear as opposed to assuming a fixed selectivity). They estimated the current abundance of canary rockfish coastwide is about 8% of B_0 (see Table 2-2). A canary rockfish rebuilding plan was adopted by the Council and submitted for incorporation in the groundfish FMP under Amendment 16-2.

2.4.1.3 Cowcod

Distribution and Life History

Relatively little is known about cowcod (*Sebastes levis*), a species of large rockfish that ranges from Ranger Bank and Guadalupe Island in central Baja California to Usal, Mendocino County, California (Miller and Lea 1972b), and may infrequently occur as far north as Newport, Oregon. Cowcod have been assessed only once (Butler *et al.* 1999).

Love *et al.* (2002) and Barnes (2001) described cowcod distribution and life history. Cowcod are most abundant in waters off central and southern California. They range from 22-491 m in depth and are considered to be parademersal (transitional between a midwater pelagic and benthic species). Adults are commonly found at depths of 180 m to 235 m and juveniles are most often found in 30 m to 149 m of water (Love *et al.* 1990).

MacGregor (1986) found that larval cowcod are almost exclusively found in Southern California and may occur many miles offshore. Juveniles occur over sandy bottom areas, and solitary ones have been observed resting within a few centimeters of soft-bottom areas where gravel or other low relief was found (Allen 1982). Young of the year have been observed on fine sand and clay sediment as well as oil platform shell mounds and other complex bottom features at depths ranging from 22-122 fm (40-224 m). Adult cowcod are primarily found over high relief rocky areas (Allen 1982). They are generally solitary, but occasionally aggregate (Love *et al.* 1990). Solitary subadult cowcod have been found in association with large white sea anemones on outfall pipes in Santa Monica Bay (Allen 1982). Although cowcod are generally not migratory, they may move, to some extent, to follow food (Love 1991).

Cowcod can live to be at least 55 years old. Maximum size is 94 cm (37 in) and 13 kg (28.5 lb). The instantaneous rate of natural mortality is believed to be 0.08 (92% adult annual survival when there is no fishing mortality) (Butler *et al.* 1999). Average size at age of mature females is similar to males. Females reach 90% of their maximum expected size by 40 years (Butler *et al.* 1999).

Cowcod are ovoviviparous, and large females may produce up to three broods per season (Love *et al.* 1990). Spawning peaks in January in the Southern California Bight (MacGregor 1986). Fecundity is dependent on size and ranges from 181,000 to 1,925,000 eggs. Larvae emerge at about 5.0 mm (MacGregor 1986).

Little is known about ecological relationships between cowcod and other organisms. Small cowcod feed on planktonic organisms such as copepods. Juveniles eat shrimp and crabs, and adults eat fish, octopus, and squid (Allen 1982).

Stock Status and Management History

While cowcod are not a major component of the groundfish fishery, they are highly desired by both recreational and commercial fishers because of their bright color and large size. The cowcod stock south of Cape Mendocino has experienced a long-term decline. The cowcod stock in the Conception area was assessed in 1998 (Butler *et al.* 1999). Abundance indices decreased approximately tenfold between the 1960s and the 1990s, based on commercial passenger fishing vessel (CPFV) logs (Butler *et al.* 1999). Recreational and commercial catch also declined substantially from peaks in the 1970s and 1980s, respectively.

B_0 was estimated to be 3,370 mt, and 1998 spawning biomass was estimated at 7% of B_0, well below the 25% overfishing threshold. As a result, NMFS declared cowcod in the Conception and Monterey management areas overfished in January 2000. Large areas off southern California (the Cowcod Conservation Areas) have been closed to fishing for cowcod. The stock's low productivity and declined spawning biomass also necessitates an extended rebuilding period, estimated at 62 years with no fishing-related mortality (T_{MIN}), to achieve a 1,350 mt B_{MSY} for the Conception management area.

There is relatively little information about the cowcod stock and there are major uncertainties in the one assessment that has been conducted. The assessment authors needed to make estimates of early landings based on more recent data and reported total landings of rockfish. Age and size composition of catches are poorly sampled, population structure is unknown, and the assessment was restricted to southern California waters.

A cowcod rebuilding review was completed in 2003, which validated the assumption that non-retention regulations and area closures have been effective in constraining cowcod fishing mortality (Butler *et al.* 2003). These results, although encouraging, are based on cowcod fishery-related removals from CPFV observations and angler reported discards. Non-retention regulations and limited observation data have increased the need for fishery independent population indices.

2.4.1.4 Darkblotched Rockfish

Distribution and Life History

Darkblotched rockfish (*Sebastes crameri*) are found from Santa Catalina Island off Southern California to the Bering Sea (Miller and Lea 1972a; Richardson and Laroche 1979). They are most abundant from Oregon to British Columbia.

Off Oregon, Washington, and British Columbia, darkblotched rockfish occur primarily on the outer shelf and upper slope (Richardson and Laroche 1979). Distinct population groups have been found off the Oregon coast between 44°30' N latitude and 45°20' N latitude (Richardson and Laroche 1979).

Young-of-the-year recruit to bottom at depths ranging from 55-200 m after spending up to five months as pelagic larvae and juveniles in offshore waters (Love *et al.* 2002). Off central California, young darkblotched rockfish recruit to soft substrate and low (<1 m) relief reefs (Love *et al.* 1991). Darkblotched rockfish make limited migrations after they become adults (Gunderson 1977).

Adults occur in depths of 25 m to 600 m, and 95% are found between 50 m and 400 m (Allen and Smith 1988). Adults are often found on mud near cobble or boulders. Fish tend to move to deeper waters as they age.

Maximum age of darkblotched rockfish is 64 years, and maximum size is 58 cm (23 in) and 2.3 kg (5.1 lb). Rogers, *et al.* (2000) estimated that the instantaneous rate of natural mortality was about 0.05 (95% adult annual survival when there is no fishing mortality). Females tend to be larger than males of the same age, and reach 90% of their maximum expected size by 13 years (Rogers *et al.* 2000).

Darkblotched rockfish are ovoviviparous (live bearers) (Nichol and Pikitch 1994). Insemination of female darkblotched rockfish occurs from August to December, and fertilization and parturition occur from December to March off Oregon and California, and primarily in February off Oregon and Washington (Hart 1988; Nichol and Pikitch 1994; Richardson and Laroche 1979). Fecundity is dependent on size and ranges from 20,000 to 610,000 eggs.

Little is known about ecological relationships between darkblotched rockfish and other organisms. Pelagic juveniles feed on planktonic organisms such as copepods. Adults are often caught with other fish such as Pacific Ocean perch and splitnose rockfish. Midwater animals such as euphausiids and amphipods dominate the diet of adult fish. Albacore and chinook salmon consume pelagic juveniles (Hart 1988); little is known about predation of adults.

Stock Status and Management History

Darkblotched rockfish were managed as part of the coastwide *Sebastes* complex, which was later segregated into north and south management units divided at 40°30' N latitude. The first assessment of darkblotched rockfish estimated the proxy MSY harvest rate and overfishing rate for the stock (Lenarz 1993). Lenarz (1993) estimated a range of likely natural mortalities (M = 0.025-0.05) for darkblotched rockfish based on a range of maximum ages (60 years to 105 years). He also estimated fishery selectivity from length compositions from the California fishery, which he converted to an age-based selectivity function. He then plotted the relative fecundity per recruit as a function of fishing-related and natural mortality to estimate an F_{MSY} of $F_{35\%}$ (the target MSY proxy harvest rate at that time) and $F_{20\%}$ (the overfishing harvest rate) relative to fecundity per recruit. Lenarz estimated the range of likely harvest rates (F) at the MSY target ($F_{35\%}$) was 0.04 to 0.06, and the overfishing harvest rate ($F_{20\%}$) ranged between 0.07 and 0.11. While he did not calculate an ABC for darkblotched rockfish, he did note the estimated harvest rates at MSY and overfishing were lower than expected. He also noted a trend of decreasing size of darkblotched rockfish from the length composition data he evaluated.

The next informative assessment for darkblotched rockfish addressed all West Coast *Sebastes* without individual ABCs (Rogers *et al.* 1996). Two methodologies were used to estimate an ABC for darkblotched rockfish. In the first method, fishing-related mortality was assumed to equal natural mortality (F=M) to estimate an $F_{35\%}$ harvest rate; in the second case, a simple stock synthesis model was used to estimate $F_{35\%}$. In the F=M approach, a catchability adjustment (Q) to triennial survey data was calculated to estimate relative biomass of generic *Sebastes*. It was determined that adjusting Q by 0.5 and then by M approximated $F_{35\%}$ estimates from stock synthesis models for most rockfish. A Q of 0.8 (instead of 0.5) was assumed for darkblotched rockfish, since the survey swept most of the depth range of darkblotched rockfish and caught smaller fish than the fishery. The other factors that influenced the magnitude of Q was a noted decreasing trend in estimated survey biomass over time, and the estimated size at 50% maturity was greater than estimated size at 50% selectivity (i.e., the survey caught darkblotched rockfish at sizes less than those estimated for most maturing and mature fish). The F=M method was compared to a stock synthesis modeling approach that incorporated triennial survey data and a Pacific ocean perch bycatch effort index.

Rogers *et al.* (2000) assessed darkblotched stock status in 2000 and determined the stock was at 14-31% of its unfished level, depending on assumptions regarding the historic catch of darkblotched rockfish in the foreign fishery from 1965-1978. They incorporated five relative abundance indices in a length based stock synthesis model (Methot 1990) to derive current estimates of abundance and productivity. The five indices included three NMFS surveys with different latitudinal and depth coverages, the Pacific ocean perch effort index developed in the generic *Sebastes* assessment (Rogers *et al.* 1996), and a logbook index derived from

California trawl logbook and species composition data stratified by major California port (Ralston 1999). Major uncertainties in the assessment model included the uncertain foreign catch composition, which had a significant effect on estimated unfished biomass (B_0), and assumptions regarding maturity, discard rates, and unchanging selectivity over time. Of these, the foreign catch of darkblotched influences our understanding of stock status the most; larger assumed historical catches increase estimates of B_0. Four accepted model runs varied the assumed foreign catch proportion from 0%-20%, which resulted in significant differences in B_0 and the spawning index. Only one of those model runs (assuming 0% foreign catch of darkblotched) estimated the stock was not overfished. In all cases, the spawning biomass increased over the three-year time period with the reduced catch and the estimated very large 1994 year class reaching maturity. The STAR Panel (PFMC 2000b) and the GMT were unable to resolve the uncertainty in foreign catch composition. While the GMT thought it implausible that no darkblotched were caught in the foreign fishery, they could not offer a definitive recommendation. Therefore, the Stock Assessment Team's (STAT) assumption that 10% of foreign catch was comprised of darkblotched (Rogers *et al.* 2000) was accepted, leading to the conclusion that the spawning stock biomass was 22% of its unfished level (see Table 2-3).

Methot and Rogers (2001) prepared a rebuilding analysis for darkblotched that was recommended by the SSC and adopted by the Council in 2001. On the earlier recommendation of the SSC (June 2001 Council meeting), they incorporated results of the 2000 triennial slope trawl survey conducted by the Alaska Fishery Science Center and modeled a more recent time series of recruitments. Incorporating these data resulted in a downward revision in the estimated recruitment and abundance throughout the time series in the Rogers et al. (2000) assessment. The mean recruitment in the 1983-1996 period was estimated to be about 67% of earlier estimates. This led to a revised estimate of spawning stock biomass at the beginning of 2002 of 14% of its unfished level. The minimum time to rebuild (T_{MIN}) in the absence of fishing was estimated to be 14 years with a median rebuilding year of 2014. The maximum time to rebuild (T_{MAX}) in accordance with the National Standard Guidelines was 47 years (2047).

An assessment update for darkblotched rockfish, completed in 2003, suggested that the stock has not changed significantly from the last assessment, but there is evidence of strong recent recruitment (Rogers 2003). These strong recruitments have not been validated by indices used in the assessment, resulting in the determination that the stock is at 11% of it unfished level ($B_{11\%}$) (Table 2-3). New information included in this update includes revised estimates of the darkblotched rockfish catch in foreign fisheries, new fishery length and age composition information, a new Triennial Survey data point, and new slope survey data. Unresolved data discrepancies between data sources in length and age composition limited the amount of new data used in this assessment update. Although the indices suggested improving stock status for darkblotched rockfish, the greatest uncertainty was associated with evidence of recent recruitment strength. The SSC STAR Lite Panel requested progressive inclusion of 1997-1999, 2000, and 2001 recruitment estimates (Ralston *et al.* 2003). Risk of error progressively increased from including those recruitment estimates because they were based on increasingly limited data. Rebuilding results were sensitive to the high 2000 and 2001 recruitment estimates and including them allowed much greater 2004 OYs because those recruits enter the fishery and help rebuild the stock before the maximum allowable year.

A darkblotched rockfish rebuilding plan was adopted by the Council and submitted for incorporation in the groundfish FMP under Amendment 16-2. The rebuilding plan established a target rebuilding year of 2030 and the harvest control rule of $F = 0.027$ (with a P_{MAX} of 80%).

2.4.1.5 Lingcod

Distribution and Life History

Lingcod (*Ophiodon elongatus*), a top order predator of the family Hexagrammidae, ranges from Baja California, Mexico, to Kodiak Island in the Gulf of Alaska. Lingcod are demersal at all life stages (Allen and Smith 1988; NOAA 1990; Shaw and Hassler 1989). Adult lingcod prefer two main habitat types: slopes of submerged banks 10 m to 70 m below the surface with seaweed, kelp, and eelgrass beds and channels with swift currents that flow around rocky reefs (Emmett *et al.* 1991; Giorgi and Congleton 1984; NOAA 1990; Shaw and Hassler 1989). Juveniles prefer sandy substrates in estuaries and shallow subtidal zones (Emmett *et al.* 1991; Forrester and Thomson 1969; Hart 1988; NOAA 1990). As the juveniles grow they move to deeper waters. Adult lingcod are considered a relatively sedentary species, but there are reports of migrations of greater than 100 km by sexually immature fish (Jagielo 1990; Mathews and LaRiviere 1987; Matthews 1992; Smith *et al.* 1990).

Mature females live in deeper water than males and move from deep water to shallow water in the winter to spawn (Forrester 1969; Hart 1988; Jagielo 1990; LaRiviere *et al.* 1980; Mathews and LaRiviere 1987; Matthews 1992; Smith *et al.* 1990). Mature males may live their whole lives associated with a single rock reef, possibly out of fidelity to a prime spawning or feeding area (Allen and Smith 1988; Shaw and Hassler 1989). Spawning generally occurs over rocky reefs in areas of swift current (Adams 1986; Adams and Hardwick 1992; Giorgi and Congleton 1984; LaRiviere *et al.* 1980). After the females leave the spawning grounds, the males remain in nearshore areas to guard the nests until the eggs hatch. Hatching occurs in April off Washington, but as early as January and as late as June at the geographic extremes of the lingcod range. Males begin maturing at about two years (50 cm), whereas females mature at three plus years (76 cm). In the northern extent of their range, fish mature at an older age and larger size (Emmett *et al.* 1991; Hart 1988; Mathews and LaRiviere 1987; Miller and Geibel 1973; Shaw and Hassler 1989). The maximum age for lingcod is about 20 years (Adams and Hardwick 1992).

Lingcod are a visual predator, feeding primarily by day. Larvae are zooplanktivores (NOAA 1990). Small demersal juveniles prey upon copepods, shrimps, and other small crustaceans. Larger juveniles shift to clupeids and other small fishes (Emmett *et al.* 1991; NOAA 1990). Adults feed primarily on demersal fishes (including smaller lingcod), squids, octopi, and crabs (Hart 1988; Miller and Geibel 1973; Shaw and Hassler 1989). Lingcod eggs are eaten by gastropods, crabs, echinoderms, spiny dogfish, and cabezon. Juveniles and adults are eaten by marine mammals, sharks, and larger lingcod (Miller and Geibel 1973; NOAA 1990).

Stock Status and Management History

In 1997, U.S. scientists assessed the size and condition of the portion of the stock in the Columbia and Vancouver areas (including the Canadian portion of the Vancouver management area), and concluded the stock had fallen to below 10% of its unfished size (Jagielo *et al.* 1997). The Council responded by imposing substantial harvest reductions coastwide, reducing the harvest targets for the Eureka, Monterey, and Conception areas by the same percentage as in the north. In 1999, scientists assessed the southern portion of the stock and concluded the condition of the southern stock was similar to the northern stock, thus confirming the Council had taken appropriate action to reduce harvest coastwide (Adams *et al.* 1999).

Jagielo (2000) conducted a coastwide lingcod assessment and determined the total biomass increased from 6,500 mt in the mid-1990s to about 8,900 mt in 2000. In the south, the population had also increased slightly from 5,600 mt in 1998 to 6,200 mt in 2000. In addition, the assessment concluded previous aging methods portrayed an older population; whereas new aging efforts showed the stock to be younger and more productive. Therefore, the ABC and OY were increased in 2001 on the basis of the new assessment. A revised rebuilding analysis of coastwide lingcod (Jagielo and Hastie 2001) was adopted by the Council in September 2001. It confirmed the major conclusions of the 2000 assessment and rebuilding analysis, but slightly modified recruitment projections to stay on the rebuilding trajectory that reaches target biomass in 2009. This modification resulted in a slight decrease in the 2002 ABC and OY.

A new, full coastwide assessment for lingcod was completed in 2003 and approved by the Council in March 2004 for a use in setting harvest specifications for the 2005-2006 biennium.

A lingcod rebuilding plan was adopted by the Council and incorporated into the groundfish FMP under Amendment 16-2. Rebuilding parameters based on the 2000 rebuilding analysis are presented in Table 2-2.

2.4.1.6 Pacific Ocean Perch

Distribution and Life History

Pacific ocean perch (POP, *Sebastes alutus*) are found from La Jolla (Southern California) to the western boundary of the Aleutian Archipelago (Eschmeyer *et al.* 1983; Gunderson 1971; Ito *et al.* 1986; Miller and Lea 1972b), but are common from Oregon northward (Eschmeyer *et al.* 1983). They primarily inhabit waters of the upper continental slope (Dark and Wilkins 1994) and are found along the edge of the continental shelf (Archibald *et al.* 1983). Pacific ocean perch occur as deep as 825 m, but usually are at 100 m to 450 m and along submarine canyons and depressions (NOAA 1990). Larvae and juveniles are pelagic; subadults and adults are benthopelagic. Adults form large schools 30 m wide, to 80 m deep, and as much as 1,300 m long (NOAA 1990). They also form spawning schools (Gunderson 1971). Juvenile POP form ball-shaped schools near the surface or hide in rocks (NOAA 1990). Throughout their range, POP are generally associated with gravel, rocky, or boulder type substrate found in and along gullies, canyons, and submarine depressions of the upper continental slope (Ito 1986).

Pacific ocean perch winter and spawn in deeper water (>275 m). In the summer (June through August) they move to feeding grounds in shallower water (180 m to 220 m) (June through August) to allow gonads to ripen (Archibald *et al.* 1983; Gunderson 1971; NOAA 1990). They are slow-growing and long-lived. The maximum age has been estimated at about 98 years (Heifetz *et al.* 2000). Largest size is about 54 cm and 2 kg (Archibald *et al.* 1983; Beamish 1979; Eschmeyer *et al.* 1983; Ito *et al.* 1986; Mulligan and Leaman 1992; NOAA 1990). POP are carnivorous. Larvae eat small zooplankton. Small juveniles eat copepods, and larger juveniles feed on euphausiids. Adults eat euphausiids, shrimps, squids, and small fishes. Immature fish feed throughout the year, but adults feed only seasonally, mostly April through August (NOAA 1990). POP predators include sablefish and Pacific halibut.

Stock Status and Management History

POP were harvested exclusively by U.S. and Canadian vessels in the Columbia and Vancouver INPFC areas prior to 1965. Large Soviet and Japanese factory trawlers began fishing for POP in 1965 in the Vancouver area and in the Columbia area a year later. Intense fishing pressure by these foreign fleets occurred during the 1966 through 1975 period. The foreign fishery ended in 1977 after passage of the Magnuson-Stevens Act and the transition to a domestic fishery.

The POP resource off the West Coast was overfished before implementation of the groundfish FMP. Large removals of POP in the foreign trawl fishery, followed by significant declines in catch and abundance led the Council to limit harvest beginning in 1979. A 20-year rebuilding plan for POP was adopted in 1981. Rebuilding under the original plan was largely influenced by a cohort analysis of 1966 through 1976 catch and age composition data (Gunderson 1979), updated with 1977 through 1980 data (Gunderson 1981), and an evaluation of trip limits as a management tool (Tagart *et al.* 1980). This was the first time trip limits were used by the Council to discourage targeting and overharvest of an overfished stock. This is a management strategy still in use today in the West Coast groundfish fishery. The OY for POP was also lowered significantly. After twenty years of rebuilding under the original plan, the stock stabilized at a lower equilibrium than estimated in the pre-fishing condition. While continuing stock decline was abated, rebuilding was not achieved as the stock failed to increase in abundance to B_{MSY}.

Ianelli (1998) estimated POP female spawning biomass in 1997 was 13% of its unfished level, thereby confirming the stock was overfished. NMFS formally declared POP overfished in March 1999 after the groundfish FMP was amended to incorporate the tenets of the Sustainable Fisheries Act. The Council adopted and NMFS enacted more conservative management measures in 1999 as part of a redoubled rebuilding effort.

A 2000 POP assessment suggests the stock is more productive than originally thought (Ianelli *et al.* 2000). A revised POP rebuilding analysis was completed and adopted by the Council in 2001 (Punt and Ianelli 2001). This analysis estimated a T_{MIN} of 12 years and a T_{MAX} of 42 years. It was noted in the rebuilding analysis that the ongoing retrospective analysis of historic foreign fleet catches (Rogers In prep) is likely to change projections of POP rebuilding.

A new assessment for POP was done in 2003 (Punt *et al.* 2003) incorporating updated survey and fishery data including the retrospective of foreign fleet catches (Rogers In prep). The assessment region covers areas from southern Oregon to the U.S. border with Canada, the southern extent of POP distribution. The overall conclusion is that the stock is relatively stable at approximately 28% of its unfished biomass ($B_{28\%}$). Many cases were presented in the rebuilding analysis and, based on SSC advice, the Council chose the one based on the full Bayesian posterior distribution where recruits were resampled to project future recruitment (Case C). Using the full Bayesian posterior distribution captured more of the assessment model uncertainty than using the maximum of the posterior density function. Resampling recruits rather than recruits per spawner was recommended because only the southern fringe of the stock occurs in waters off the U.S. West Coast. One would want to resample recruits per spawner if measured recruitment is a function of measured stock size. However, it is unlikely that the recruitment measured off the U.S. West Coast is wholly from the portion of the parental stock occurring in these same waters. Therefore, resampling recruits was advised.

A Pacific ocean perch rebuilding plan was adopted by the Council and submitted for incorporation in the groundfish FMP under Amendment 16-2. The rebuilding plan established a target rebuilding year of 2027 and the harvest control rule of $F = 0.0082$ (with a P_{MAX} of 70%) (Table 2.-3).

2.4.1.7 Widow Rockfish

Distribution and Life History

Widow rockfish (*Sebastes entomelas*) range from Albatross Bank of Kodiak Island to Todos Santos Bay, Baja California, Mexico (Eschmeyer *et al.* 1983; Miller and Lea 1972a; NOAA 1990). They occur over hard bottoms along the continental shelf (NOAA 1990) and prefer rocky banks, seamounts, ridges near canyons, headlands, and muddy bottoms near rocks. Large widow rockfish concentrations occur off headlands such as Cape Blanco, Cape Mendocino, Point Reyes, and Point Sur. Adults form dense, irregular, midwater and semi-demersal schools deeper than 100 m at night and disperse during the day (Eschmeyer *et al.* 1983; NOAA 1990; Wilkins 1986). All life stages are pelagic, but older juveniles and adults are often associated with the bottom (NOAA 1990). All life stages are fairly common from Washington to California (NOAA 1990). Pelagic larvae and juveniles co-occur with yellowtail rockfish, chilipepper, shortbelly rockfish, and bocaccio larvae and juveniles off Central California (Reilly *et al.* 1992).

Widow rockfish are ovoviviparous, have internal fertilization, and brood their eggs until released as larvae (NOAA 1990; Ralston *et al.* 1996a; Reilly *et al.* 1992). Mating occurs from late fall-early winter. Larval release occurs from December through February off California, and from February through March off Oregon. Juveniles are 21 mm to 31 mm at metamorphosis, and they grow to 25 cm to 26 cm over three years. Age and size at sexual maturity varies by region and sex, generally increasing northward and at older ages and larger sizes for females. Some mature in three years (25 cm to 26 cm), 50% are mature by four years to five years (25 cm to 35 cm), and most are mature in eight years (39 cm to 40 cm) (NOAA 1990). The maximum age of widow rockfish is 28 years, but rarely over 20 years for females and 15 years for males (NOAA 1990). The largest size is 53 cm and about 2.1 kg (Eschmeyer *et al.* 1983; NOAA 1990).

Widow rockfish are carnivorous. Adults feed on small pelagic crustaceans, midwater fishes (such as age-one or younger Pacific whiting), salps, caridean shrimp, and small squids (Adams 1987; NOAA 1990). During spring, the most important prey item is salps, during the fall fish are more important, and during the winter widow rockfish primarily eat sergestid shrimp (Adams 1987). Feeding is most intense in the spring after spawning (NOAA 1990). Pelagic juveniles are opportunistic feeders, and their prey consists of various life stages of calanoid copepods, and euphausiids (Reilly *et al.* 1992).

Stock Status and Management History

Widow rockfish are an important commercial species from British Columbia to central California, particularly since 1979, when Oregon trawl fisherman demonstrated the ability to make large catches at night using midwater trawl gear. Since that time, many more participants entered the fishery and landings of widow rockfish increased rapidly (Love *et al.* 2002). Widow rockfish are a minor component of the recreational groundfish fisheries.

Williams (2000) assessed the widow rockfish in 2000. The spawning output level (8,223 mt), based on that assessment and a revised rebuilding analysis (Punt and MacCall 2002) adopted by the Council in June 2001, was at 23.6% of the unfished level (33,490 mt) in 1999. This result was computed using the average recruitment from 1968 to 1979 multiplied by the spawning output-per-recruit at F = 0. The analysis concluded the rebuilding period in the absence of fishing is 22 years, and with a mean generation time of 16 years, the maximum allowable time to rebuild (T_{MAX}) is 38 years. Widow rockfish were declared overfished in 2001 based on these analyses. A rebuilding plan is being developed for incorporation into the FMP through Amendment 16-3.

The most recent assessment (He *et al.* 2003b) concluded that the widow rockfish stock size is 22.4% of the unfished biomass, but indicates that stock productivity is considerably lower than previously thought. Data sparseness was a significant problem in this widow rockfish assessment (Conser *et al.* 2003; He *et al.* 2003b). Limited logbook data prior to 1990 is available from bottom trawl fisheries, a questionable data source for a midwater species. The NMFS laboratory at Santa Cruz conducts a midwater trawl survey from which a juvenile index is derived. This index has been highly variable in its ability to predict recruitment in part due to the survey's limited geographical area relative to the overall distribution of widow rockfish. The widow rockfish rebuilding analysis considered a wide range of model formulations that investigated different hypothesis on natural mortality, stock-recruitment variability, and the use of a power coefficient to reduce variability of the Santa Cruz midwater juvenile survey. The SSC recommended model formulations that pre-specify the recruitment for 2003-2005, do not use a stock-recruitment relationship (recruits per spawner ratios were used instead to project future recruitment), and vary the power coefficient between two and four in the Santa Cruz midwater juvenile survey. The SSC did not recommend a power coefficient higher than four because the relationship between the Santa Cruz midwater survey recruitment index and other recruitment indices changed dramatically with higher powers. The previous rebuilding analysis (Punt and MacCall 2002) had used a power coefficient of 10 that dampened the estimate of recruitment variability and suggested much higher stock productivity.

Many of the strategic rebuilding parameters for widow rockfish did not change dramatically with the new rebuilding analysis (Table 2-3). The rebuilding period in the absence of fishing increased to 25 years and, with a mean generation time of 16 years, the maximum allowable time to rebuild (T_{MAX}) is 41 years. However, the harvest rate associated with these rebuilding trajectories has dropped significantly in response to the new understanding of decreased stock productivity. The interim rebuilding OY for 2003 using the 2000 rebuilding analysis was 832 mt. Under the 2003 rebuilding analysis (He *et al.* 2003a), the OY for 2004 is 284 mt using the base model (Model 8, which uses a power coefficient of three).

2.4.1.9 Yelloweye Rockfish

Distribution and Life History

Yelloweye rockfish (*Sebastes ruberrimus*) range from the Aleutian Islands, Alaska, to northern Baja California, Mexico, and are common from Central California northward to the Gulf of Alaska (Eschmeyer *et al.* 1983; Hart 1988; Love 1991; Miller and Lea 1972b; O'Connell and Funk 1986). Yelloweye rockfish occur in water 25 m to 550 m deep with 95% of survey catches occurring from 50 m to 400 m (Allen and Smith 1988). Yelloweye rockfish are bottom dwelling, generally solitary, rocky reef fish, found either on or just over reefs (Eschmeyer *et al.* 1983; Love 1991; Miller and Lea 1972b; O'Connell and Funk 1986). Boulder areas in deep water (>180 m) are the most densely populated habitat type, and juveniles prefer shallow-zone broken-rock habitat (O'Connell and Carlile 1993). They also reportedly occur around steep cliffs and offshore pinnacles (Rosenthal *et al.* 1982). The presence of refuge spaces is an important factor affecting their occurrence (O'Connell and Carlile 1993).

Yelloweye rockfish are ovoviviparous and give birth to live young in June off Washington (Hart 1988). The age of first maturity is estimated at six years and all are estimated to be mature by eight years (Wyllie Echeverria 1987). They can grow to 91 cm (Eschmeyer *et al.* 1983; Hart 1988) and males and females probably grow at the same rates (Love 1991; O'Connell and Funk 1986). The growth rate levels off at approximately 30 years of age (O'Connell and Funk 1986) but they can live to be 114 years old (Love 1991; O'Connell and Funk 1986). Yelloweye rockfish are a large predatory reef fish that usually feeds close to the bottom (Rosenthal *et al.* 1982). They have a widely varied diet, including fish, crabs, shrimps and snails, rockfish, cods, sand lances, and herring (Love 1991). Yelloweye rockfish have been observed underwater capturing smaller rockfish with rapid bursts of speed and agility. Off Oregon the major food items of the yelloweye rockfish include cancroid crabs, cottids, righteye flounders, adult rockfishes, and pandalid shrimps (Steiner 1978). Quillback and yelloweye rockfish have many trophic features in common (Rosenthal *et al.* 1982).

Stock Status and Management History

The first ever yelloweye rockfish stock assessment was conducted in 2001 (Wallace 2002). This assessment incorporated two area assessments: one from Northern California using CPUE indices constructed from Marine Recreational Fisheries Statistical Survey (MRFSS) sample data and CDFG data collected on board commercial passenger fishing vessels, and the other from Oregon using Oregon Department of Fish and Wildlife (ODFW) sampling data. The assessment concluded current yelloweye rockfish stock biomass is about 7% of unexploited biomass in Northern California and 13% of unexploited biomass in Oregon. The assessment revealed a thirty-year declining biomass trend in both areas with the last above average recruitment occurring in the late 1980s. The assessment's conclusion that yelloweye rockfish biomass was well below the 25% of unexploited biomass threshold for overfished stocks led to this stock being separated from the rockfish complexes in which it was previously listed. Until 2002, when yelloweye rockfish were declared overfished, they were listed in the "remaining rockfish" complex on the shelf in the Vancouver, Columbia, and Eureka INPFC areas and the "other rockfish" complex on the shelf in the Monterey and Conception areas. As with the other overfished stocks, yelloweye rockfish harvest is now tracked separately.

In June 2002 the SSC recommended that managers should conduct a new assessment incorporating Washington catch and age data. This recommendation was based on evidence that the biomass distribution of yelloweye rockfish on the West Coast was centered in waters off Washington and that useable data from Washington were available. Based on that testimony, the Council recommended completing a new assessment in the summer of 2002, before a final decision was made on 2003 management measures. Methot et al. (2002b) did the assessment, which was reviewed by a STAR Panel in August 2002. The assessment result was much more optimistic than the one prepared by Wallace (2002), largely due to the incorporation of Washington fishery data. While the overfished status of the stock was confirmed (24% of unfished biomass), Methot et al. (2002b) provided evidence of higher stock productivity than originally assumed (Table 2-2). The assessment also treated the stock as a coastwide assemblage. This assessment was reviewed and approved by the SSC and the Council at the September 2002 Council meeting.

2.4.2 Precautionary Zone Stocks

2.4.2.1 Dover Sole

Distribution and Life History

Dover sole (*Microstomus pacificus*) are distributed from the Navarin Canyon in the northwest Bering Sea and westernmost Aleutian Islands to San Cristobal Bay, Baja California, Mexico (Hagerman 1952; Hart 1988; NOAA 1990). Dover sole are a dominant flatfish on the continental shelf and slope from Washington to Southern California. Adults are demersal and are found from 9 m to 1,450 m, with highest abundance below 200 m to 300 m (Allen and Smith 1988). Adults and juveniles show a high affinity toward soft bottoms of fine sand and mud. Juveniles are often found in deep nearshore waters. Dover sole are considered to be a migratory species. In the summer and fall, mature adults and juveniles can be found in shallow feeding grounds, as shallow as 55 m off British Columbia (Westrheim and Morgan 1963). By late fall, Dover sole begin moving offshore into deep waters (400 m or more) to spawn. Although there is an inshore-offshore seasonal migration, little north-south coastal migration occurs (Westrheim and Morgan 1963).

Spawning occurs from November through April off Oregon and California (Hart 1988; NOAA 1990; Pearcy *et al.* 1977) in waters 80 m to 550 m depth at or near the bottom (Hagerman 1952; Hart 1988; Pearcy *et al.* 1977). Dover sole are oviparous and fertilization is external. Larvae are planktonic and are transported to offshore nursery areas by ocean currents and winds for up to two years. Settlement to benthic living occurs mid-autumn to early spring off Oregon, and February through July off California (Markle *et al.* 1992). Juvenile fish move into deeper water with age and begin seasonal spawning and feeding migrations upon reaching maturity.

Dover sole larvae eat copepods, eggs, and nauplii, as well as other plankton. Juveniles and adults eat polychaetes, bivalves, brittlestars, and small benthic crustaceans. Dover sole feed diurnally by sight and smell (Dark and Wilkins 1994; Gabriel and Pearcy 1981; Hart 1988; NOAA 1990). Dover sole larvae are eaten by pelagic fishes like albacore, jack mackerel and tuna, as well as sea birds. Juveniles and adults are preyed upon by sharks, demersally feeding marine mammals, and to some extent by sablefish (NOAA 1990). Dover sole compete with various eelpout species, rex sole, English sole, and other fishes of the mixed species flatfish assemblage (NOAA 1990).

Stock Status and Management History

The 1997 Dover sole assessment north of the Conception area provided landed catch OYs based on the $F_{40\%}$ harvest rate (Brodziak *et al.* 1997). The Groundfish Management Team (GMT) recommended a 2001 total catch OY of 7,151 mt, which is the average of yields calculated for 2000 through 2002 at $F_{40\%}$ (with the 40-10 adjustment), inflated to reflect 5% discard. The Groundfish FMP set the original ABC for the Conception Area at 1,000 mt based on average landings. For 1998, this was inflated to reflect 5% discard for a total catch ABC of 1,053 mt. The coastwide total catch ABC is 8,204 mt. To calculate the total catch OY (7,677 mt), the GMT reduced the Conception area's OY contribution by 50% (to 526 mt), consistent with the new harvest policy. The coastwide landed catch target was then calculated to be 95% of OY, or 7,293 mt.

The 1997 Dover sole stock assessment treated the entire population from the Monterey area through the U.S./Vancouver area as a single stock based on recent research addressing the genetic structure of the population. The assessment author generated projections of spawning biomass and expected landings for 1998 to 2000 under a variety of harvest policies and three recruitment scenarios. The hypothetical harvest policies ranged from an immediate reduction to the $F_{45\%}$ harvest rate to an increase up to the $F_{20\%}$ harvest rate. In all cases, for each of the low, medium, and high projected recruitments, the expected spawning biomass increased from the estimated year-end level in 1997 through the year 2000 due to growth of the exceptionally large 1991 year class and to the lower catches observed in the fishery since 1991.

Researchers carried out a new Dover sole stock assessment in 2001, resulting in an estimated spawning stock size that is about 29% of the unexploited biomass (Sampson and Wood 2001). Although there is no recent clear trend in abundance, stocks steadily declined from the 1950s until the mid-1990s. The 1991 year class was the last strong one, which confirms the findings of the 1997 assessment. Poor ocean conditions associated with the El Niños in the 1990s have likely affected Dover sole recruitment. The 2001 assessment authors projected five years of Dover sole harvest levels based on preferred, optimistic, and pessimistic projections of recruitment. These options varied the harvest rate from F40% (the current F_{MSY} proxy) to F50%. The Council adopted an ABC of 8,510 mt and an OY of 7,440 mt, which is calculated using the current FMSY proxy and the 40-10 adjustment.

2.4.2.2 Sablefish

Distribution and Life History

Sablefish (*Anoplopoma fimbria*) are abundant in the north Pacific, from Honshu Island, Japan, north to the Bering Sea, and southeast to Cedros Island, Baja California, Mexico. There are at least three genetically distinct populations off the West Coast of North America: one south of Monterey characterized by slower growth rates and smaller average size, one that ranges from Monterey to the U.S./Canada border that is characterized by moderate growth rates and size, and one ranging off British Columbia and Alaska characterized by fast growth rates and large size. Large adults are uncommon south of Point Conception (Hart 1988; Love 1991; McFarlane and Beamish 1983a; McFarlane and Beamish 1983b; NOAA 1990). Adults are found as deep as 1,900 m, but are most abundant between 200 m and 1,000 m (Beamish and McFarlane 1988; Kendall and Matarese 1987; Mason *et al.* 1983). Off Southern California , sablefish are abundant to depths of 1,500 m (MBC 1987). Adults and large juveniles commonly occur over sand and mud (McFarlane and Beamish 1983a; NOAA 1990) in deep marine waters. They were also reported on hard-packed mud and clay bottoms in the vicinity of submarine canyons (MBC 1987).

Spawning occurs annually in the late fall through winter in waters greater than 300 m (Hart 1988; NOAA 1990). Sablefish are oviparous with external fertilization (NOAA 1990). Eggs hatch in about 15 days (Mason *et al.* 1983; NOAA 1990) and are demersal until the yolk sac is absorbed (Mason *et al.* 1983).

Age-zero juveniles become pelagic after the yolk sac is absorbed. Older juveniles and adults are benthopelagic. Larvae and small juveniles move inshore after spawning and may rear for up to four years (Boehlert and Yoklavich 1985; Mason *et al.* 1983). Older juveniles and adults inhabit progressively deeper waters. Estimates indicate that 50% of females are mature at five years to six years (24 inches) and 50% of males are mature at five years (20 inches).

Sablefish larvae prey on copepods and copepod nauplii. Pelagic juveniles feed on small fishes and cephalopods—mainly squids (Hart 1988; Mason *et al.* 1983). Demersal juveniles eat small demersal fishes, amphipods, and krill (NOAA 1990). Adult sablefish feed on fishes like rockfishes and octopus (Hart 1988; McFarlane and Beamish 1983a). Larvae and pelagic juvenile sablefish are heavily preyed upon by seabirds and pelagic fishes. Juveniles are eaten by Pacific cod, Pacific halibut, lingcod, spiny dogfish, and marine mammals, such as Orca whales (Cailliet *et al.* 1988; Hart 1988; Love 1991; Mason *et al.* 1983; NOAA 1990). Sablefish compete with many other co-occurring species for food, mainly Pacific cod and spiny dogfish (Allen 1982).

Stock Status and Management History

There are at least three genetically distinct populations on the West Coast of North America: one south of Monterey characterized by slower growth rates and smaller average size, one that ranges from Monterey to the U.S./Canada border that is characterized by moderate growth rates and size, and one ranging off British Columbia and Alaska characterized by fast growth rates and large size. The Council actively assesses and manages the stock found between California and Washington.

The 2001 sablefish ABC (7,661 mt) was based on the proxy $F_{45\%}$ harvest rate, and the OY (6,895 mt) on application of the 40-10 harvest policy (the stock was estimated at 37% of the initial biomass). The OY applied north of 36° N latitude. A 22% trawl discard rate was based on discard rates observed in the mid to late 1980s. The GMT assumed an average mortality rate of 70% for discarded fish, which may have been too low for a predominantly summer fishery and too high for a winter fishery.

In 2001 two stock assessments were done for the sablefish stock north of Monterey (Hilborn *et al.* 2001; Schirripa and Methot 2001). The assessments incorporated new survey and fishery data and extended the assessment area south from 36° N latitude to 34° 27' N latitude (Point Conception). Both assessments indicated a normal decline in biomass since the late 1970s due to the fishing down of the unfished stock and an unexpected decline in recruitment during the early 1990s. A change in environmental conditions may have been responsible for the abrupt decline in recruitment in the 1990s (see section 2.3.1), or this low recruitment may have been the natural consequence of the gradual decline in spawning biomass. The sablefish stock is currently estimated to be between 27% and 38% of the unfished biomass, depending on the assessment scenario and the basis for estimating unfished biomass. Recruitment scenarios in both assessments hinge on two different hypotheses: whether sablefish recruitment has been most affected by density dependence, or by environmental regime shifts. Because of this uncertainty, two 2002 ABC estimates were produced and reviewed by the Council: an ABC of 4,786 mt based on the current F_{MSY} proxy of $F_{45\%}$, and an ABC of 4,062 mt based on a reduced harvest rate of $F_{50\%}$. The Council adopted the ABC based on the proxy harvest rate, but adjusted it to reflect the distribution north and south of 36° N latitude. This was done because a plan amendment would be needed to change the management area since groundfish FMP Amendment 14, permit stacking, specified only the area north of 36° N latitude. The OY was based on the 40-10 adjustment. The Council also wanted to verify industry reports of a large abundance of juvenile sablefish, an observation that was confirmed to some extent by preliminary results from the 2001 NMFS slope survey. Based on these considerations, the Council recommended a new expedited assessment be done in 2002.

Schirripa (2002) recently re-assessed the stock under the terms of reference developed by the SSC for expedited stock assessments. Under these terms of reference, the assessment would be updated with new survey and fishery data, but would not be restructured in any substantive fashion. This allowed an expedited but less rigorous review of the updated assessment, compared to an assessment that uses a new model. The expedited assessment confirmed fishers' anecdotal reports of a large 1999 year class, which is also apparent in the preliminary results of the 2001 slope survey. This new assessment also suggests that 2000 produced a relatively strong year class.

2.4.2.3 Shortspine Thornyhead

Distribution and Life History

Shortspine thornyhead (*Sebastolobus alascanus*) are found from northern Baja California, Mexico, to the Bering Sea and occasionally to the Commander Islands north of Japan (Jacobson and Vetter 1996). They are common from Southern California northward (Love 1991). Shortspine thornyhead inhabit areas over the continental shelf and slope (Erickson and Pikitch 1993; Wakefield and Smith 1990). Although they can occur as shallow as 26 m (Eschmeyer *et al.* 1983), shortspine thornyhead mainly occur between 100 m and 1,400 m off Oregon and California, most commonly between 100 m to 1,000 m (Jacobson and Vetter 1996).

Spawning occurs in February and March off California (Wakefield and Smith 1990). Shortspine thornyhead are thought to be oviparous (Wakefield and Smith 1990), although there is no clear evidence to substantiate this (Erickson and Pikitch 1993). Eggs rise to the surface to develop and hatch. Larvae are pelagic for about 12 months to 15 months. During January to June, juveniles settle onto the continental shelf and then move into deeper water as they become adults (Jacobson and Vetter 1996). Off California, they begin to mature at five years; 50% are mature by 12 years to 13 years; and all are mature by 28 years (Owen and Jacobson 1992). Although it is difficult to determine the age of older individuals, Owen and Jacobson (1992) report that off California, they may live to over 100 years of age. The mean size of shortspine thornyhead increases with depth and is greatest at 1,000 m to 1,400 m (Jacobson and Vetter 1996).

Benthic individuals are ambush predators that rest on the bottom and remain motionless for extended periods of time (Jacobson and Vetter 1996). Off Alaska, shortspine thornyhead eat a variety of invertebrates such as shrimps, crabs, and amphipods, as well as fishes and worms (Owen and Jacobson 1992). Longspine thornyhead are a common item found in the stomachs of shortspine thornyhead. Cannibalism of newly settled juveniles is important in the life history of thornyheads (Jacobson and Vetter 1996).

Stock Status and Management History

Shortspine thornyhead are a major component of the deepwater fishery on the continental slope, especially the trawl fishery for Dover sole, thornyheads, and sablefish (referred to as the DTS complex). The status of this stock is subject to substantial public debate; the species is one of the most numerous components of the slope ecosystem. However, this is an especially long-lived species and cannot sustain aggressive harvest rates. It is taken coincidentally with Dover sole, sablefish, and longspine thornyhead, especially in the upper slope and lower shelf; in deeper water, longspine thornyhead is a more predominate species. The two thornyhead species are often difficult to distinguish, and historical landings data combine the two into a single category. Shortspine thornyhead is a "constraining species" in the deepwater fishery; that is, coincidental catch of this species prevents full harvest of Dover sole and sablefish.

The individual assessments for shortspine thornyhead and longspine thornyhead in 1997 covered the area from Central California at 36° N latitude (the southern boundary of the Monterey management area) to the U.S./Canada border (the northern boundary of the U.S./Vancouver management area) (Rogers *et al.* 1997). The STAR Panel expressed concern that management requires more detailed information on thornyheads than could be obtained from the available data. Given the kinds and quality of data, the more accurate assessments are difficult because, (1) growth and natural mortality for shortspine thornyhead is uncertain, (2) it is difficult to differentiate between longspine and shortspine thornyheads in the historic landings, (3) year class strength is not easily estimated, and (4) true discard rates are unknown.

The 2001 shortspine thornyhead ABC (757 mt) was based on a synthesis of two stock assessments prepared in 1998 (NMFS STAT and OT STAT 1998; Rogers *et al.* 1998) and application of the $F_{50\%}$ harvest rate. The 2001 shortspine thornyhead ABCs and OYs were separately specified north and south of 36° N latitude, which is the northern boundary of the Conception area. The stock size was estimated to be 32% of the unfished abundance in 1999. The 2001 OY (689 mt) was based on $F_{50\%}$ and the 40-10 policy. The landed catch equivalent reflected a 20% reduction for discard.

There were a range of uncertainties in the most recent assessment of shortspine thornyhead, in 2001, not the least of which was the estimated biomass (Piner and Methot 2001). The assessment was extended south to Point Conception (in contrast to past surveys, which were limited to stocks north of 36° N latitude management area boundary). The authors concluded the 2001 spawning biomass ranged between 25% and 50% of unexploited spawning biomass. The uncertainty in abundance largely revolved around the uncertainty in recruitment and survey Q, or catchability, of shortspine thornyhead in slope surveys. The authors also concluded that the trend in stock biomass was increasing and the stock was not overfished. Based on estimated biomass and application of the GMT-recommended F=0.75M principle (which approximates an $F_{50\%}$ proxy harvest rate for shortspine thornyhead), the assessment authors and GMT recommended a slight increase in the ABC and OY for 2002 and combining the previous Monterey area north and Conception area specifications to a coastwide one. Despite the uncertainty in biomass estimates and determination of whether shortspine thornyhead should be treated as a "precautionary zone" stock, these recommendations did treat the stock as such by applying the 40-10 adjustment. The Council adopted the GMT-recommended coastwide ABC of 1,004 mt, and the associated total catch OY of 955 mt for 2002 management.

2.4.3 Stocks at or Above Target Levels

2.4.3.1 Arrowtooth Flounder

Arrowtooth flounder (*Atheresthes stomias*) range from the southern coast of Kamchatka to the northwest Bering Sea and Aleutian Islands to San Simeon, California. Arrowtooth flounder is the dominant flounder species on the outer continental shelf from the western Gulf of Alaska to Oregon. Eggs and larvae are pelagic; juveniles and adults are demersal (Garrison and Miller 1982; NOAA 1990). Juveniles and adults are most commonly found on sand or sandy gravel substrates, but occasionally occur over low-relief rock-sponge bottoms. Arrowtooth flounder exhibit a strong migration from shallow water summer feeding grounds on the continental shelf to deep water spawning grounds over the continental slope (NOAA 1990). Depth distribution may vary from as little as 50 m in summer to more than 500 m in the winter (Garrison and Miller 1982; NOAA 1990; Rickey 1995).

Arrowtooth flounder are oviparous with external fertilization. Spawning may occur deeper than 500 m off Washington (Rickey 1995). Larvae eat copepods, their eggs, and copepod nauplii (Yang 1995; Yang and Livingston 1985). Juveniles and adults feed on crustaceans (mainly ocean pink shrimp and krill) and fish (mainly gadids, herring, and pollock) (Hart 1988; NOAA 1990). Arrowtooth flounder exhibit two feeding peaks, at noon and midnight.

2.4.3.2 Bank Rockfish

Bank rockfish (*Sebastes rufus*) are found from Newport, Oregon, to central Baja California, Mexico, most commonly from Fort Bragg southward (Love 1992). Bank rockfish occur offshore (Eschmeyer*et al.* 1983) from depths of 31 m to 247 m (Love 1992), although adults prefer depths over 210 m (Love *et al.* 1990). Observations of commercial catches indicate juveniles occupy the shallower part of the species range (Love *et al.* 1990). Bank rockfish are a midwater, aggregating species and are found over hard bottoms (Love 1992), over high relief or on bank edges (Love *et al.* 1990), and along the ledge of Monterey Canyon (Sullivan 1995). They also frequent deep water over muddy or sandy bottoms (Miller and Lea 1972a). Spawning occurs from December to May (Love *et al.* 1990). Peak spawning of bank rockfish in the Southern California Bight occurs in January and a month later in Central and Northern California. Off California, bank rockfish are multiple brooders (Love *et al.* 1990). Females grow to a larger maximum size (50 cm) than males (44 cm), but grow at a slightly slower rate (Cailliet *et al.* 1996). Males reach first maturity at 28 cm, 50% maturity at 31 cm, and 100% at 38 cm. Females reach first maturity at 31 cm, 50% at 36 cm, and 100% maturity at 39 cm (Love *et al.* 1990). Bank rockfish are midwater feeders, eating mostly gelatinous planktonic organisms such as tunicates, but also preying on small fishes and krill (Love 1992).

2.4.3.3 Black Rockfish

Black rockfish (*Sebastes melanops*) are found from Southern California (San Miguel Island) to the Aleutian Islands (Amchitka Island) and they occur most commonly from San Francisco northward (Hart 1988; Miller and Lea 1972a; Phillips 1957; Stein and Hassler 1989). Black rockfish occur from the surface to greater than 366 m; however, they are most abundant at depths less than 54 m (Stein and Hassler 1989). Off California, black rockfish are found along with the blue, olive, kelp, black-and-yellow, and gopher rockfishes (Hallacher and Roberts 1985). Adults are usually observed well up in the water column (Hallacher and Roberts 1985). The abundance of black rockfish in shallow water declines in the winter and increases in the summer (Stein and Hassler 1989). Densities of black rockfish decrease with depth during both the upwelling and non-upwelling seasons (Hallacher and Roberts 1985; PFMC 1996). Off Oregon, larger fish seem to be found in deeper water (20 m to 50 m) (Stein and Hassler 1989). Black rockfish off the northern Washington coast and outer Strait of Juan de Fuca exhibit no significant movement. However, fish appear to move from the Central Washington coast southward to the Columbia River, but not into waters off Oregon. Movement displayed by black rockfish off the northern Oregon coast is primarily northward to the Columbia River (Culver 1986). Black rockfish form mixed sex, midwater schools, especially in shallow water (Hart 1988; Stein and Hassler 1989). Black rockfish larvae and young juveniles (<40 mm to 50 mm) are pelagic, but are benthic at larger sizes (Laroche and Richardson 1980).

Black rockfish have internal fertilization and annual spawning (Stein and Hassler 1989). Parturition occurs from February through April off British Columbia, January through March off Oregon, and January through May off California (Stein and Hassler 1989). Spawning areas are unknown, but spawning may occur in offshore waters because gravid females have been caught well offshore (Dunn and Hitz 1969; Hart 1988; Stein and Hassler 1989). Black rockfish can live to be more than 20 years in age. The maximum length attained by the black rockfish is 60 cm (Hart 1988; Stein and Hassler 1989). Off Oregon, black rockfish primarily prey on pelagic nekton (anchovies and smelt) and zooplankton such as salps, mysids, and crab megalops. Off Central California, juveniles eat copepods and zoea, while adults prey on juvenile rockfish, euphausiids, and amphipods during upwelling periods. During periods without upwelling they primarily consume invertebrates. Black rockfish feed almost exclusively in the water column (Culver 1986). Black rockfish are known to be eaten by lingcod and yelloweye rockfish (Stein and Hassler 1989).

2.4.3.4 Blackgill Rockfish

Blackgill rockfish *(Sebastes melanostomus)* are distributed from Washington to Punta Abreojos in central Baja California, Mexico (Love 1991; Moser and Ahlstrom 1978). Adult blackgill rockfish are found offshore at depths of 219 m to 768 m (Eschmeyer *et al.* 1983). Blackgill rockfish usually inhabit rocky or hard bottom habitats along steep drop-offs, such as the edges of submarine canyons and over seamounts (Love 1991). However, they may also occur over soft bottoms (Eschmeyer *et al.* 1983). Blackgill rockfish are a transitional species, occupying both midwater and benthic habitats (Love *et al.* 1990), although they are rarely taken at more than 9 m above the bottom (Love 1991). Blackgill are considered an aggregating species (Love 1991).

Blackgill rockfish spawn from January to June (peaking in February) off Southern California , and in February off Central and northern California (Love 1991; Love *et al.* 1990; Moser and Ahlstrom 1978). The largest blackgill rockfish on record is 61 cm (Eschmeyer *et al.* 1983, Love 1991, Love *et al.* 1990). Blackgill rockfish primarily prey on such planktonic prey as euphausiids and pelagic tunicates, as well as small fishes (e.g., juvenile rockfishes and Pacific whiting, anchovies, and lantern fishes), and squid (Love *et al.* 1990).

2.4.3.5 Chilipepper Rockfish

Chilipepper rockfish (*Sebastes goodei*) are found from Magdalena Bay, Baja California, Mexico, to as far north as the northwest coast of Vancouver Island, British Columbia (Allen 1982); Hart, 1988 #231, (Miller and Lea 1972a). Chilipepper have been taken as deep as 425 m, but nearly all in survey catches were taken between 50 and 350 m (Allen and Smith 1988). Adults and older juveniles usually occur over the shelf and slope; larvae and small juveniles are generally found near the surface. In California, chilipepper are most commonly found associated with deep, high relief rocky areas and along cliff drop-offs (Love *et al.* 1990), as well as on sand and mud bottoms (MBC 1987). They are occasionally found over flat, hard substrates (Love *et al.* 1990). Love (1991) does not consider this to be a migratory species. Chilipepper may migrate as far as 45 m off the bottom during the day to feed (Love 1991).

Chilipeppers are ovoviviparous and eggs are fertilized internally (Reilly *et al.* 1992). Chilipepper school by sex just prior to spawning (MBC 1987). In California, fertilization of eggs begins in October and spawning occurs from September to April (Oda 1992) with the peak occurring during December to January (Love *et al.* 1990). Chilipepper may spawn multiple broods in a single season (Love *et al.* 1990). Females of the species are significantly larger, reaching lengths of up to 56 cm (Hart 1988). Males are usually smaller than 40 cm (Dark and Wilkins 1994). Males mature at two years to six years of age, and 50% are mature at three years to four years. Females mature at two years to five years with 50% mature at three years to four years (MBC 1987). Females may attain an age of about 27 years, whereas the maximum age for males is about 12 years (MBC 1987).

Larval and juvenile chilipepper eat all life stages of copepods and euphausiids, and are considered to be somewhat opportunistic feeders (Reilly *et al.* 1992). In California, adults prey on large euphausiids, squid, and small fishes such as anchovies, lanternfish, and young hake (Hart 1988; Love *et al.* 1990). Chilipepper are found with widow rockfish, greenspotted rockfish, and swordspine rockfish (Love *et al.* 1990). Juvenile chilipepper compete for food with bocaccio, yellowtail rockfish, and shortbelly rockfish (Reilly *et al.* 1992).

2.4.3.6 English Sole

English sole (*Parophrys vetulus*) are found from Nunivak Island in the southeast Bering Sea and Agattu Island in the Aleutian Islands, to San Cristobal Bay, Baja California Sur, Mexico (Allen and Smith 1988). In research survey data, nearly all occurred at depths greater than 250 m (Allen and Smith 1988). Adults and juveniles prefer soft bottoms composed of fine sands and mud (Ketchen 1956), but also occur in eelgrass habitats (Pearson and Owen 1992). English sole use nearshore coastal and estuarine waters as nursery areas (Krygier and Pearcy 1986; Rogers *et al.* 1988). Adults make limited migrations. Those off Washington show a northward post-spawning migration in the spring on their way to summer feeding grounds and a southerly movement in the fall (Garrison and Miller 1982). Tagging studies have identified separate stocks based on this species' limited movements and meristic characteristics (Jow 1969).

Spawning occurs over soft-bottom mud substrates (Ketchen 1956) from winter to early spring, depending on the stock. Eggs are neritic and buoyant, but sink just before hatching (Hart 1988); juveniles and adults are demersal (Garrison and Miller 1982). Small juveniles settle in the estuarine and shallow nearshore areas all along the coast, but are less common in southerly areas, particularly south of Point Conception. Large juveniles commonly occur up to depths of 150 m. Although many postlarvae may settle outside of estuaries, most will enter estuaries during some part of their first year of life (Gunderson *et al.* 1990). Some females mature as three-year-olds (26 cm), but all females over 35 cm long are mature. Males mature at two years (21 cm).

Larvae are planktivorous. Juveniles and adults are carnivorous, eating copepods, amphipods, cumaceans, mysids, polychaetes, small bivalves, clam siphons, and other benthic invertebrates (Allen 1982; Becker 1984; Hogue and Carey 1982; Simenstad *et al.* 1979). English sole feed primarily by day, using sight and smell, and sometimes dig for prey (Allen 1982; Hulberg and Oliver 1979). A juvenile English sole's main predators are probably piscivorous birds such as great blue heron (*Ardia herodias*), larger fishes, and marine mammals. Adults may be eaten by marine mammals, sharks, and other large fishes.

2.4.3.7 Longspine Thornyhead

Longspine thornyhead (*Sebastolobus altivelis*) are found from the southern tip of Baja California, Mexico, to the Aleutian Islands (Eschmeyer *et al.* 1983, Jacobson and Vetter 1996, Love 1991, Miller and Lea 1972, Smith and Brown 1983), but are abundant from Southern California northward (Love 1991). Juvenile and adult longspine thornyhead are demersal and occupy the benthic surface (Smith and Brown 1983). Off Oregon and California, longspine thornyhead mainly occur at depths of 400 m to 1,400 plus m, most between 600 m and 1,000 m in the oxygen minimum zone (Jacobson and Vetter 1996). Thornyhead larvae (*Sebastolobus* spp.) have been taken in research surveys up to 560 km off the California coast (Cross 1987; Moser *et al.* 1993). Juveniles settle on the continental slope at about 600 m to 1,200 m (Jacobson and Vetter 1996). Longspine thornyhead live on soft bottoms, preferably sand or mud (Eschmeyer *et al.* 1983, Jacobson and Vetter 1996, Love 1991). Longspine thornyheads neither school nor aggregate (Jacobson and Vetter 1996).

Spawning occurs in February and March at 600 m to 1,000 m (Jacobson and Vetter 1996, Wakefield and Smith 1990). Longspine thornyhead are oviparous and are multiple spawners, spawning two to four batches per season (Love 1991, Wakefield and Smith 1990). Eggs rise to the surface to develop and hatch. Floating egg masses can be seen at the surface in March, April, and May (Wakefield and Smith 1990). Juveniles (<5.1 cm long) occur in midwater (Eschmeyer *et al.* 1983). After settling, longspine thornyhead are completely benthic (Jacobson and Vetter 1996). Longspine thornyhead can grow to 38 cm (Eschmeyer *et al.* 1983, Jacobson and Vetter 1996, Miller and Lea 1972) and live more than 40 years (Jacobson and Vetter 1996). Longspine thornyhead reach the onset of sexual maturity at 17 cm to 19 cm total length (10% of females mature) and 90% are mature by 25 cm to 27 cm (Jacobson and Vetter 1996).

Longspine thornyhead are ambush predators (Jacobson and Vetter 1996). They consume fish fragments, crustaceans, bivalves, and polychaetes and occupy a tertiary consumer level in the food web. Pelagic juveniles prey largely on herbivorous euphausiids and occupy a secondary consumer level in the food web (Love 1991, Smith and Brown 1983). Longspine thornyhead are commonly found in shortspine thornyhead stomachs. Cannibalism in newly settled longspine thornyhead may occur, because juveniles settle directly onto adult habitat (Jacobson and Vetter 1996). Sablefish commonly prey on longspine thornyhead.

2.4.3.8 Pacific Cod

Pacific cod (*Gadus macrocephalus*) are widely distributed in the coastal north Pacific, from the Bering Sea to Southern California in the east, and to the Sea of Japan in the west. Adult Pacific cod occur as deep as 875 m (Allen and Smith 1988), but the vast majority occurs between 50 m and 300 m (Allen and Smith 1988, Hart 1986, Love 1991, NOAA 1990). Along the West Coast, Pacific cod prefer shallow, soft-bottom habitats in marine and estuarine environments (Garrison and Miller 1982), although adults have been found associated with coarse sand and gravel substrates (Garrison and Miller 1982; Palsson 1990). Larvae and small juveniles are pelagic; large juveniles and adults are parademersal (Dunn and Matarese 1987; NOAA 1990). Adult Pacific cod are not considered to be a migratory species. There is, however, a seasonal bathymetric movement from deep spawning areas of the outer shelf and upper slope in fall and winter to shallow middle-upper shelf feeding grounds in the spring (Dunn and Matarese 1987; Hart 1988; NOAA 1990; Shimada and Kimura 1994).

Pacific cod have external fertilization (Hart 1986, NOAA 1990) with spawning occurring from late fall to early spring. Their eggs are demersal. Larvae may be transported to nursery areas by tidal currents (Garrison and Miller 1982). Half of females are mature by three years (55 cm) and half of males are mature by two years (45 cm) (Dunn and Matarese 1987, Hart 1986). Juveniles and adults are carnivorous and feed at night (Allen and Smith 1988; Palsson 1990) with the main part of the adult Pacific cod diet being whatever prey species is most abundant (Kihara and Shimada 1988; Klovach *et al.* 1995). Larval feeding is poorly understood. Pelagic fish and sea birds eat Pacific cod larvae, while juveniles are eaten by larger demersal fishes, including Pacific cod. Adults are preyed upon by toothed whales, Pacific halibut, salmon shark, and larger Pacific cod (Hart 1986, Love 1991, NOAA 1990, Palsson 1990). The closest competitor of the Pacific cod for resources is the sablefish (Allen 1982).

2.4.3.9 Pacific Whiting

Distribution and Life History

Pacific whiting (*Merluccius productus*), also known as Pacific hake, are a semi-pelagic merlucciid (a cod-like fish species) that range from Sanak Island in the western Gulf of Alaska to Magdalena Bay, Baja California Sur, Mexico. They are most abundant in the California Current System (Bailey 1982; Hart 1988; Love 1991; NOAA 1990). Smaller populations of Pacific whiting occur in several of the larger semi-enclosed inlets of the northeast Pacific Ocean, including the Strait of Georgia, Puget Sound, and the Gulf of California (Bailey *et al.* 1982; Stauffer 1985). The highest densities of Pacific whiting are usually between 50 m and 500 m, but adults occur as deep as 920 m and as far offshore as 400 km (Bailey 1982; Bailey *et al.* 1982; Dark and Wilkins 1994; Dorn 1995; Hart 1988; NOAA 1990). Pacific whiting school at depth during the day, then move to the surface and disband at night for feeding (McFarlane and Beamish 1986; Sumida and Moser 1984; Tanasich *et al.* 1991). Coastal stocks spawn off Baja, California in the winter, then the mature adults begin moving northward and inshore following food supply and Davidson Currents (NOAA 1990). Pacific whiting reach as far north as southern British Columbia by fall. They then begin a southern migration to spawning grounds further offshore (Bailey *et al.* 1982; Dorn 1995; Smith 1995; Stauffer 1985).

Spawning occurs from December through March, peaking in late January (Smith 1995). Pacific whiting are oviparous with external fertilization. Eggs of the Pacific whiting are neritic and float to neutral buoyancy (Bailey 1982; Bailey *et al.* 1982; NOAA 1990). Hatching occurs in five days to six days, and within three months to four months juveniles are typically 35 mm (Hollowed 1992). Juveniles move to deeper water as they get older (NOAA 1990). Females mature at three years to four years (34 cm to 40 cm) and nearly all males are mature by three years (28 cm). Females grow more rapidly than males after four years; growth ceases for both sexes at 10 years to 13 years (Bailey *et al.* 1982).

All life stages feed near the surface late at night and early in the morning (Sumida and Moser 1984). Larvae eat calanoid copepods, as well as their eggs and nauplii (McFarlane and Beamish 1986; Sumida and Moser 1984). Juveniles and small adults feed chiefly on euphausiids (NOAA 1990). Large adults also eat amphipods, squid, herring, smelt, crabs, and sometimes juvenile whiting (Bailey 1982; Dark and Wilkins 1994; McFarlane and Beamish 1986; NOAA 1990). Eggs and larvae of Pacific whiting are eaten by pollock, herring, invertebrates, and sometimes Pacific whiting. Juveniles are eaten by lingcod, Pacific cod, and rockfish species. Adults are preyed on by sablefish, albacore, pollock, Pacific cod, marine mammals, soupfin sharks, and spiny dogfish (Fiscus 1979; McFarlane and Beamish 1986; NOAA 1990).

Stock Status and Management History

The history of the coastal whiting fishery is characterized by rapid changes brought about by the development of foreign fisheries in 1966, joint-venture fisheries in the early 1980s, and domestic fisheries in 1990s. Whiting are assessed annually by a joint technical team of U.S. and Canadian scientists. The 2001 assessment (Helser *et al.* 2002) incorporated 2001 hydroacoustic survey data and showed the spawning stock biomass declined substantially and had been lower during the past several years than previously estimated. The stock assessment estimated the biomass in 2001 was 0.7 million mt, and the female spawning biomass was less than 20% of the unfished biomass. This was substantially lower than indicated in the 1998 assessment (Dorn *et al.* 1999), which estimated the biomass to be at 39% of its unfished biomass. Therefore, NMFS declared the whiting stock overfished in April 2002. The stock was projected to be near 25% of the unfished biomass in 2002 and above $B_{25\%}$ in 2003. In retrospect, revised biomass estimates based on the results of the 2001assessment indicate the exploitation rates in 1999 (28%), 2000 (24%) and 2001 (31%) were above the overfishing level.

The most recent whiting stock assessment (Helser *et al.* 2004), incorporating new data from the 2003 hydro-acoustic survey, estimates current biomass between 47% and 51% of unfished biomass; the stock is therefore not currently overfished, nor is it in the precautionary zone. Furthermore, because the 1999 year class was larger than previously estimated, estimates of the 2001 biomass in the current stock assessment range from 27% to 33% of unfished biomass, indicating that the stock approached, but never fell below, the $B_{25\%}$ minimum stock size threshold (Whiting STAR Panel 2004). On April 30, 2004, NMFS announced that Pacific whiting is no longer considered an overfished stock (69 FR 23667). This removes the requirement to prepare a rebuilding plan and manage the stock accordingly.

2.4.3.10 Petrale Sole

Petrale sole (*Eopsetta jordani*) are found from Cape Saint Elias, Alaska to Coronado Island, Baja California, Mexico. The range may possibly extend into the Bering Sea, but the species is rare north and west of southeast Alaska and in the inside waters of British Columbia (Garrison and Miller 1982; Hart 1988). Nine separate breeding stocks have been identified, although stocks intermingle on summer feeding grounds (Hart 1988; NOAA 1990). Of these nine, one occurs off British Columbia, two off Washington, two off Oregon, and four off California. Adults are found from the surf line to 550 m, but their highest abundance is deeper than 300 m. Adults migrate seasonally between deepwater, winter spawning areas to shallower, spring feeding grounds. They show an affinity to sand, sandy mud, and occasionally muddy substrates (NOAA 1990).

Spawning occurs over the continental shelf and continental slope to as deep as 550 m. Spawning occurs in large spawning aggregations in the winter. Eggs are pelagic and juveniles and adults are demersal (Garrison and Miller 1982). Eggs and larvae are transported from offshore spawning areas to nearshore nursery areas by oceanic currents and wind. Larvae metamorphose into juveniles at six months (22 cm) and settle to the bottom of the inner continental shelf (Pearcy *et al.* 1977). Petrale sole tend to move into deeper water with increased age and size. Petrale sole begin maturing at three years. Half of males mature by seven years (29 cm to 43 cm) and half of the females are mature by eight years (>44 cm) (Pearcy *et al.* 1977; Pedersen 1975a; Pedersen 1975b). Near the Columbia River, petrale sole mature one to two years earlier (Pedersen 1975a; Pedersen 1975b).

Larvae are planktivorous. Small juveniles eat mysids, sculpins, and other juvenile flatfishes. Large juveniles and adults eat shrimps and other decapod crustaceans, as well as euphausiids, pelagic fishes, ophiuroids, and juvenile petrale sole (Garrison and Miller 1982; Hart 1988; Pearcy *et al.* 1977; Pedersen 1975a; Pedersen 1975b). Petrale sole eggs and larvae are eaten by planktivorous invertebrates and pelagic fishes. Juveniles are preyed upon (sometimes heavily) by adult petrale sole, as well as other large flatfishes. Adults are preyed upon by sharks, demersally feeding marine mammals, and larger flatfishes and pelagic fishes (NOAA 1990). Petrale sole competes with other large flatfishes. It has the same summer feeding grounds as lingcod, English sole, rex sole, and Dover sole (NOAA 1990).

2.4.3.11 Shortbelly Rockfish

Shortbelly rockfish (*Sebastes jordani*) are found from San Benito Islands, Baja California, Mexico, to La Perouse Bank, British Columbia (Eschmeyer *et al.* 1983; Lenarz 1980). The habitat of the shortbelly rockfish is wide ranging (Eschmeyer *et al.* 1983). Shortbelly rockfish inhabit waters from 50 m to 350 m in depth (Allen and Smith 1988) on the continental shelf (Chess *et al.* 1988) and upper-slope (Stull and Tang 1996). Adults commonly form very large schools over smooth bottoms near the shelf break (Lenarz 1992). Shortbelly rockfish have also been observed along the Monterey Canyon ledge (Sullivan 1995). During the day shortbelly rockfish are found near the bottom in dense aggregations. At night they are more dispersed (Chess *et al.* 1988). During the summer shortbelly rockfish tend to move into deeper waters and to the north as they grow, but they do not make long return migrations to the south in the winter to spawn (Lenarz 1980).

Shortbelly rockfish are viviparous, bearing advanced yolk sac larvae (Ralston *et al.* 1996a). Shortbelly rockfish spawn off California during January through April (Lenarz 1992). Larvae metamorphose to juveniles at 27 mm and appear to begin forming schools at the surface at that time (Laidig *et al.* 1991; Lenarz 1980). A few shortbelly rockfish mature at age two, while 50% are mature at age three, and nearly all are mature by age four (Lenarz 1992). They live to be about ten years old (Lenarz 1980; MacGregor 1986) with the maximum recorded age being 22 years (Lenarz 1992).

Shortbelly rockfish feed primarily on various life stages of euphausiids and calanoid copepods both during the day and night (Chess *et al.* 1988; Lenarz *et al.* 1991). Shortbelly rockfish play a key role in the food chain as they are preyed upon by chinook and coho salmon, lingcod, black rockfish, Pacific whiting, bocaccio, chilipepper, pigeon guillemots, western gull, marine mammals, and other taxa (Chess *et al.* 1988; Eschmeyer *et al.* 1983; Hobson and Howard 1989; Lenarz 1980).

2.4.3.12 Splitnose Rockfish

Splitnose rockfish (*Sebastes diploproa*) occur from Prince William Sound, Alaska to San Martin Island, Baja California, Mexico (Miller and Lea 1972). Splitnose rockfish occur from zero m to 800 m, with most survey catches occurring in depths of 100 m to 450 m (Allen and Smith 1988). The relative abundance of juveniles (<21 cm) is quite high in the 91 m to 272 m depth zone and then decreases sharply in the 274 m to 475 m depth zone (Boehlert 1980). Splitnose rockfish have a pelagic larval stage, a prejuvenile stage, and a benthic juvenile stage (Boehlert 1977). Benthic splitnose rockfish associate with mud habitats (Boehlert 1980). Young occur in shallow water, often at the surface under drifting kelp (Eschmeyer *et al.* 1983). The major types of vegetation juveniles are found under are *Fucus* spp. (dominant), eelgrass, and bull kelp (Shaffer *et* *al.* 1995). Juvenile splitnose rockfish off Southern California are the dominant rockfish species found under drifting kelp (Boehlert 1977).

Splitnose rockfish are ovoviviparous and release yolk sac larvae (Boehlert 1977). They may have two parturition seasons, or may possibly release larvae throughout the year (Boehlert 1977). In general, the main parturition season get progressively shorter and later toward the north (Boehlert 1977). Splitnose rockfish growth rates vary with latitude, being generally faster in the north. Splitnose rockfish mean sizes increase with depth in a given latitudinal area. Mean lengths of females are generally greater than males (Boehlert 1980). Off California, 50% maturity occurs at 21 cm, or five years of age, whereas off British Columbia 50% of males and females are mature at 27 cm (Hart 1988). Adults can achieve a maximum size of 46 cm (Boehlert 1980, Eschmeyer *et al.* 1983, Hart 1986). Females have surface ages to 55 years and section ages to 81 years.

Adult splitnose rockfish off Southern California feed on midwater plankton, primarily euphausiids (Allen 1982). Juveniles feed mainly on planktonic organisms, including copepods and cladocerans during June and August. In October, their diets shift to larger epiphytic prey and are dominated by a single amphipod species. Juvenile splitnose rockfish actively select prey (Shaffer *et al.* 1995)) and are probably diurnally active (Allen 1982). Adults are probably nocturnally active, at least in part (Allen 1982).

2.4.3.13 Yellowtail Rockfish

Yellowtail rockfish (*Sebastes flavidus*) range from San Diego, California, to Kodiak Island, Alaska (Fraidenburg 1980; Gotshall 1981; Lorz *et al.* 1983; Love 1991; Miller and Lea 1972a; Norton and MacFarlane 1995). The center of yellowtail rockfish abundance is from Oregon to British Columbia (Fraidenburg 1980). Yellowtail rockfish are a common, demersal species abundant over the middle shelf (Carlson and Haight 1972; Fraidenburg 1980; Tagart 1991; Weinberg 1994). Yellowtail rockfish are most common near the bottom, but not on the bottom (Love 1991; Stanley *et al.* 1994). Yellowtail rockfish adults are considered semi-pelagic (Stanley *et al.* 1994; Stein *et al.* 1992) or pelagic, which allows them to range over wider areas than benthic rockfish (Pearcy 1992). Adult yellowtail rockfish occur along steeply sloping shores or above rocky reefs (Hart 1986). They can be found above mud with cobble, boulder and rock ridges, and sand habitats; they are not, however, found on mud, mud with boulder, or flat rock (Love 1991, Stein *et al.* 1992). Yellowtail rockfish form large (sometimes greater than 1,000 fish) schools and can be found alone or in association with other rockfishes (Love 1991, Pearcy 1992, Rosenthal *et al.* 1982, Stein *et al.* 1992, Tagart 1991). These schools may persist at the same location for many years (Pearcy 1992).

Yellowtail rockfish are viviparous (Norton and MacFarlane 1995) and mate from October to December. Parturition peaks in February and March and from November to March off California (Westrheim 1975). Young-of-the-year pelagic juveniles often appear in kelp beds beginning in April and live in and around kelp in midwater during the day, descending to the bottom at night (Love 1991, Tagart 1991). Male yellowtail rockfish are 34 cm to 41 cm in length (five years to nine years) at 50% maturity, females are 37 cm to 45 cm (six years to ten years) (Tagart 1991). Yellowtail rockfish are long-lived and slow-growing; the oldest recorded individual was 64 years old (Fraidenburg 1981, Tagart 1991). Yellowtail rockfish have a high growth rate relative to other rockfish species (Tagart 1991). They reach a maximum size of about 55 cm in approximately 15 years (Tagart 1991). Yellowtail rockfish feed mainly on pelagic animals, but are opportunistic, occasionally eating benthic animals as well (Lorz *et al.* 1983). Large juveniles and adults eat fish (small Pacific whiting, Pacific herring, smelt, anchovies, lanternfishes, and others), along with squid, krill, and other planktonic organisms (euphausiids, salps, and pyrosomes) (Love 1991, Phillips 1964, Rosenthal *et al.* 1982, Tagart 1991).

2.4.3.14 Groundfish Stock Complexes

Rockfish Stock Complexes

Rockfish species, excluding thornyheads, are divided into categories north and south of Cape Mendocino (40º 10' N latitude) depending on the depths where they are most often caught; nearshore, shelf, and slope (see Figure 2-4). South of Cape Mendocino, the minor nearshore complex is further divided into three categories; shallow nearshore species, deeper nearshore species, and California scorpionfish. The shallow nearshore category includes black-and-yellow rockfish, China rockfish, gopher rockfish, grass rockfish, and kelp rockfish. The deeper nearshore category includes black rockfish, blue rockfish, brown rockfish, calico rockfish, copper rockfish, olive rockfish, quillback rockfish, and treefish.

Other Groundfish Stock Complexes

"Other Fish" are those FMP groundfish species or species groups for which there is no specified landing limit, size limit, quota, or harvest guideline (as defined in federal regulation at 50 CFR 660.302).

"Other Flatfish" are those species that do not have individual ABC/OYs and include butter sole, curlfin sole, flathead sole, Pacific sanddab, rex sole, rock sole, sand sole, and starry flounder. Life history descriptions of these species may be found in the EFH Appendix to the groundfish FMP (EFH Core Team for West Coast Groundfish 1998).

TABLE 2-1. Latitudinal and depth distributions of groundfish species (adults) managed under the Pacific Coast Groundfish Fishery Management Plan.[a/] (Page 1 of 3)

		Latitudinal Distribution		Depth Distribution (fm)	
Common name	**Scientific name**	**Overall**	**Highest Density**	**Overall**	**Highest Density**
		Flatfish Species			
Arrowtooth flounder	*Atheresthes stomias*	N. 34°N. lat.	N. 40°N. lat.	10-400	27-270
Butter sole	*Isopsetta isolepis*	N. 34°N. lat.	N. 34°N. lat.	0-200	0-100
Curlfin sole	*Pleuronichthys decurrens*	Coastwide	Coastwide	4-291	4-50
Dover sole	*Microstomus pacificus*	Coastwide	Coastwide	10-500	110-270
English sole	*Parophrys vetulus*	Coastwide	Coastwide	0-300	40-200
Flathead sole	*Hippoglossoides elassodon*	N. 38°N. lat.	N. 40°N. lat.	3-300	100-200
Pacific sanddab	*Citharichthys sordidus*	Coastwide	Coastwide	0-300	0-82
Petrale sole	*Eopsetta jordani*	Coastwide	Coastwide	10-250	160-250
Rex sole	*Glyptocephalus zachirus*	Coastwide	Coastwide	10-350	27-250
Rock sole	*Lepidopsetta bilineata*	Coastwide	N. 32°30'N. lat.	0-200	summer 10-44 winter 70-150
Sand sole	*Psettichthys melanostictus*	Coastwide	N. 33°50'N. lat.	0-100	0-44
Starry flounder	*Platichthys stellatus*	Coastwide	N. 34°20'N. lat.	0-150	0-82
		Rockfish Species			
Aurora rockfish	*Sebastes aurora*	Coastwide	Coastwide	100-420	82-270
Bank rockfish	*Sebastes rufus*	S. 39°30'N. lat.	S. 39°30'N. lat.	17-135	115-140
Black rockfish	*Sebastes melanops*	N. 34°N. lat.	N. 34°N. lat.	0-200	0-30
Black-and-yellow rockfish	*Sebastes chrysomelas*	S. 40°N. lat.	S. 40°N. lat.	0-20	0-10
Blackgill rockfish	*Sebastes melanostomus*	Coastwide	S. 40°N. lat.	48-420	125-300
Blue rockfish	*Sebastes mystinus*	Coastwide	Coastwide	0-300	13-21
Bocaccio[b/]	*Sebastes paucispinis*	Coastwide	S. 40° N. lat., N. 48° N. lat.	15-180	54-82
Bronzespotted rockfish	*Sebastes gilli*	S. 37°N. lat.	S. 37°N. lat.	41-205	110-160
Brown rockfish	*Sebastes auriculatus*	Coastwide	S. 40°N. lat.	0-70	0-50
Calico rockfish	*Sebastes dallii*	S. 38°N. lat.	S. 33°N. lat.	10-140	33-50
California scorpionfish rockfish	*Scorpaena gutatta*	S. 37°N. lat.	S. 34°27'N. lat.	0-100	0-100
Canary rockfish	*Sebastes pinniger*	Coastwide	Coastwide	50-150	50-100
Chameleon rockfish	*Sebastes phillipsi*	37°- 33°N. lat.	37°- 33°N. lat.	95-150	95-150
Chilipepper	*Sebastes goodei*	Coastwide	34°- 40°N. lat.	27-190	27-190
China rockfish	*Sebastes nebulosus*	N. 34°N. lat.	N. 35°N. lat.	0-70	2-50
Copper rockfish	*Sebastes caurinus*	Coastwide	S. 40°N. lat.	0-100	0-100
Cowcod	*Sebastes levis*	S. 40°N. lat.	S. 34°27'N. lat.	22-203	100-130
Darkblotched rockfish	*Sebastes crameri*	N. 33°N. lat.	N. 38°N. lat.	16-300	96-220
Dusky rockfish[c/]	*Sebastes ciliatus*	N. 55°N. lat.	N. 55°N. lat.	0-150	0-150
Dwarf-Red rockfish[d/]	*Sebastes rufinanus*	33° N. lat.	33°N. lat.	>100	>100
Flag rockfish	*Sebastes rubrivinctus*	S. 38° N. lat.	S. 37°N. lat.	17-100	shallow
Freckled rockfish	*Sebastes lentignosus*	S. 33° N.l at.	S. 33° N. lat.	22-92	22-92
Gopher rockfish	*Sebastes carnatus*	S. 40° N. lat.	S. 40°N. lat.	0-30	0-16
Grass rockfish	*Sebastes rastrelliger*	S. 44°40' N. lat.	S. 40°N. lat.	0-25	0-8
Greenblotched rockfish	*Sebastes rosenblatti*	S. 38°N. lat.	S. 38° N. lat.	33-217	115-130
Greenspotted rockfish	*Sebastes chlorostictus*	S. 47° N. lat.	S. 40° N. lat.	27-110	50-100
Greenstriped rockfish	*Sebastes elongatus*	Coastwide	Coastwide	33-220	27-136
Halfbanded rockfish	*Sebastes semicinctus*	S. 36°40' N. lat.	S. 36°40' N. lat.	32-220	32-220
Harlequin rockfish[e/]	*Sebastes variegatus*	N. 40° N. lat.	N. 51° N. lat.	38-167	38-167
Honeycomb rockfish	*Sebastes umbrosus*	S. 36°40' N. lat.	S. 34°27' N. lat.	16-65	16-38
Kelp rockfish	*Sebastes atrovirens*	S. 39° N. lat.	S. 37° N. lat.	0-25	3-4
Longspine thornyhead	*Sebastolobus altivelis*	Coastwide	Coastwide	167->833	320-550
Mexican rockfish	*Sebastes macdonaldi*	S. 36°20' N. lat.	S. 36°20' N. lat.	50-140	50-140

TABLE 2-1. Latitudinal and depth distributions of groundfish species (adults) managed under the Pacific Coast Groundfish Fishery Management Plan.[a/] (Page 2 of 3)

		Latitudinal Distribution		**Depth Distribution (fm)**	
Common name	**Scientific name**	**Overall**	**Highest Density**	**Overall**	**Highest Density**
Olive rockfish	*Sebastes serranoides*	S. 41°20' N. lat.	S. 40° N. lat.	0-80	0-16
Pacific ocean perch	*Sebastes alutus*	Coastwide	N. 42° N. lat.	30-350	110-220
Pink rockfish	*Sebastes eos*	S. 37° N. lat.	S. 35° N. lat.	40-200	40-200
Pinkrose rockfish	*Sebastes simulator*	S. 34° N. lat.	S. 34° N. lat.	54-160	108
Puget Sound rockfish	*Sebastes emphaeus*	N. 40° N. lat.	N. 40° N. lat.	6-200	6-200
Pygmy rockfish	*Sebastes wilsoni*	N. 32°30' N.l at.	N. 32°30' N. lat.	17-150	17-150
Quillback rockfish	*Sebastes maliger*	N. 36°20' N. lat.	N. 40° N. lat.	0-150	22-33
Redbanded rockfish	*Sebastes babcocki*	Coastwide	N. 37° N. lat.	50-260	82-245
Redstripe rockfish	*Sebastes proriger*	N. 37° N. lat.	N. 37° N. lat.	7-190	55-190
Rosethorn rockfish	*Sebastes helvomaculatus*	Coastwide	N. 38° N. lat.	65-300	55-190
Rosy rockfish	*Sebastes rosaceus*	S. 42° N. lat.	S. 40° N. lat.	8-70	30-58
Rougheye rockfish	*Sebastes aleutianus*	Coastwide	N. 40° N. lat.	27-400	27-250
Semaphore rockfish	*Sebastes melanosema*	S. 34°27' N. lat.	S. 34°27' N. lat.	75-100	75-100
Sharpchin rockfish	*Sebastes zacentrus*	Coastwide	Coastwide	50-175	50-175
Shortbelly rockfish	*Sebastes jordani*	Coastwide	S. 46°N. lat.	50-175	50-155
Shortraker rockfish	*Sebastes borealis*	N. 39°30' N. lat.	N. 44° N. lat.	110-220	110-220
Shortspine thornyhead	*Sebastolobus alascanus*	Coastwide	Coastwide	14->833	55-550
Silvergray rockfish	*Sebastes brevispinis*	Coastwide	N. 40° N. lat.	17-200	55-160
Speckled rockfish	*Sebastes ovalis*	S. 38° N. lat.	S. 37° N. lat.	17-200	41-83
Splitnose rockfish	*Sebastes diploproa*	Coastwide	Coastwide	50-317	55-250
Squarespot rockfish	*Sebastes hopkinsi*	S. 38° N. lat.	S. 36° N. lat.	10-100	10-100
Starry rockfish	*Sebastes constellatus*	S. 38° N. lat.	S. 37° N. lat.	13-150	13-150
Stripetail rockfish	*Sebastes saxicola*	Coastwide	Coastwide	5-230	5-190
Swordspine rockfish	*Sebastes ensifer*	S. 38° N. lat.	S. 38° N. lat.	38-237	38-237
Tiger rockfish	*Sebastes nigrocinctus*	N. 35° N. lat.	N. 35° N. lat.	30-170	35-170
Treefish	*Sebastes serriceps*	S. 38° N. lat.	S. 34°27' N. lat.	0-25	3-16
Vermillion rockfish	*Sebastes miniatus*	Coastwide	Coastwide	0-150	4-130
Widow rockfish	*Sebastes entomelas*	Coastwide	N. 37° N. lat.	13-200	55-160
Yelloweye rockfish	*Sebastes ruberrimus*	Coastwide	N. 36° N. lat.	25-300	27-220
Yellowmouth rockfish	*Sebastes reedi*	N. 40° N. lat.	N. 40° N. lat.	77-200	150-200
Yellowtail rockfish	*Sebastes flavidus*	Coastwide	N. 37° N. lat.	27-300	27-160
Roundfish Species					
Cabezon	*Scorpaenichthys marmoratus*	Coastwide	Coastwide	0-42	0-27
Kelp greenling	*Hexagrammos decagrammus*	Coastwide	N. 40° N. lat.	0-25	0-10
Lingcod	*Ophiodon elongatus*	Coastwide	Coastwide	0-233	0-40
Pacific cod	*Gadus macrocephalus*	N. 34° N. lat.	N. 40° N. lat.	7-300	27-160
Pacific whiting	*Merluccius productus*	Coastwide	Coastwide	20-500	27-270
Sablefish	*Anoplopoma fimbria*	Coastwide	Coastwide	27->1,000	110-550
Shark and Skate Species					
Big skate	*Raja binoculata*	Coastwide	S. 46° N. lat.	2-110	27-110
California skate	*Raja inornata*	Coastwide	S. 39° N. lat.	0-367	0-10
Leopard shark	*Triakis semifasciata*	S. 46°N. lat.	S. 46° N. lat.	0-50	0-2
Longnose skate	*Raja rhina*	Coastwide	N. 46° N. lat.	30-410	30-340
Soupfin shark	*Galeorhinus zyopterus*	Coastwide	Coastwide	0-225	0-225
Spiny dogfish	*Squalus acanthias*	Coastwide	Coastwide	0->640	0-190
Other Species					
Finescale codling	*Antimora microlepis*	Coastwide	N. 38° N. lat.	190-1,588	190-470

TABLE 2-1. Latitudinal and depth distributions of groundfish species (adults) managed under the Pacific Coast Groundfish Fishery Management Plan.[a/] (Page 3 of 3)

		Latitudinal Distribution		Depth Distribution (fm)	
Common name	**Scientific name**	**Overall**	**Highest Density**	**Overall**	**Highest Density**
Pacific rattail	*Coryphaenoides acrolepis*	Coastwide	N. 38° N. lat. Coastwide	85-1,350	500-1,350
Ratfish	*Hydrolagus colliei*	Coastwide	Coastwide	0-499	55-82

a/ Data from Casillas *et al.* 1998, Eschmeyer *et al.* 1983, Hart 1973, Miller and Lea 1972, and NMFS survey data. Depth distributions refer to offshore distributions, not vertical distributions in the water column.

b/ Only the southern stock of bocaccio south of 40°10' N latitude is listed as overfished.

c/ Dusky rockfish do not occur on the U.S. West Coast south of 49° N latitude The species needs to be removed from the FMP.

d/ Dwarf-Red rockfish are a very rare species with only one occurrence listed in the literature (2 specimens from an underwater explosion off San Clemente Is., California in 1970; Eschmeyer *et al.* 1983). The species is not in the FMP.

e/ Only 2 occurrences of harlequin rockfish south of 51° N latitude (off Newport, Oregon and La Push, Washington; Casillas *et al.* 1998).

TABLE 2-2. Current rebuilding parameter/target estimates specified for overfished West Coast groundfish: shelf species. (Page 1 of 2)

	Shelf rockfish & lingcod				
Rebuilding Parameter/Target	**Bocaccio**[a/]	**Canary**[b/]	**Cowcod**[c/]	**Lingcod**[d/]	**Yelloweye**[e/]
T_0 (year declared overfished)	1999	2000	2000	1999	2002
T_{MIN} (minimum time to achieve B_{MSY}; F = 0)	2018	2057	2062	2007	2027
Mean generation time	14 years	19 years	37 years	NA	44 years
T_{MAX} (maximum time to achieve B_{MSY})	2032	2076	2099	2009	2071
P_{MAX} (P to achieve B_{MSY} by T_{MAX})[f/]	$70%	60%	55%	60%	92%
Most recent stock assessment	MacCall 2003a	Methot and Piner 2002a	Butler *et al.* 1999	Jagielo *et al.* 2000	Methot *et al.* 2002
Most recent rebuilding analysis	MacCall 2003b	Methot and Piner 2002b	Butler and Barnes 2000	Jagielo and Hastie 2001	Methot and Piner 2002
B_0 (estimated unfished biomass)	13,387 B eggs in 2003	31,550 mt	3,367 mt	22,882 mt N 20,971 mt S	3,875 mt
$B_{CURRENT}$ (current estimated biomass)	984 B eggs in 2003	2,524 mt in 2002	238 mt in 1998	3,527 mt N 3,220 mt S in 2000	934 mt in 2002
$B_{CURRENT}$ % Unfished Biomass	7.4% in 2003	8% in 2002	7% in 1998	17% N 15% S in 2000	24% in 2002
MSST (minimum stock size threshold = 25% of B_0)	3,347 B eggs	7,888 mt	842 mt	5,720 mt N 5,243 mt S	969 mt
B_{MSY} (rebuilding biomass target = 40% of B_0)	5,355 B eggs	12,620 mt	1,350 mt	9,153 mt N 8,389 mt S	1,550 mt
MFMT (maximum fishing mortality threshold = F_{MSY})	$F_{50\%}$	$F_{73\%}$	$F_{50\%}$	$F_{45\%}$: F = 0.12 N F = 0.14 S	$F_{57\%}$
Harvest control rule[f/]	F . 0.041	F = 0.0220	F = 0.0136	F = 0.053 N F = 0.061 S	F = 0.0139
T_{TARGET}[f/]	2021	2074	2095	2009	2052

TABLE 2-2. Current rebuilding parameter/target estimates specified for overfished West Coast groundfish: shelf species. (Page 2 of 2)

	Shelf rockfish & lingcod				
Rebuilding Parameter/Target	**Bocaccio**[a/]	**Canary**[b/]	**Cowcod**[c/]	**Lingcod**[d/]	**Yelloweye**[e/]

a/ Bocaccio were assessed by MacCall (2003a) in the Conception and Monterey INPFC areas combined. Biomass estimates are spawning output in billions of eggs. All rebuilding parameters based on model STATc in the most recent rebuilding analysis (MacCall 2003b). The strategic rebuilding parameters (T_{TARGET}, the harvest control rule (F), and P_{MAX}) are interpolated from model STATc results. A rebuilding plan for bocaccio south of 40°10' N latitude will be analyzed in an EIS contemplated for groundfish FMP Amendment 16-3 scheduled for 2004.

b/ A canary rockfish rebuilding plan was adopted by the Council and submitted for incorporation in the groundfish FMP under Amendment 16-2. The *Council OY* alternative does not contemplate changing the harvest control rule nor the target rebuilding year adopted for West Coast canary rockfish with Amendment 16-2.

c/ Cowcod were assessed in the Conception area. All parameters/targets are for the Conception area, although harvest specifications and management measures decided under the proposed action analyzed under the *Council OY* alternative are for the Conception and Monterey INPFC areas combined. A rebuilding plan for cowcod will be analyzed in an EIS contemplated for groundfish FMP Amendment 16-3 scheduled for 2004.

d/ West coast lingcod were assessed as two stocks north (Columbia and U.S. Vancouver INPFC areas) and south (Eureka, Monterey, and Conception INPFC areas). The *Council OY* alternative does not contemplate changing the harvest control rule nor the target rebuilding year adopted for lingcod with Amendment 16-2.

e/ Yelloweye rockfish rebuilding parameters are from the most recent rebuilding analysis (Methot and Piner 2003). A rebuilding plan for yelloweye rockfish will be analyzed in an EIS contemplated for groundfish FMP Amendment 16-3 scheduled for submission in 2004.

f/ Under *Council OY* alternative harvest specifications and/or rebuilding strategies.

TABLE 2-3. Current rebuilding parameter/target estimates specified for overfished West Coast groundfish: slope and midwater species. (Page 1 of 2)

	Slope rockfish		Midwater species
Rebuilding Parameter/Target	**Darkblotched**[a/]	**POP**[b/]	**Widow**[c/]
T_0 (year declared overfished)	2000	1999	2001
T_{MIN} (minimum time to achieve B_{MSY} @ F = 0)	2011	2011	2026
Mean generation time	33 years	28 years	16 years
T_{MAX} (maximum time to achieve B_{MSY})	2044	2042	2042
P_{MAX} (P to achieve B_{MSY} by T_{MAX})[e/]	>90%	>70%	60%
Most recent stock assessment	Rogers 2003	Hamel *et al.* 2003	He *et al.* 2003a
Most recent rebuilding analysis	Rogers 2003	Punt *et al.* 2003	He *et al.* 2003b
B_0 (estimated unfished biomass)[d/]	30,775 mt	37,230 units of spawning output	43,580 M eggs
$B_{CURRENT}$ (current estimated biomass)	3,385 mt in 2003	10,313 units of spawning output in 2003	9,756 M eggs in 2002
% Unfished Biomass	11% in 2003	27.7% in 2003	22.4% in 2002
MSST (minimum stock size threshold = 25% of B_0)	7,694 mt	9,308 units of spawning output	10,895 M eggs
B_{MSY} (rebuilding biomass target = 40% of B_0)	12,310 mt	14,892 units of spawning output	17,432 M eggs
MFMT (maximum fishing mortality threshold = F_{MSY})	$F_{50\%}$	$F_{50\%}$	$F_{50\%}$
Harvest control rule[e/]	F = 0.032	F = 0.0257	F = 0.0093
T_{TARGET}[e/]	2030	2027	2037

TABLE 2-3. Current rebuilding parameter/target estimates specified for overfished West Coast groundfish: slope and midwater species. (Page 2 of 2)

	Slope rockfish		Midwater species
Rebuilding Parameter/Target	Darkblotched[a/]	POP[b/]	Widow[c/]

a/ A darkblotched rockfish rebuilding plan was adopted by the Council and submitted for incorporation in the groundfish FMP under Amendment 16-2. The proposed action (*Council OY*) is to raise the harvest control rule (F) from 0.027 estimated in the previous rebuilding analysis (Methot and Rogers 2001) and specified in FMP Amendment 16-2 to 0.032 estimated in the recent rebuilding analysis (Rogers 2003). However, the target rebuilding year of 2030 is not being revised as part of the proposed action (*Council OY*) resulting in an increased probability of rebuilding by T_{MAX} (P_{MAX} increases from 80% to >90%). Rebuilding parameters are based on an intermediate model run and are consistent with the range of OY adopted by the Council. See Section 4.2.1.2 for more details.

b/ A Pacific ocean perch rebuilding plan was adopted by the Council and submitted for incorporation in the groundfish FMP under Amendment 16-2. The proposed action (*Council OY*) is to change the harvest control rule (F) from 0.0082 estimated in the previous rebuilding analysis (Punt and Ianelli 2001) and specified in FMP Amendment 16-2 to 0.0257 estimated in the most recent rebuilding analysis (Punt *et al.* 2003). However, the target rebuilding year of 2027 is not being revised as part of the proposed action (*Council OY*) resulting in an increased probability of rebuilding by T_{MAX} (P_{MAX} increases from 70% to >70%). See Section 4.2.1.2 for more details.

c/ The widow rockfish stock was assessed in 2003. All rebuilding parameters estimated in the most recent rebuilding analysis (He *et al.* 2003). Rebuilding spawning biomass parameters (i.e., B_0, B_{MSY}, $B_{CURRENT}$, MSST) are in millions of eggs. A rebuilding plan for coastwide widow rockfish will be analyzed in an EIS contemplated for groundfish FMP Amendment 16-3 scheduled for 2004.

d/ Under either a Council-adopted rebuilding plan (for those species' plans considered under FMP Amendment 16-2) or under the *Council OY* alternative, except Pacific whiting.

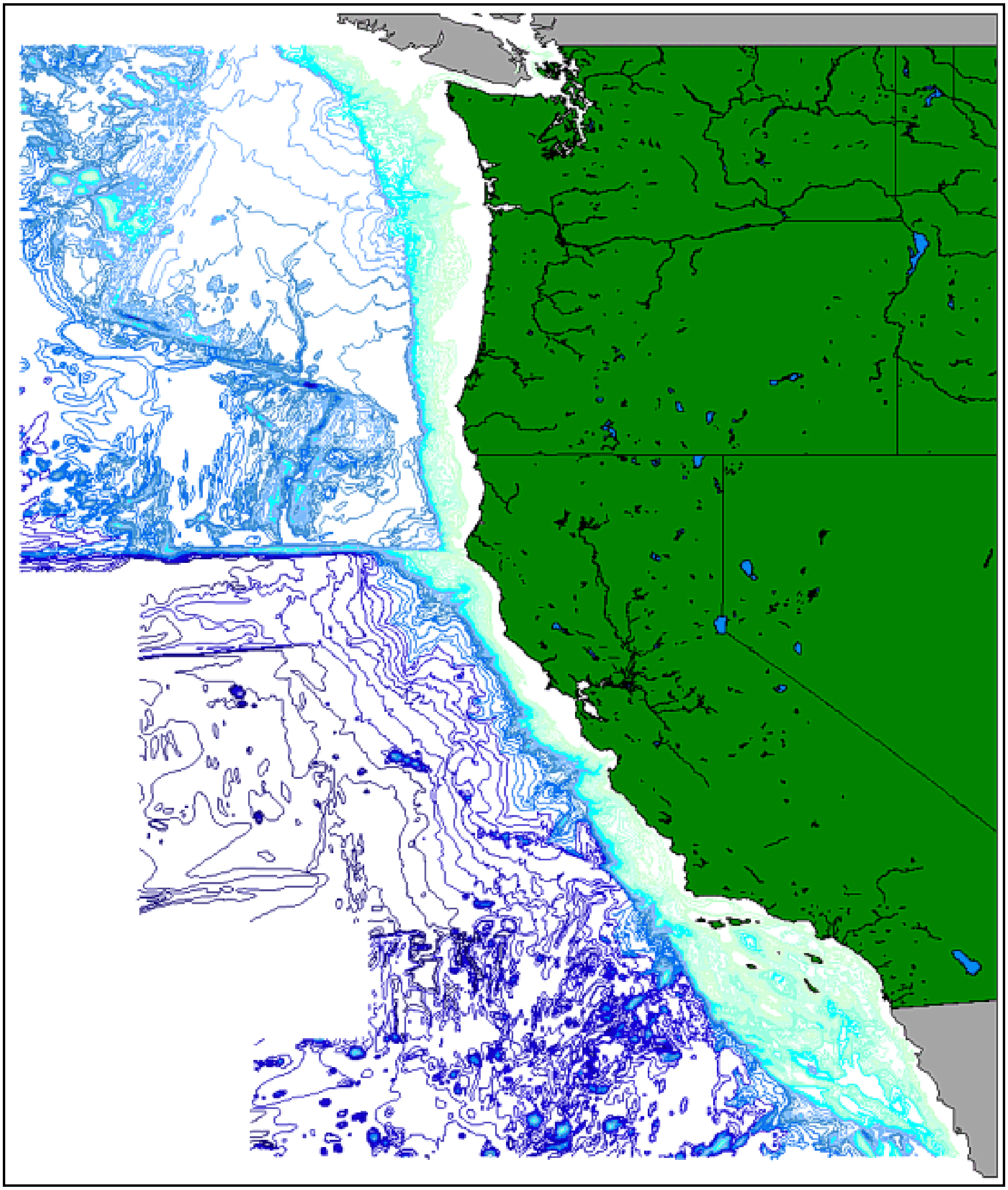


FIGURE 2-1. Bathymetry of the West Coast, 100 m contours. (Source: USGS GLORIA Imagery and Bathymetry from the U.S. EEZ off Washington, Oregon, and California.)

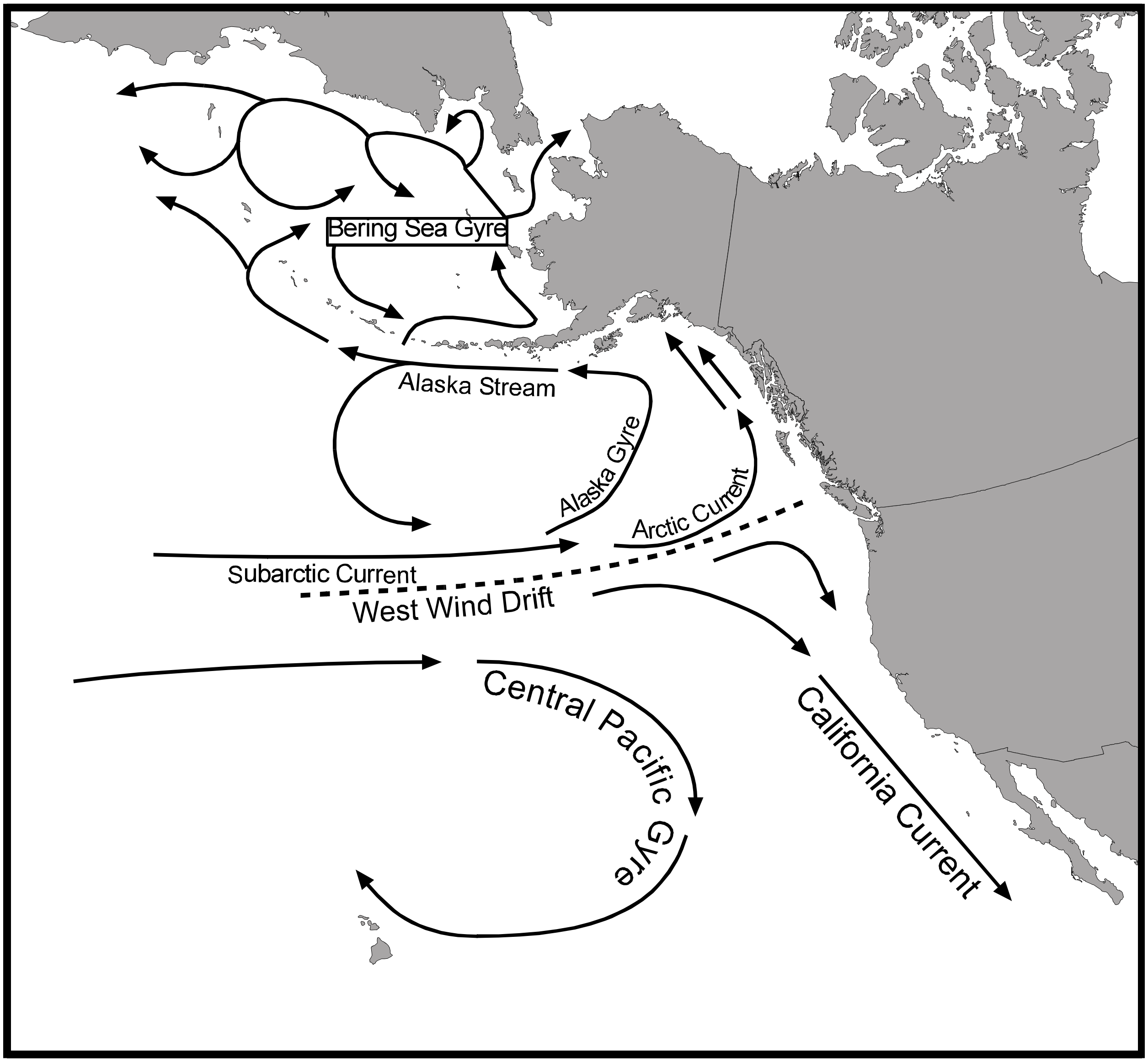


FIGURE 2-2. Surface current systems of the northeast Pacific Ocean.

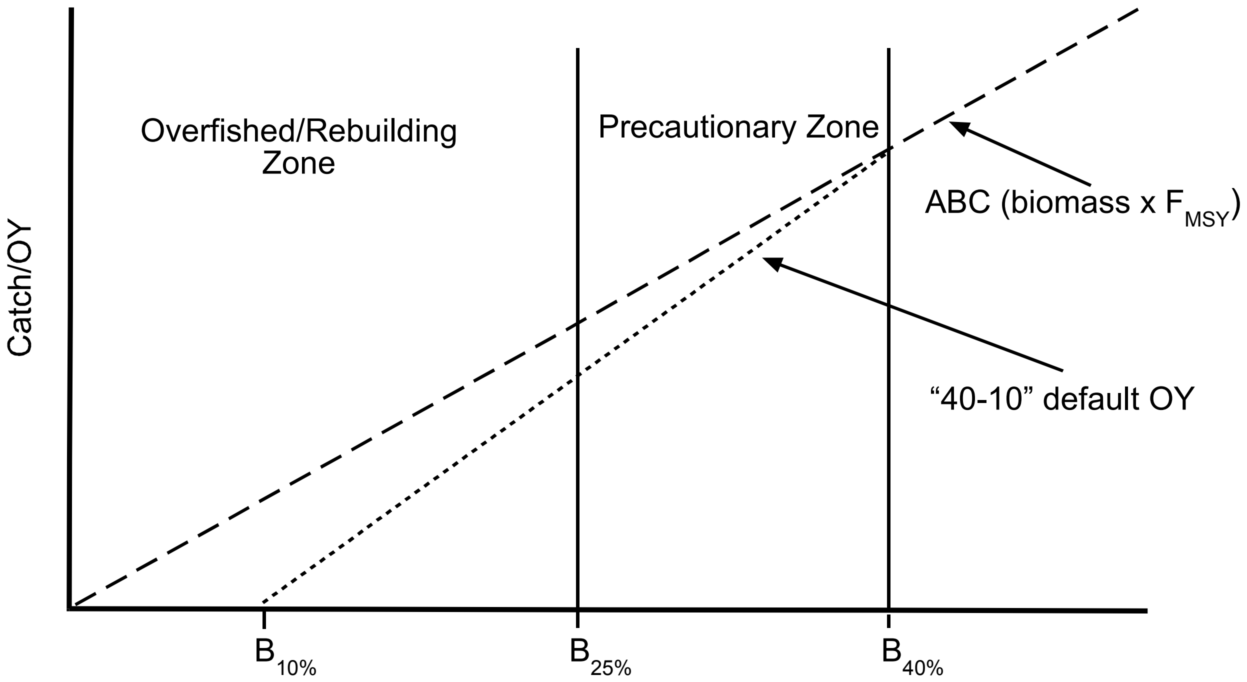
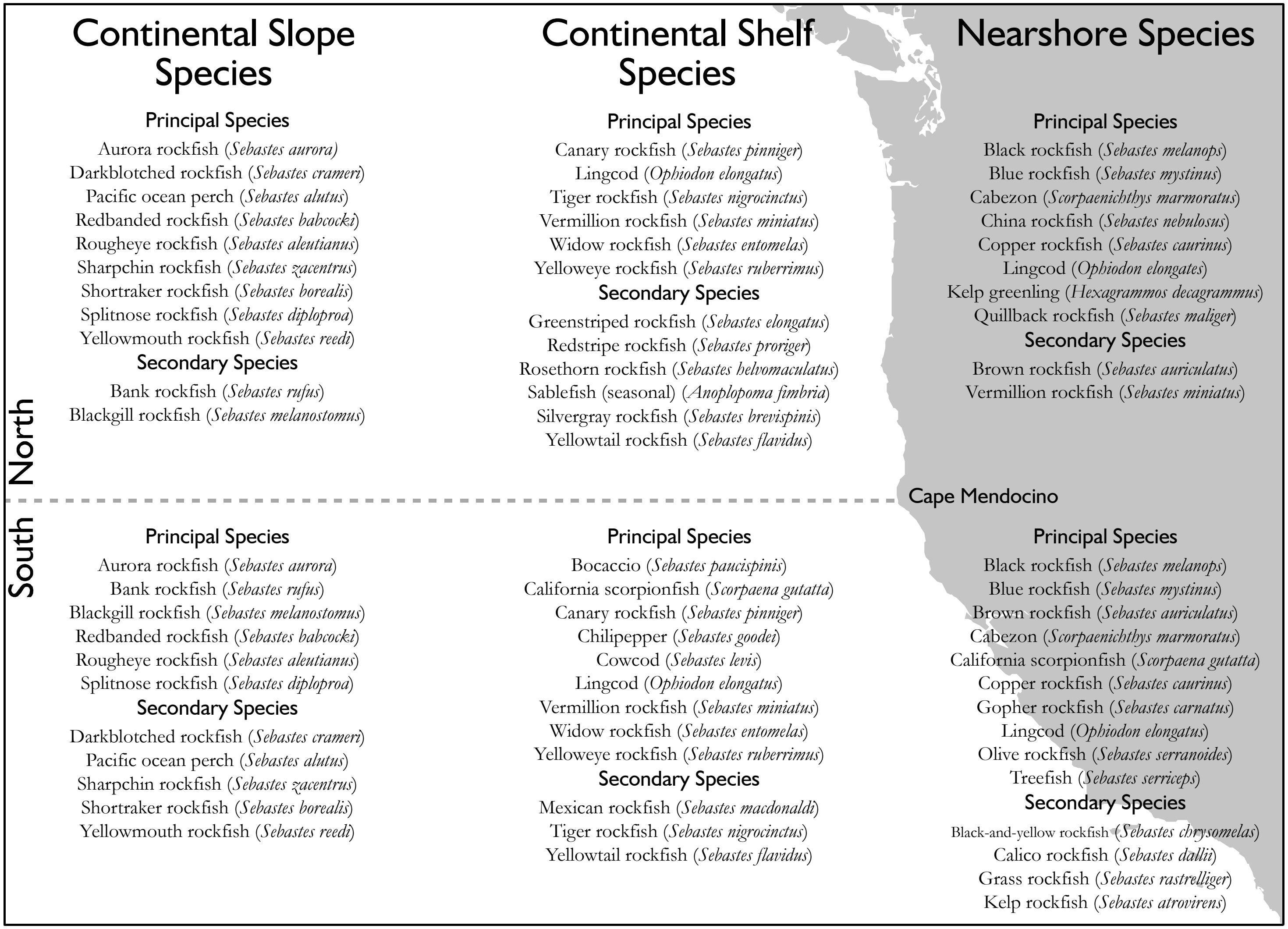


FIGURE 2-3. 40-10 Rule.



	Continental Slope Species	Continental Shelf Species	Nearshore Species
North	**Principal Species** Aurora rockfish (*Sebastes aurora)* Darkblotched rockfish (*Sebastes crameri*) Pacific ocean perch (*Sebastes alutus*) Redbanded rockfish (*Sebastes babcocki*) Rougheye rockfish (*Sebastes aleutianus*) Sharpchin rockfish (*Sebastes zacentrus*) Shortraker rockfish (*Sebastes borealis*) Splitnose rockfish (*Sebastes diploproa*) Yellowmouth rockfish (*Sebastes reedi*) **Secondary Species** Bank rockfish (*Sebastes rufus*) Blackgill rockfish (*Sebastes melanostomus*)	**Principal Species** Canary rockfish (*Sebastes pinniger*) Lingcod (*Ophiodon elongatus*) Tiger rockfish (*Sebastes nigrocinctus*) Vermillion rockfish (*Sebastes miniatus*) Widow rockfish (*Sebastes entomelas*) Yelloweye rockfish (*Sebastes ruberrimus*) **Secondary Species** Greenstriped rockfish (*Sebastes elongatus*) Redstripe rockfish (*Sebastes proriger*) Rosethorn rockfish (*Sebastes helvomaculatus*) Sablefish (seasonal) (*Anoplopoma fimbria*) Silvergray rockfish (*Sebastes brevispinis*) Yellowtail rockfish (*Sebastes flavidus*)	**Principal Species** Black rockfish (*Sebastes melanops*) Blue rockfish (*Sebastes mystinus*) Cabezon (*Scorpaenichthys marmoratus*) China rockfish (*Sebastes nebulosus*) Copper rockfish (*Sebastes caurinus*) Lingcod (*Ophiodon elongates*) Kelp greenling (*Hexagrammos decagrammus*) Quillback rockfish (*Sebastes maliger*) **Secondary Species** Brown rockfish (*Sebastes auriculatus*) Vermillion rockfish (*Sebastes miniatus*)
South	**Principal Species** Aurora rockfish (*Sebastes aurora*) Bank rockfish (*Sebastes rufus*) Blackgill rockfish (*Sebastes melanostomus*) Redbanded rockfish (*Sebastes babcocki*) Rougheye rockfish (*Sebastes aleutianus*) Splitnose rockfish (*Sebastes diploproa*) **Secondary Species** Darkblotched rockfish (*Sebastes crameri*) Pacific ocean perch (*Sebastes alutus*) Sharpchin rockfish (*Sebastes zacentrus*) Shortraker rockfish (*Sebastes borealis*) Yellowmouth rockfish (*Sebastes reedi*)	**Principal Species** Bocaccio (*Sebastes paucispinis*) California scorpionfish (*Scorpaena gutatta*) Canary rockfish (*Sebastes pinniger*) Chilipepper (*Sebastes goodei*) Cowcod (*Sebastes levis*) Lingcod (*Ophiodon elongatus*) Vermillion rockfish (*Sebastes miniatus*) Widow rockfish (*Sebastes entomelas*) Yelloweye rockfish (*Sebastes ruberrimus*) **Secondary Species** Mexican rockfish (*Sebastes macdonaldi*) Tiger rockfish (*Sebastes nigrocinctus*) Yellowtail rockfish (*Sebastes flavidus*)	**Principal Species** Black rockfish (*Sebastes melanops*) Blue rockfish (*Sebastes mystinus*) Brown rockfish (*Sebastes auriculatus*) Cabezon (*Scorpaenichthys marmoratus*) California scorpionfish (*Scorpaena gutatta*) Copper rockfish (*Sebastes caurinus*) Gopher rockfish (*Sebastes carnatus*) Lingcod (*Ophiodon elongatus*) Olive rockfish (*Sebastes serranoides*) Treefish (*Sebastes serriceps*) **Secondary Species** Black-and-yellow rockfish (*Sebastes chrysomelas*) Calico rockfish (*Sebastes dallii*) Grass rockfish (*Sebastes rastrelliger*) Kelp rockfish (*Sebastes atrovirens*)

FIGURE 2-4. Geographic distribution of rockfish and allied species (lingcod, cabezon, kelp greenling, and California scorpionfish).

3.0 Other Stocks and Fisheries Potentially Affected by Groundfish Management

Nongroundfish species and fisheries targeting them often need to be considered in groundfish management for two reasons. First, they may be caught incidentally in fisheries targeting groundfish. Thus, management measures that change total fishing effort in groundfish fisheries could increase or decrease fishing mortality on incidentally-caught species. Second, those fisheries targeting nongroundfish species may be affected by management measures intended to reduce or eliminate incidental catches of overfished groundfish species in these fisheries. This section describes these species and associated fisheries. Tabular information on catches of groundfish in nongroundfish fisheries may be found in the 2004 groundfish harvest specifications FEIS (PFMC 2004).

3.1 California Halibut

California halibut (*Paralichthys californicus*) are a left-eyed flatfish of the family *Bothidae*. They range from Northern Washington at approximately the Quileute River to southern Baja California, Mexico, (Eschmeyer *et al.* 1983), but are most common south of Oregon. They are predominantly associated with sand substrates from nearshore areas just beyond the surf line to about 183 m. California halibut feed on fishes and squids and can take their prey well off the bottom.

The commercial California halibut fishery extends from Bodega Bay in northern California to San Diego in Southern California, and across the international border into Mexico. California halibut, a state-managed species, is targeted with hook-and-line, setnets and trawl gear, all of which intercept groundfish. Fishing with 4.5-inch minimum mesh size trawl nets is permitted in federal waters, but prohibited within state waters, except in the designated “California halibut trawl grounds,” where a 7.5-inch minimum mesh size must be used. These areas are also closed seasonally. Historically, commercial halibut fishers have preferred setnets, because of these restrictions. Setnets with 8.5-inch mesh and maximum length of 9,000 feet are the main gear type used in Southern California. Setnets are prohibited in certain designated areas, including a Marine Resources Protection Zone (MRPZ), covering state waters (to 3 nm) south of Point Conception and waters around the Channel Islands to 70 fm, but extending seaward no more than one mile. In comparison to trawl and setnet landings, commercial hook-and-line catches are historically insignificant. Over the last decade they have ranged from 11% to 23% of total California halibut landings. Most of those landings were made in the San Francisco Bay area by salmon fishers mooching or trolling slowly over the ocean bottom (Kramer *et al.* 2001).

3.2 California Sheephead

California sheephead (*Semicossyphus pulcher*) are a large member of the wrasse family *Labridae*. They range from Monterey Bay south to Guadalupe Island in central Baja California and the Gulf of California, in Mexico, but are uncommon north of Point Conception. They are associated with rocky bottom habitats, particularly in kelp beds to 55 m, but more commonly at depths of 3 m to 30 m.

They can live to 50 years of age and a maximum length of 91 cm (16 kg). Like some other wrasse species, California sheephead change sex starting first as a female, but changing to a male at about 30 cm in length.

3.3 Coastal Pelagic Species (CPS)

CPS are schooling fish, not associated with the ocean bottom, that migrate in coastal waters. These species include: northern anchovy (*Engraulis mordax*), Pacific sardine (*Sardinops sagax*), Pacific (chub) mackerel (Scomber japonicus), jack mackerel (*Trachurus symmetricus*), and market squid (Decapoda spp.). Until 1999, northern anchovy was managed under the Council’s Northern Anchovy FMP. Amendment 8 to the Northern

Anchovy FMP brought the remaining CPS species under federal management and renamed the FMP the Coastal Pelagic Species FMP. This FMP was implemented in December 1999.

Sardines inhabit coastal subtropical and temperate waters, and at times, have been the most abundant fish species in the California current. During times of high abundance, Pacific sardine range from the tip of Baja California, Mexico, to southeastern Alaska. When abundance is low, Pacific sardine do not occur in large quantities north of Point Conception, California. Pacific mackerel in the northeastern Pacific range from Banderas Bay, Mexico to southeastern Alaska. They are common from Monterey Bay, California to Cabo San Lucas, Baja California, and most abundant south of Point Conception, California. The central subpopulation of northern anchovy ranges from San Francisco, California to Punta Baja, Mexico. Jack mackerel are a pelagic schooling fish that range widely throughout the northeastern Pacific; however, much of their range lies outside the U.S. EEZ. Adult and juvenile market squid are distributed throughout the Alaska and California current systems, but are most abundant between Punta Eugenio, Baja California, Mexico, and Monterey Bay, Central California.

Recent (December 1999 and July 1999, respectively) stock assessments indicate Pacific sardine and Pacific mackerel are increasing in relative abundance. Pacific sardine biomass in U.S. waters was estimated to be 1,581,346 mt in 1999; Pacific mackerel biomass (in U.S. waters) was estimated to be 239,286 mt. Pacific sardine landings for the directed fisheries off California and Baja California, Mexico, reached the highest level in recent history during 1999, with a combined total of 115,051 mt harvested. In 1998 70,799 mt of Pacific mackerel were landed, representing near-record levels for the combined directed fisheries off California and Baja California. Population dynamics for market squid are poorly understood, and annual fluctuations in commercial catch vary from less than 10,000 mt to 90,000 mt. Amendment 10 to the CPS FMP describes and analyzes several approaches for estimating an MSY proxy for market squid. Amendment 10 was adopted by the Council in June 2002 and implemented by NMFS on January 27, 2003 (68 FR 3819). They are thought to have an annual mortality rate approaching 100%, which means the adult population is almost entirely new recruits and successful spawning is crucial to future years' abundance.

CPS are largely landed with round haul gear (purse seines and lampara nets); vessels using round haul gear are responsible for 99% of total CPS landings and revenues per year. These fisheries are concentrated in California, but CPS fishing also occurs in Washington and Oregon. In Washington, the sardine fishery is managed under the Emerging Commercial Fishery provisions as a trial commercial fishery. The target of the trial fishery is sardines; however, anchovy, mackerel, and squid are also landed. The fishery is limited to vessels using purse seine gear. It is also prohibited inside of three miles and logbooks are required. Eleven of the 45 permits holders participated in the fishery in 2000, landing 4,791 mt of sardines (Robinson 2000). Three vessels accounted for 88% of the landings. Of these, two fished out of Ilwaco and one out of Westport. In Oregon, the sardine fishery is managed under the Development Fishery Program under annually-issued permits, which have ranged from 15 in 1999 and 2000 to 20 in 2001. Landings, almost all by purse seine vessels, have rapidly increased in Oregon: from 776 mt in 1999 to 12,798 mt in 2001. The number of vessels increased from three to 18 during this period (McCrae 2001; McCrae 2002). The Southern California round haul fleet is the most important sector of the CPS fishery in terms of landings. This fleet is primarily based in Los Angeles Harbor, along with fewer vessels in the Monterey and Ventura areas. The fishery harvests Pacific bonito, market squid, and tunas as well as CPS. The fleet consists of about 40 active purse seiners averaging 20 m in length. Approximately one-third of the this fleet are steel-hull boats built during the last 20 years, the remainder are wooden-hulled vessels built from 1930 to 1949, during the boom of the Pacific sardine fleet. Because stock sizes of these species can radically change in response to ocean conditions, the CPS FMP takes a flexible management approach. Pacific mackerel and Pacific sardine are actively managed through annual harvest guidelines based on periodic assessments. Northern anchovy, jack mackerel, and market squid are monitored through commercial catch data. If appropriate, one third of the harvest guideline is allocated to Washington, Oregon, and northern California (north of 35°40' N latitude) and two-thirds is allocated to Southern California (south of 35°40' N latitude). An open access CPS fishery is in place north of 39° N latitude and a limited entry fishery is in place south of 39° N latitude. The Council does not set harvest guidelines for anchovy, jack mackerel, or market squid (PFMC 1998).

3.4 Dungeness Crab

The Dungeness crab (*Cancer magister*) is distributed from the Aleutian Islands, Alaska, to Monterey Bay, California. They live in bays, inlets, around estuaries, and on the continental shelf. Dungeness crab are found to a depth of about 180 m. Although it is found at times on mud and gravel, this crab is most abundant on sand bottoms; frequently it occurs among eelgrass. The Dungeness crab, which are typically harvested using traps (crab pots), ring nets, by hand (scuba divers), or dip nets are incidentally taken or harmed unintentionally by groundfish gears.

Dungeness crab are managed by the states of Oregon and California, and by the State of Washington in cooperation with Washington Coast treaty tribes, and with inter-state coordination through the Pacific States Marine Fisheries Commission. The Dungeness crab fishery is divided between treaty sectors, covering catches by Indian Tribes, and a non-treaty sector. This fishery is managed on the basis of simple "3-S" principles: sex, season, and size. Only male crabs may be retained in the commercial fishery (thus protecting the reproductive potential of the populations), the fishery has open and closed seasons, and a minimum size limit is imposed on commercial landings of male crabs (Hankin and Warner 2001). In Washington, the Dungeness crab fishery is managed under a limited entry system with two tiers of pot limits and a December 1 through September 15 season. In Oregon, 306 vessels made landings in 1999 during a season that generally starts on December 1. In California, distinct fisheries occur in Northern and Central California, with the northern fishery covering a larger area. California implemented a limited entry program in 1995, and as of March 2000 about 600 California residents and 70 non-residents had limited entry permits. Nonetheless, effort has increased with the entry of larger multipurpose vessels from other fisheries. Landings have not declined, but this effort increase has resulted in a "race for fish" with more than 80% of total landings made during the month of December (Hankin and Warner 2001).

3.5 Highly Migratory Species (HMS)

Highly migratory species (HMS) include tunas, billfish, dorado, and sharks—species that range great distances during their lifetime, extending beyond national boundaries into international waters and among the EEZs of many nations in the Pacific. In 2003, the Council adopted a Highly Migratory Species FMP to federally regulate the take of HMS within and outside the U.S. West Coast EEZ. NMFS approved the FMP, allowing implementation, on January 30, 2004. The FMP (PFMC 2003c) describes management unit species in detail; these are five tuna species, five shark species, striped marlin, swordfish, and dorado (dolphinfish). A much longer list of species, constituting all those that have been caught in HMS fisheries and not already under state or federal management, will be monitored, but are not part of the management unit.

Management of HMS is complex due to the multiple management jurisdictions, users, and gear types targeting these species. Adding to this complexity are oceanic regimes that play a major role in determining species availability and which species will be harvested off the U.S. West Coast in a given year. There are five distinctive gear types used to harvest HMS commercially, with hook-and-line gear being the oldest and most common. Other gear types used to target HMS are driftnet, pelagic longline, purse seine, and harpoon. While hook-and-line can be used to take any HMS species, traditionally it has been used to harvest tunas. The principal target species in these fisheries include albacore and other tunas, swordfish and other billfish, several shark species, and dorado. Albacore is the most important species, in terms of landings and is commonly caught with troll gear. The majority of albacore are taken by troll and jig-and-bait gear (92% in 1999), with a small portion of fish landed by gillnet, drift longline, and other gear. These gears vary in the incidence of groundfish interception depending on the area fished, time of year, as well as gear type. Overall, nearly half of the total coastwide landings of albacore, by weight, were landed in California. Other HMS gear includes pelagic longline, used to target swordfish, shark and tunas; drift gillnet gear for swordfish, tunas, and sharks off California and Oregon; purse seine gear for tuna off California and Oregon; and harpoon for swordfish off California and Oregon. Some vessels, especially longliners and purse seiners, fish outside of the U.S. EEZ, but may deliver to West Coast ports. Drift gillnet is most likely to intercept groundfish, including whiting, spiny dogfish, and yellowtail rockfish.

3.6 Ocean Whitefish

Ocean whitefish (*Caulolatilus princeps)* occur as far north as Vancouver Island in British Columbia, but are rare north of Central California. A solitary species, they inhabit rocky bottoms and are also found on soft sand and mud bottoms. Whitefish dig into the substrate for food.

3.7 Pacific Pink Shrimp

Pacific pink shrimp (*Pandalus jordani*) are found from Unalaska in the Aleutian Islands to San Diego, California, at depths of 25 fm to 200 fm (46 m to 366 m). Off the U.S. West Coast these shrimp are harvested with trawl gear from Northern Washington to Central California between 60 fm and 100 fm (110 m to 180 m). The majority of the catch is taken off the coast of Oregon. Concentrations of pink shrimp are associated with well-defined areas of green mud and muddy-sand bottoms. Shrimp trawl nets are usually constructed with net mesh sizes smaller than the net mesh sizes for legal groundfish trawl gear. Thus, it is shrimp trawlers that commonly take groundfish in association with shrimp, rather than the reverse.

Pacific shrimp fisheries are managed by the states of Washington, Oregon, and California. The pink shrimp fishery is managed by the states of Washington, Oregon, and California. The Council has no direct management authority. In 1981, the three coastal states established uniform coastwide regulations for the pink shrimp fishery. The season runs from April 1 through October 31. Pink shrimp may be taken for commercial purposes only by trawl nets or pots. Most of the pink shrimp catch is taken with trawl gear with minimum mesh size of one inch to three-eights inches between knots. In some years the pink shrimp trawl fishery has accounted for a significant share of canary rockfish incidental catch. The Council has discussed methods to control shrimp fishing activities, such as requiring all vessels to use bycatch reduction devices (finfish excluders). In 2002, finfish excluders in the pink shrimp fisheries were mandatory in California, Oregon, and Washington. Many vessels that participate in the shrimp trawl fishery also have groundfish limited entry permits. When participating in the pink shrimp fishery, they must abide by the same rules as vessels that do not have limited entry permits. However, all groundfish landed by vessels with limited entry permits are included in the limited entry total.

3.8 Pacific Halibut

Pacific halibut (*Hippoglossus stenolepis*) belong to a family of flounders called *Pleuronectidae*. Pacific halibut can be found along the continental shelf in the North Pacific and Bering Sea. They have flat, diamond-shaped bodies and are able to migrate long distances. Most adult fish tend to remain on the same grounds year after year, making only a seasonal migrations from the more shallow feeding grounds in summer to deeper spawning grounds in winter. Halibut are usually found in deep water (40 m to 200 m).

Pacific halibut are managed by the bilateral (U.S./Canada) International Pacific Halibut Commission (IPHC) with implementing regulations set by Canada and the U.S. in their own waters. The Pacific Halibut Catch Sharing Plan for waters off Washington, Oregon, and California (Area 2A) specifies IPHC management measures for Pacific halibut on the West Coast. Implementation of IPHC catch levels and regulations is the responsibility of the Council, the states of Washington, Oregon, and California, and the Pacific halibut treaty tribes. A license from the IPHC is required to participate in the commercial Pacific halibut fishery. The commercial sector in Area 2A has both a treaty and non-treaty sector. The directed commercial fishery in Area 2A is confined to south of Point Chehalis, Washington, Oregon, and California. In the non-treaty commercial sector, 85% of the harvest is allocated to the directed halibut fishery and 15% to the salmon troll fishery to cover incidental catch. When the Area 2A total allowable catch (TAC) is above 900,000 pounds, halibut may be retained in the limited entry primary sablefish fishery north of Point Chehalis, Washington (46° 53' 18" N latitude). In 2003, the TAC was above this level, and the allocation was 70,000 pounds. Final landings for this fishery in 2003 were 65,325 pounds; 56% (47,946 pounds) of the allocation was harvested. Area 2A licenses, issued for the directed commercial fishery, have decreased from 428 in 1997 to 320 in 2001.

3.9 Ridgeback Prawn

Ridgeback prawns (*Sicyonia ingentis*) are found south of Monterey, California to Baja California, Mexico, in depths of 145 metric feet to 525 metric feet (Sunada *et al.* 2001). They are more abundant south of Point Conception and are the most common invertebrate appearing in trawls. Their preferred habitat is sand, shell and green mud substrate, and relatively sessile. Although information about their feeding habits is limited, these prawns probably are detritus feeders. In turn, they are prey for sea robins, rockfish, and lingcod. Unlike other shrimp species, which carry their eggs during maturation, ridgeback prawns release their eggs into the water column. They spawn seasonally from June to October. Surveys recorded increasing abundance of ridgeback prawns from 1982, when surveys began, to 1985; the population then declined; more recent CPUE data suggest increased abundance in the 1990s. These changes may be due to climate phenomena, particularly El Niño events.

The Ridgeback prawn fishery occurs exclusively in California, centered in the Santa Barbara Channel and off Santa Monica Bay. In 1999, 32 boats participated in the ridgeback prawn fishery. Traditionally, a number of boats fish year-round for both ridgeback and spot prawns, targeting ridgeback prawns during the closed season for spot prawns and vice versa. Most boats typically use single-rig trawl gear. The ridgeback prawn fishery is managed by the State of California and, similar to spot prawn and pink shrimp, is considered an “exempted” trawl gear in the federal open access groundfish fishery, entitling the fishery to groundfish trip limits.

Following a 1981 decline in landings, the California Fish and Game Commission adopted a June through September closure to protect spawning female and juvenile ridgeback prawns. An incidental take of 50 pounds of prawns or 15% by weight is allowed during the closed period. During the season, a maximum of 1,000 pounds of other finfish may be landed with ridgeback prawns, of which federal regulations require no more than 300 pounds per trip be groundfish. Any amount of sea cucumbers may be landed with ridgeback prawns as long as the vessel owner/operator possesses a sea cucumber permit. Other regulations include a prohibition on trawling within state waters, a minimum fishing depth of 25 fm, a minimum mesh size of 1.5 inches for single-walled codends or 3 inches for double-walled codends and a logbook requirement. Ridgeback prawn trawl logs have been required since 1986.

3.10 Sea Cucumber

Two sea cucumber species are targeted commercially: the California sea cucumber (*Parastichopus californicus*), also known as the giant red sea cucumber, and the warty sea cucumber (*P. parvimensis*) (Rogers-Bennett and Ono 2001). These species are tube-shaped Echinoderms, a phylum that also includes sea stars and sea urchins. The California sea cucumber occurs as far north as Alaska, while the warty sea cucumber is uncommon north of Point Conception and does not occur north of Monterey. Both species are found in the intertidal zone to as deep as 300 feet (the California sea cucumber). These bottom-dwelling organisms feed on detritus and small organisms found in the sand and mud. Because sea cucumbers consume bottom sediment and remove food from it, they can alter the substrate in areas where they are concentrated. They can also increase turbidity as they excrete ingested sand or mud particles. They are preyed upon by sea stars, crabs, various fishes, and sea otters. They spawn by releasing gametes into the water column, and spawning occurs simultaneously for different segments of a population. During development, they go through several planktonic larval stages, settling to the bottom two months to three months after fertilization of the egg. Little is known about the population status of these two species; and assessment is difficult, because of their patchy distribution. However, density surveys suggest abundance has declined since the late 1980s. This is not unexpected since a commercial fishery for these species began in the late 1970s and expanded substantially after 1990.

Along the West Coast, sea cucumbers are harvested by diving or trawling. They are managed by the states. The warty sea cucumber is fished almost exclusively by divers. The California sea cucumber is caught principally by trawling in Southern California, but is targeted by divers in Northern California. Only the trawl fishery for sea cucumbers lands an incidental catch of groundfish.

California implemented a permit program in 1992. In 1997 the state established separate, limited entry permits for the dive and trawl sectors. Permit rules encourage transfer to the dive sector, and this has lead to growth in this sector, which now accounts for 80% of landings. There are currently 113 sea cucumber dive permittees and 36 sea cucumber trawl permittees. Many commercial sea urchin and/or abalone divers also hold sea cucumber permits and began targeting sea cucumbers more heavily beginning in 1997. At up to $20 per pound wholesale for processed sea cucumbers, there is a strong incentive to participate in this fishery.

Sea cucumber fisheries have expanded worldwide and, on this coast, there is a dive fishery for warty sea cucumbers in Baja California, Mexico, and dive fisheries for California sea cucumbers in Washington, Oregon, Alaska, and British Columbia, Canada (Rogers-Bennett and Ono 2001). In Washington, the sea cucumber fishery only occurs inside Puget Sound and the Straight of Juan de Fuca. Most of the harvest is taken by diving, although the tribes can also trawl for sea cucumbers in these waters.

3.11 Salmon

Salmon are anadromous fish, spending a part of their life in ocean waters, but returning to freshwater rivers and streams to spawn and then die. After rearing in freshwater for up to two years (depending on species), young fish migrate to the ocean for rearing until they are ready to return to their natal rivers to spawn. Council-managed ocean salmon fisheries mainly catch chinook and coho salmon (*Oncorhynchus tshawytscha* and *O. kisutch*); pink salmon (*O. gorbuscha*) are also caught in odd-numbered years, principally off of Washington. Historical and contemporary habitat modification and degradation, primarily in and along rivers and streams that are critical to spawning and juvenile survival—along with poor ocean conditions and past high harvest rates—have led to precipitous declines in West Coast salmon populations. As a result, several salmon stocks have been listed as either threatened or endangered under the Endangered Species Act (ESA). Adult returns also fluctuate from year to year due to variability in juvenile production and survival rates. Salmon originating from hatcheries have become an important component of all West Coast fisheries. Hatcheries have been established primarily for mitigation of development (hydropower, irrigation, etc.) and for fishery augmentation.

Both chinook and coho salmon have specific life history features. Chinook show considerable life history variation. In addition to age of maturity and timing of entry to freshwater, stream-type and ocean-type races have been identified. Stream-type fish spend one to two years in freshwater as juveniles before moving to the ocean. Adults enter freshwater in spring and summer, and spawn upriver in late summer or early fall. Juvenile ocean-type fish spend a few days to several months in freshwater, but may spend a long time in estuarine areas. The timing of adult entry varies from late summer-early fall into winter months. In some river systems, chinook may enter freshwater throughout a good portion of the year. However, not all runs types are equally abundant. In Oregon and Washington, spring (March through May) and fall (August through November) chinook runs are most common; a few stocks run in summer (May through July). In California there are also late fall and winter runs (December through July) in the Sacramento River. (A late fall run has also been reported from the Eel River.) Chinook salmon mature and return to spawn between two to six years of age, although most returning fish are three to five years old. Precocious males that return to spawn early, at age two or three, are called jacks. In contrast to chinook, coho salmon have a relatively fixed residence time in fresh and salt water and mature predominantly as age 3 fish. Juveniles spend at least a year in freshwater and usually 18 months at sea before maturity. Like chinook, precocious male coho jacks return to spawn early. Although their historic range stretches south to Monterey Bay, California, most production currently occurs north of California. Most coho spawning sites are in smaller, low gradient streams and tributaries. Unlike the year round distribution of chinook runs, coho generally return to spawn in the fall. Pink salmon are caught in significant numbers in odd numbered years, such as 2003. Pink salmon spawn in areas close to salt water, and have a very short freshwater residence time as juveniles, migrating to the ocean soon after emergence. Adults return almost exclusively as 2 year olds.

The ocean commercial salmon fishery, both non-treaty and treaty, is under federal management with a suite of seasons and total allowable harvest. The Council manages fisheries in the EEZ while the states manage fisheries in their waters (zero nm to three nm). All ocean commercial salmon fisheries off the West Coast states use troll gear. Chinook and coho are the principle target species with limited pink salmon landings in odd-years. However, commercial coho landings fell precipitously in the early 1990s and remain very low. Because many wild salmon stocks have been listed under the ESA, the management regime is largely structured around so-called “no jeopardy standards” developed through the ESA-mandated consultation process. Ocean fisheries are managed according to zones reflecting the distribution of salmon stocks and are structured to allow and encourage capture of hatchery-produced stocks while depressed natural stocks are avoided. The Columbia River, on the Oregon/Washington border, the Klamath River in Southern Oregon, and the Sacramento River in Central California support the largest runs of returning salmon.

The salmon troll fishery has an incidental catch of Pacific halibut and groundfish, including yellowtail rockfish. The historical data show that trips where no halibut are landed have a higher range of groundfish landings (11-149 mt) in comparison to trips where halibut was landed (1-19 mt). However, looking at groundfish catch frequency, either by vessel or trips, reveals that groundfish are caught more often by vessels or on trips catching halibut. Small amounts of rockfish and other groundfish are taken as incidental catch in salmon troll fisheries. Although the gillnet/tangle net fishery does not technically occur in Council-managed waters, it may have some impact on groundfish that migrate through that area during part of their life cycle. To account for yellowtail rockfish landed incidentally while not promoting targeting on the species, a federal regulation was adopted in 2001 that allowed salmon trollers to land up to one pound of yellowtail per two pounds of salmon, not to exceed 300 pounds per month (north of Cape Mendocino).

3.12 Spot Prawn

Spot prawn (*Pandalus platyceros*) are the largest of the pandalid shrimp and range from Baja California, Mexico, north to the Aleutian Islands and west to the Korean Strait (Larson 2001). They inhabit rocky or hard bottoms including coral reefs, glass sponge reefs, and the edges of marine canyons. They have a patchy distribution, which may result from active habitat selection and larval transport. Spot prawn are hermaphroditic, first maturing as males at about three years of age. They enter a transition phase after mating at about four years of age when they metamorphose into females.

Spot prawn are targeted with both trawl and pot gear. Although these fisheries are state-managed, for the purposes of managing incidentally-caught groundfish, the trawl fishery is categorized in the open access sector. California has the largest and oldest trawl fishery with about 54 vessels operating from Bodega Bay south to the U.S./Mexico border. (Most vessels operate out of Monterey, Morro Bay, Santa Barbara, and Ventura, although some Washington-based vessels participate in this fishery during the fall and winter.) Standard gear is a single-rig shrimp trawl with roller gear, varying in size from eight-inch disks to 28-inch tires. Washington state phased out its trawl fishery by converting its trawl permits to pot/trap permits in 2003. In California, area and season closures for the trawl fleet were instituted in 1984 to protect spot prawns during their peak egg-bearing months of November through January. In 1994, the trawl area and season closure was expanded to include the entire Southern California Bight. As of 2003, the trawl fishery was closed. These closures, along with the development of ridgeback prawn, sea cucumber, and other fisheries, and also greater demand for fresh fish, have kept spot prawn trawl landings low and facilitated growth of the trap fishery. The trap fishery began in 1985 with a live prawn segment developing subsequently. The fleet operates from Monterey Bay, where 6 boats are based, to Southern California, where a 30 to 40 boat fleet results in higher production. In both fishing areas traps are set at depths of 600 feet to 1,000 feet along submarine canyons or along shelf breaks. Between 1985 and 1991 trapping accounted for 75% of statewide landings; trawling accounted for the remaining 25% (Larson 2001). Landings continued to increase through 1998, when they reached a historic high of 780,000 pounds. Growth in participation and a subsequent drop in landings led to the development of a limited entry program, which is still in the process of being implemented. Other recent regulations include closures, trap limits, bycatch reduction measures for the trawl fishery, and an observer program.

3.13 White Seabass and the Gillnet Complex

Since the setnet fishery for white seabass was prohibited in 1994, white seabass have been primarily targeted with driftnet gear. White seabass may also be caught with commercial hook-and-line gear in the early spring, when large seabass are available. Regulations covering white seabass have been in effect since 1931 and have included a minimum size limit, closed seasons, bag limits, and fishing gear restrictions. Such regulations are in effect today, with slight variations. An FMP for white seabass is presently being adopted, and the need for additional regulations will be considered (Vojkovich and Crooke 2001).

The gillnet complex is managed by the State of California and comprises two gear types. Fishers use setnets to target California halibut, white seabass, white croaker, swordfish, and sharks. Driftnets are used for California halibut, white croaker, and angel shark. Southeast Asian refugees (mainly Vietnamese), many of whom had fished with this gear in their home country, entered this fishery and began targeting white croaker, resulting in a shift in fishing effort from Southern California to Central California. Most of the commercial catch is sold in the fresh fish market, although a small amount is used for live bait (Moore and Wild 2001). Currently, the only restriction on catches of white croaker off California is a small no-take zone off Palos Verdes peninsula. In the early 1990s, California's set gillnet fishery was subject to increasingly restrictive state regulations addressing high marine bird and mammal bycatch mortality. This forced the fleet into deeper water where shelf rockfish became their primary target. However, as open access rockfish limits became smaller, there was a shift from targeting shelf rockfish with setnets to the use of line gear in the more lucrative nearshore live-fish fishery. Thus, many fishers that were historically setnet fishers have changed their target strategy in response to increasing restrictions and changing market value.

3.14 Miscellaneous Species

Little information is available on other nongroundfish species that are incidentally captured in the groundfish fishery. Other than those species mentioned above, documentation from the whiting fishery indicates that species such as American shad (*Alosa sapidissima*) and walleye pollock (*Theragra chalcogramma*) are taken incidentally. About 112 mt of shad and 280 mt of pollock were taken as incidental catch in the at-sea sector of the Pacific whiting fishery in 2001. American shad was also taken in the shore-based whiting fishery. Introduced in 1885, they have flourished throughout the lower Columbia River, producing a record run of 2.2 million fish in 1988 (ODFW and WDF 1989). Walleye pollock are found in the waters of the Northeastern Pacific Ocean from the Sea of Japan, north to the Sea of Okhotsk, east in the Bering Sea and Gulf of Alaska, and south in the Northwestern Pacific Ocean along the Canadian and U.S. West Coast to Carmel, California. In 2002 trawlers began targeting this species off Washington after the primary whiting fishery closed, based on reports of larger concentrations of the fish in these waters. Since this species is not managed under any of the Council's FMPs, there are no harvest levels, management measures, or observer requirements specified for this fishery.

4.0 Essential Fish Habitat

4.1 Defining Groundfish Essential Fish Habitat

The MSA, as revised by the Sustainable Fisheries Act (SFA) requires Councils to describe Essential Fish Habitat (EFH), and potential threats to EFH, in their FMPs. Federal agencies must consult with NMFS on activities that may adversely affect EFH. A source document, referred to as the EFH Appendix (because it is appended to the groundfish FMP) describes EFH for groundfish FMU species in detail, including information about each life history stage (EFH Core Team for West Coast Groundfish 1998). NMFS is currently updating this document in support of the preparation of a programmatic EIS evaluating measures to identify and classify EFH (see Section 4.5 below).

The more than 80 groundfish species in the management unit occur throughout the EEZ and occupy diverse habitats at all stages in their life histories. Some species are widely dispersed during certain life stages, particularly those with pelagic eggs and larvae; the EFH for these species/stages is correspondingly large. On the other hand, other species/stages, the adults of many nearshore rockfishes for example—which show strong affinities to a particular location or type of substrate—rely on EFH covering a comparatively small area. As a consequence of the large number of groundfish FMU species and their diverse habitat associations, when all the individual EFHs are taken together, all waters from the mean higher high water line, and the upriver extent of saltwater intrusion in river mouths, along the coasts of Washington, Oregon, and California seaward to the boundary of the U.S. EEZ become EFH.

Therefore, the FMP groups the various EFH descriptions into seven units called composite EFHs. This approach focuses on ecological relationships among species and between the species and their habitat, reflecting an ecosystem approach in defining EFH. Seven major habitat types are proposed as the basis for such assemblages or composites. These major habitat types are readily recognizable by those who potentially may be required to consult about impacts to EFH, and their distributions are relatively stationary and measurable over time and space.

The seven composite EFH identifications are as follows.

1. **Estuarine** - Those waters, substrates and associated biological communities within bays and estuaries of the coasts of Washington, Oregon, and California, seaward from the high tide line (MHHW) or extent of upriver saltwater intrusion. These areas are delineated from the U.S. Fish and Wildlife Service's National Wetlands Inventory (NWI) and supplemented from NOAA's Coastal Assessment Framework for the water portion of the Estuarine Drainage Areas for two small estuaries (Klamath River and Rogue River), the Columbia River, and San Francisco Bay. NWI defines estuaries as areas with water greater than 0.5 ppt ocean-derived salt.

2. **Rocky Shelf** - Those waters, substrates, and associated biological communities living on or within ten meters (5.5 fathoms) overlying rocky areas, including reefs, pinnacles, boulders and cobble, along the continental shelf, excluding canyons, from the high tide line (MHHW) to the shelf break (~200 meters or 109 fathoms).

3. **Non-Rocky Shelf** - Those waters, substrates, and associated biological communities living on or within ten meters (5.5 fathoms) overlying the substrates of the continental shelf, excluding the rocky shelf and canyon composites, from the high tide line (MHHW) to the shelf break (~200 meters or 109 fathoms).

4. **Canyon** - Those waters, substrates, and associated biological communities living within submarine canyons, including the walls, beds, sea floor, and any outcrops or landslide morphology, such as slump scarps and debris fields.

5. **Continental Slope/Basin** - Those waters, substrates, and biological communities living on or within 20 meters (11 fathoms) overlying the substrates of the continental slope and basin below the shelf break (~200 meters or 109 fathoms) and extending to the western boundary of the EEZ.

6. **Neritic Zone** - Those waters and biological communities living in the water column more than ten meters (5.5 fathoms) above the continental shelf.

7. **Oceanic Zone** - Those waters and biological communities living in the water column more than 20 meters (11 fathoms) above the continental slope and abyssal plain, extending to the westward boundary of the EEZ.

The EFH Appendix provides all the supporting information used for these identifications, including life history descriptions, lists of data sets and references utilized to identify EFH, and a glossary of terms. Geographic information system (GIS) maps of the distribution of species' life stages in survey and fishery data sets are included as available. For each life stage, tables of known habitat associations, life history traits, reproductive traits and EFH information levels are also provided in the EFH Appendix. The four EFH information levels are:

Level 1:	Presence/absence distribution data are available for some or all portions of the geographic range of the species.
Level 2:	Habitat-related densities of the species are available.
Level 3:	Growth, reproduction, or survival rates within habitats are available.
Level 4:	Production rates by habitat are available.

The scientific basis for the composite EFHs is rooted in the EFH identifications for individual species' life stages. When Level 1 information is available, EFH for a species' life stage is its general distribution, the geographic area of known habitat associations containing most (e.g., about 95%) of the individuals. If known, areas uncommonly utilized are excluded. Data on West Coast groundfish are not readily available to evaluate the extent of areas most commonly utilized by these species at each life stage. However, for adults of many species, Allen and Smith (1988) report the depth ranges in which about 95% of each species was taken during research surveys in the north Pacific Ocean. When such estimates are available, the EFH is identified as this percentage of its general distribution; otherwise, the general distribution corresponds to the full documented range and habitat associations of the life stage within the EEZ. Rare observations that extend a species range during anomalous environmental conditions are not considered part of its EFH. When no information about the distribution of a species' life stage is available and ancillary information is inadequate to infer its distribution, EFH is not identified for that species' life stage.

When Level 2 information is available, the alternatives of using the general distribution or known concentrations to define EFH for species' life stages may be considered. For adults of a few species, sufficient data are available to evaluate their frequencies of occurrence and densities in all or a portion of their distribution, and areas of known concentrations could be identified. Based on risk-averse and ecosystem approaches and the best scientific information available, EFH is defined as for Level 1 information, (i.e., EFH is the geographic area of known habitat associations [general distribution]), in order to maintain healthy populations and ecosystems and sustain productive fisheries.

Relying on known concentrations alone to designate EFH would not ensure that adequate areas were protected as EFH. Areas of known concentrations based on current information do not adequately address unpredictable annual differences in spatial distributions of a life stage, nor changes due to long-term shifts in oceanographic regimes. There are significant areal (primarily from 50 meters to 350 meters depth on the continental shelf) and seasonal (chiefly spring and summer) limitations on the survey information upon which descriptions of known concentrations would be primarily based, whereas the general distribution is based on the best available scientific information, as well as fishery and local knowledge of a species' life stage. Also, all habitats occupied by a species contribute to production at some level, and observed concentrations or densities do not necessarily reflect all habitat essential to maintain healthy stocks within the ecosystem. Although contributions from individual locations may be small, collectively they can account for a significant part of total production. A species' long-term productivity is based on both high and low levels of abundance and the entire distribution may be required during times of high abundance. Finally, there is no discrete or definitive basis for the distinction between known concentrations and general distribution of a species' life stage.

4.2 Groundfish Habitats

Pacific coastal waters are some of the most productive in the United States. The waters and substrate that comprise the EFH under jurisdiction of the Council are diverse, widely distributed, and closely affiliated with other aquatic and terrestrial environments. These characteristics make them susceptible to human activities.

From a broad perspective, fish habitat is the geographic area where the species occurs at any time during its life. This area can be described in terms of ecological characteristics, location, and time. Ecologically, essential habitat includes waters and substrate that focus distribution (e.g., rocky reefs, intertidal salt marshes, or submerged aquatic vegetation) and other characteristics that are less distinct (e.g., turbidity zones, salinity gradients). Spatially, habitats and their use may shift over time due to climatic change, human activities and impacts. The type of habitat available, its attributes, and its functions are important to species productivity, diversity, health, and survival. Of the seven EFH composites described above, the estuarine, rocky shelf and nonrocky shelf habitat composites are probably the most susceptible to deleterious impacts from nonfishing activities.

Estuaries are the bays and inlets influenced by both the ocean and a river and serve as the transitional zone between fresh and salt water (Botkin *et al.* 1995). Estuaries support a community of plants and animals that are adapted to the zone where fresh and salt waters mix (Zedler *et al.* 1992). Estuaries are naturally dynamic and complex, and human actions that degrade or eliminate estuarine conditions have the effect of stabilizing and simplifying this complexity (Williams *et al.* 1996), reducing their ability to function in a manner beneficial to anadromous and marine fish. Habitat degradation and loss adversely affect inshore and riverine ecosystems critical to living marine resources (Chambers 1992). In addition, the cumulative effects of small changes in many estuaries may have a large systematic impact on estuarine and coastal oceanic carrying capacity (Monaco *et al.* 1990).

Fox (1992) states: "The ability of habitats to support high productivity levels of marine resources is diminishing, while pressures for their conversion to other uses are continuing." Point and nonpoint discharges, waste dumps, eutrophication, acid rain, and other human impacts reduce this ability (Fox 1992). Population growth and demands for international business trade along the Pacific Rim exert pressure to expand coastal towns and port facilities, resulting in net estuary losses (Fawcett and Marcus 1991; Kagan 1991). Carefoot (1977), discussing Pacific seashores, states "Estuaries are complex systems which can succumb to humankind's massive and pervasive assaults."

Estuarine habitats fulfill fish and wildlife needs for reproduction, feeding, refuge, and other physiological necessities (Good 1987; Phillips 1984; Simenstad *et al.* 1991). Coastal fish populations depend upon both the quantity and quality of the available habitat (Peters and Cross. 1992). Almost all marine and intertidal waters, wetlands, swamps and marshes are critical to fish (Fedler and Crookshank 1992). For example, seagrass beds protect young fish from predators, provide habitat for fish and wildlife, improve water quality, and control sediments (Hoss and Thayer 1993; Lockwood 1990; Phillips 1984; Thayer *et al.* 1984). In addition, seagrass beds are critical to nearshore food web dynamics (Wyllie-Echeverria and Phillips 1994).

Studies have shown seagrass beds to be among the areas of highest primary productivity in the world (Herke and Rogers 1993; Hoss and Thayer 1993). This primary production, combined with other nutrients, provide high rates of secondary production in the form of fish (Emmett *et al.* 1991; Good 1987; Herke and Rogers 1993; Sogard and Able 1991).

Other estuarine habitats such as mud flats, high salt marsh, and saltmarsh creeks also provide productive shallow water habitat for epibenthic fishes and decapods (Sogard and Able 1991). Simenstad, *et al.* (1990) found that coarse sediment tidal flats were productive benthic infauna areas.

Woody debris plays a significant role in salt marsh ecology (Maser and Sedell 1994). Reductions in woody debris input to the estuaries may affect the ecological balance of the estuary. Large woody debris also play a significant role in benthic ocean ecology, where deep-sea wood borers convert the wood to fecal matter, providing terrestrial based carbon to the ocean food chain (Maser and Sedell 1994). Dams and commercial in-river harvest of large woody debris have dwindled the supply of wood, jeopardizing the ecological link between the forest and the sea (Maser and Sedell 1994).

Estuarine zone fisheries are of great economic importance across the nation (Herke and Rogers 1993). Three-fourths of the fish species caught in the United States are supported by estuarine habitats (Hinman 1992). Clams, crabs, oysters, mussels, scallops, and estuarine and nearshore small commercial fishes contributed an average dockside revenue of $389 million nationally from 1990 to 1992 (NMFS 1993). Using NMFS data, Chambers (1992) determined that 75% of all commercial fish and shellfish landings are of estuarine-dependent species. At least 31 groundfish species inhabit estuaries and nearshore kelp forests for part, or all, of their life cycle.

Of the habitats associated with the rocky shelf habitat composite, kelp forests are of primary importance. Lush kelp forest communities (e.g., giant kelp, bull kelp, elk kelp, and feather boa kelp) are found relatively close to shore along the open coast. These subtidal communities provide vertically-structured habitat through the water column on the rocky shelf, made up of a canopy of tangled stipes from the water line to a depth of 10 feet, a mid-kelp, water-column region and the bottom, holdfast region. The stands provide nurseries, feeding grounds and/or shelter to a variety of groundfish species and their prey (Ebeling *et al.* 1980; Feder *et al.* 1974). Giant kelp communities are highly productive; relative to other habitats including wetlands, shallow and deep sand bottoms and rock bottom artificial reefs, kelp habitats are substantially more productive in the fish communities they support (Bond et al., 1998). Their net primary production is an important component to the energy flow within food webs. Foster and Schiel (Foster and Schiel 1985) reported that the net primary productivity of kelp beds may be the highest of any marine community. The net primary production of seaweeds in a kelp forest is available to consumers in three forms: living tissue on attached plants; drift in the form of whole plants or detached pieces; and, dissolved organic matter exuded by attached and drifting plants (Foster and Schiel 1985).

4.3 Identification of Adverse Impacts of Fishing Gear on EFH

There is little information on the effects of fishing gear on the habitat of Pacific coast groundfish, although there are numerous theories and a great deal of speculation about the effects of various fishing gears on structural habitat. The Council faces a major challenge in addressing gear effects on EFH because of this lack of information, and if the Council chooses to impose restrictions in the short term, such decisions would likely have to be based on the assumption that general information about the effects of gear in other environments is applicable to the specific case of the Pacific coast environment.

The available information on the effects of fishing gear on marine fish habitat comes from research that has been concentrated in heavily fished areas off the east coast of Canada and the United States, and in the North Sea. There are substantial differences in sea floor topography, other physical features, and biological characteristics between those regions and the West Coast of the United States. In addition, most research in those areas focused on trawl and dredge gears, with little information on the effects of non-mobile (fixed) gears. There is ongoing debate about the applicability of that research to the West Coast environment, however information from those areas will be used by the Council as appropriate. West Coast trawl adaptations, such as tire roller gear for improving gear performance in rocky areas, have only recently been explored outside of tropical habitats. Habitat protection will be considered as a tool in groundfish stock restoration.

A marine ecosystem in a “virgin” or unfished state would support a specific number and complexity of fish species. As a marine area is fished, the qualities of the ecosystem change in relation to the number of fish of each species removed from the ecosystem and the effects of fishing gear on the habitat(s) of species using that area. After a number of years of fishing, the habitat quality and nature of that marine ecosystem might be significantly different from the virgin ecosystem. Habitat modified by fishing pressure would support a different set of fish species from those supported by virgin habitat for that same area. In general, marine habitats that have been less altered by fishing and other activities are more complex in structure and more productive in lower level organisms such as worms and crustaceans than highly altered habitats. Marine habitats with greater complexity at lower trophic levels and with greater structural complexity tend to support a more complex mix of fish species in greater abundances than altered habitats. In some cases, however, activities that add nutrients to the system can increase total productivity but reduce complexity. Thus, productivity alone should not be used as a measure of environmental integrity.

It is likely there are few, if any, large virgin marine habitats off the Pacific coast. Due to the high relief, rocky nature of Pacific coast bottom habitat, however, there may be pockets of habitat that have undergone few alterations by trawl gear. High relief rock piles that are not accessible to trawl gear are usually accessible to commercial longline and recreational hook-and-line gear. Similarly, marine canyons that have not been trawled may be used by commercial longliners. The Pacific coast groundfish species mix, with a high proportion of rockfish, is evidence that there are several remaining complex habitat areas. The numerous, long-lived rockfish species have evolved to take advantage of varied rock habitats along the length of the coast. As rockfish stocks have been fished down to lower levels, there is little evidence of new increases in stocks of short-lived species that do not rely on high habitat complexity. Thus, alterations to rockfish habitat may not be accompanied by improvements in stocks that are better adapted to the altered habitat. For this reason, protection of rockfish and rockfish habitat is extremely important to long-term sustainability of the groundfish fishery.

Trawl gear, particularly doors and foot ropes, can alter marine habitat complexity. Changes to physical characteristics of the sea floor would include leveling of rock formations, re-suspending sediments, and other disturbances. These effects depend on towing speed, substrate type, strength of tides and currents, and gear configuration (Jones 1992). It has been found that otter doors tend to penetrate the substrate one cm to 30 cm; one cm on sand and rock substrates, and 30 cm in some mud substrates (Brylinsky *et al.* 1994; Jones 1992; Krost *et al.* 1990). Another factor that will cause variation in the depth of the troughs made by the otter doors is the size (weight) of the doors (i.e., the heavier the doors the deeper the trough) (Jones 1992). These benthic troughs can disappear in as little as a few hours or days in mud and sand sediments over which there is strong tide or current action (Caddy 1973; Jones 1992), or they can last much longer, from between a few months to over five years in seabeds with a mud or sandy-mud substrate at depths greater than 100 m with weak or no current flow (Brylinsky *et al.* 1994; Jones 1992; Krost *et al.* 1990). Footropes that are designed to roll over the sea floor cause little physical alteration other than smoothing the substrate and minor compression (Brylinsky *et al.* 1994; Kaiser and Spencer 1996). However, since a trawler may re-trawl the same area several times, these minor compressions can cause a "packing" of the substrate (Schwinghamer *et al.* 1996). Further compression of the substrate can occur as the net becomes full and is dragged along the bottom. Trawl gear used off the West Coast is often modified with a "roller gear" footrope, where rubber tires are packed together along the footrope, allowing the base of the net to bounce along the bottom, or to drag over obstructions without snagging the net. Development of roller gear has allowed trawlers to work in formerly inaccessible rocky areas. Research in the Gulf of Alaska on the impacts of roller gear on bottom habitat may soon provide documentation on the effects of this gear on bottom habitat (Heifetz 1997). Whatever the direct habitat impacts of roller gear may be, roller gear is effective in allowing trawlers to work in formerly inaccessible, rocky areas.

Similarly, longline gear has been seen to disturb or remove marine plants, corals, and sessile organisms. Observations of halibut longline gear made by NMFS scientists during submersible dives off Southeast Alaska provide some information:

> Setline gear often lies slack on the sea-floor and meanders considerably along the bottom. During the retrieval process the line sweeps the bottom for considerable distances before lifting off the bottom. It snags on whatever objects are in its path, including rocks and corals. Smaller rocks are upended, hard corals are broken, and soft corals appear unaffected by the passing line. Invertebrates and other light weight objects are dislodged and pass over or under the line. Fish, notably halibut, frequently moved the groundline numerous feet along the bottom and up into the water column during escape runs disturbing objects in their path. This line motion was noted for distances of 50 feet or more on either side of the hooked fish. (NPFMC 1992)

Further observations by scientist divers monitoring longline gear off Alaska noted that longlines swept the sea floor, entangling scallops and corals, bringing those animals to the surface during line retrieval (High 1998).

Although there has been no research conducted on pot gear effects on habitat along the West Coast, pot gear may damage demersal plants and animals as it settles, and longlined pots may drag through and damage bottom fauna during gear retrieval. Similarly, anchoring the pot lines or the ends of the longlines may have crushing or dragging effects. In addition to direct bottom habitat alteration, fishing gear that is lost at sea and left to "ghost fish" may cause changes to habitat. Pacific coast groundfish regulations include trap gear restrictions that require trap construction with biodegradable escape panels, so that traps will no longer ghost fish after the escape panels have degraded. Depending on the number of pots that are lost each year and where they are fished, lost pots may alter marine habitat simply by providing a different type of relief than the natural habitat.

Setnets (or gillnets) and trammel nets, which are only used in this fishery south of 38° N latitude, are also known to ghost fish. Ghost fishing gillnets have been observed entangling fish, seabirds, mammals, crabs, and other invertebrates (High 1998). Unlike trap gear, however, gillnets do not biodegrade and likely do not change the relief of marine habitat other than acting as a constant entangling force in areas where they are lost.

Beyond bottom habitat, there may also be fishing impacts to the water column. Although there are presumably few, if any, direct effects from mid-water trawling on EFH, this fishery may alter species complexity in the water column. Off the West Coast, there is a large mid-water trawl fishery for Pacific whiting north of 42º N latitude. There may be negative effects from the offal and processing slurry discard associated with these fisheries. Prolonged offal discards from some large-scale fisheries have redistributed prey food away from midwater and bottom feeding organisms to surface-feeding organisms, usually resulting in scavenger and seabird population increases (Evans *et al.* 1994; Hill and Wassenberg. 1990). Conversely, large offal discards in low-current environments, when not preyed upon by surface scavengers, can also collect and decompose on the ocean floor, creating anoxic bottom conditions. West Coast marine habitat is generally characterized by strong current and tide conditions, but there may be either undersea canyons affected by at-sea discard, or bays and estuaries affected by discard from shoreside processing plants (Stevens and Haaga 1994). As with bottom trawling off the West Coast, little is known about the environmental effects of mid-water trawling and processing discards on habitat conditions.

4.4 Adverse Impacts of Nonfishing Related Activities

This section generally describes non-fishing related activities that directly or cumulatively, and temporarily or permanently, may threaten the physical, chemical, and biological properties of groundfish EFH. The direct result of these threats is that the function of EFH may be eliminated, diminished, or disrupted. The list includes common and not so common activities that all have known or potential impacts to EFH. The list is not prioritized nor is it all-inclusive. The potential adverse effects described below, however, do not necessarily apply to the described activities in all cases, as the specific circumstances of the proposed activity or project just be carefully considered on a case-by-case basis. Furthermore, some of the activities described below may also have beneficial effects on habitat, which need to be considered in any analysis of an action's net effect.

4.4.1 Dredging

Dredging navigable waters is a continuous impact primarily to benthic habitats, but also to adjacent habitats in the construction and operation of marinas, harbors, and ports. Routine dredging—that is, the excavation of soft bottom substrates—is required to provide or create navigational access for ships and boats to docking facilities (ports and marinas). Dredging is used to create deepwater navigable channels or to maintain existing channels that periodically fill with sediments that flow into these channels from rivers or move by wind, wave, and tidal dynamics. In the process of dredging, excessive quantities and associated qualities of the sea floor are removed, disturbed, and re-suspended. Turbidity plumes may arise. Legal mandates covering dredging are the Federal Water Pollution Control Act of 1972 (33 U.S.C. 1251 et seq.) and the River and Harbor Act of 1899 (33 U.S.C. 401 et seq.).

Dredging may adversely affect infaunal and bottom-dwelling organisms at the site by removing immobile organisms such as polychaete worms and other prey types or forcing mobile animals such as fish to migrate. Benthic plants and animals present prior to a discharge are unlikely to re-colonize if the composition of the deeper layers of sediment are drastically different.

Dredging events using certain types of dredging equipment can result in greatly elevated levels of fine-grained mineral particles, usually smaller than silt, and organic particles in the water column. These turbidity plumes of suspended particulates may reduce light penetration and lower the rate of photosynthesis (e.g., in adjacent eelgrass beds) and the primary productivity of an aquatic area if suspended for extended periods of times. If suspended particulates persist, fish may suffer reduced feeding ability and sensitive habitats such as submerged aquatic vegetation beds, which provide source of food and shelter, may be damaged. The contents of the suspended material may react with the dissolved oxygen in the water and result in short-term oxygen depletion to aquatic resources. Toxic metals and organics, pathogens, and viruses absorbed or adsorbed to fine-grained particulates in the material may become biologically available to organisms either in the water column or through food chain processes.

Dredging as well as the equipment used in the process, such as pipelines may damage or destroy spawning, nursery, and other sensitive habitats, such as emergent marshes and subaquatic vegetation, including eelgrass beds and kelp beds. Dredging may also modify current patterns and water circulation in the habitat by changing the direction or velocity of water flow, water circulation, or otherwise changing the dimensions of the water body traditionally utilized by fish for food, shelter or reproductive purposes.

The following references were used in compiling this description: Collins (Collins 1995), Farnworth, et al. (1979), LaSalle, et al. (1991), and Port of Long Beach, et. al. (1990).

4.4.2. Dredge Material Disposal/Fills

The discharge of dredged materials subsequent to dredging operations or the use of fill material in the construction/development of harbors results in sediments (e.g., dirt, sand, mud) covering or smothering existing submerged substrates. Usually these covered sediments are of a soft-bottom nature as opposed to rock or hard-bottom substrates.

The disposal of dredged or fill material can result in varying degrees of change in the physical, chemical, and biological characteristics of the substrate. Discharges may adversely affect infaunal and bottom-dwelling organisms at the site by smothering immobile organisms (e.g., prey invertebrate species) or forcing mobile animals (e.g., benthic-oriented fish species) to migrate from the area. Infaunal invertebrate plants and animals present prior to a discharge are unlikely to re-colonize if the composition of the discharged material is drastically different. Erosion, slumping, or lateral displacement of surrounding bottom of such deposits can also adversely affect substrate outside the perimeter of the disposal site by changing or destroying benthic habitat. The bulk and composition of the discharged material and the location, method, and timing of discharges may all influence the degree of impact on the substrate.

The discharge of dredged or fill material can result in greatly elevated levels of fine-grained mineral particles, usually smaller than silt, and organic particles in the water column (i.e., turbidity plumes). These suspended particulates may reduce light penetration and lower the rate of photosynthesis and the primary productivity of an aquatic area if suspended for lengthy intervals. Aquatic vegetation such as eelgrass beds and kelp beds may also be affected. Groundfish and other fish species may suffer reduced feeding ability leading to limited growth and lowered resistance to disease if high levels of suspended particulates persist. The contents of the suspended material may react with the dissolved oxygen in the water and result in oxygen depletion. Toxic metals and organics, pathogens, and viruses absorbed or adsorbed to fine-grained particulates in the material may become biologically available to organisms either in the water column or through food chain processes.

The discharge of dredged or fill material can change the chemistry and the physical characteristics of the receiving water at the disposal site by introducing chemical constituents in suspended or dissolved form. Reduced clarity and excessive contaminants can reduce, change or eliminate the suitability of water bodies for populations of groundfish, other fish species and their prey. The introduction of nutrients or organic material to the water column as a result of the discharge can lead to a high biochemical oxygen demand (BOD), which in turn can lead to reduced dissolved oxygen, thereby potentially affecting the survival of many aquatic organisms. Increases in nutrients can favor one group of organisms such as polychaetes or algae to the detriment of other types.

The discharge of dredged or fill material can modify current patterns and water circulation by obstructing flow, changing the direction or velocity of water flow, changing the direction or velocity of water flow and circulation, or otherwise changing the dimensions of a water body. As a result, adverse changes can occur in the location, structure, and dynamics of aquatic communities; shoreline and substrate erosion and deposition rates; the deposition of suspended particulates; the rate and extent of mixing of dissolved and suspended components of the water body; and water stratification.

Disposal events may lead to the full or partial loss of habitat functions due to extent of the burial at the site. Loss of habitat function can be temporary or permanent.

The following references were used in compiling this description: Peddicord and Herbich (1979) and NOAA (1991).

4.4.3 Oil/Gas Exploration/Production

Offshore exploration and production of natural gas and oil reserves have been and will continue to be important aspects of the U. S. economy as demand for energy resources grows. Oil exploration/production occurs in varying water depths and usually over soft-bottom substrates, although hard-bottom habitats may be present in the general vicinity. Oil exploration/production areas are vulnerable to an assortment of physical, chemical, and biological disturbances resulting from activities used to locate oil and gas deposits such as high energy seismic surveys and physical disruption resulting from the use and/or installation of anchors, chains, drilling templates, dredging, pipes, platform legs and biofouling communities associated with the platform jacket. During actual operations, the predominant emissions from oil platforms are drilling muds and cuttings, produced water, and sanitary wastes.

The impacts of oil exploration-related seismic energy release may cause fish to disperse from the acoustic pulse with possible disruption to their feeding patterns. The uses of these high energy sound sources may also disrupt or damage marine life. While available data on fish species does limit concerns regarding potential effects on marine life to sensitive egg and larval stages within a few meters of the sound source, whether this data pertains to all groundfish species is questioned.

Adjacent hard-bottom habitats can be severely impacted by anchoring operations during exploratory operations resulting in the crushing, removal or burial of substrate used for feeding or shelter purposes. Disturbances to the associated epifaunal communities may also result.

The discharge of exploratory drill muds and cuttings can result in varying degrees of change on the sea floor and affect the feeding, nursery, and shelter habitat for various life stages of groundfish and shellfish species that are important to commercial and recreational fishers. Drilling muds and cuttings may adversely affect bottom-dwelling organisms (e.g, prey) at the site by burial of immobile forms or forcing mobile forms to migrate. Exploratory activities may also result in resuspension of fine-grained mineral particles, usually smaller than silt in the water column. These suspended particulates may reduce light penetration and lower the rate of photosynthesis and thus primary productivity especially if suspended for lengthy intervals. Groundfish and other fish species may suffer reduced feeding ability leading to limited growth if high levels of suspended particulates persist. The contents of the suspended material may react with the dissolved oxygen in the water and result in oxygen depletion.

Benthic forms, especially prey species, present prior to the oil/gas operations may be unlikely to re-colonize if the composition of the substrate is altered drastically. This may be especially true during actual oil/gas production operations when filter-feeding organisms such as mussel colonies may periodically become dislodged from the oil platform and form biological debris mounds on the bottom. This alteration to the sea floor may affect naturally occurring feeding opportunities and spawning habitat.

The discharge of oil drilling muds can change the chemistry and physical characteristics of the receiving water at the disposal site by introducing toxic chemical constituents. Changes in the clarity and the addition of contaminants can reduce or eliminate the suitability of water bodies for habituation of fish species and their prey.

The following references were used in compiling this description: Battelle Ocean Sciences (1988), Coats (1994) Hyland, et al. (1994), MEC Analytical Systems (1995).

4.4.4 Water Intake Structures

The withdrawal of ocean water by offshore water intakes structures is a common coastwide occurrence. Water may be withdrawn to provide sources of cooling water for coastal power generating stations or as a source of potential drinking water as in the case of desalinization plants. If not properly designed, these structures may create unnatural and vulnerable conditions to various fish life stages and their prey. In addition, freshwater withdrawals from riverine systems to support industrial and agricultural operations also occurs.

The withdrawal of seawater can create unnatural conditions to the EFH of many species. Various life stages can be affected by water intake operations, such as entrapment through water withdrawal, impingement on intake screens, and entrainment through the heat exchange systems or discharge plumes of both heated and cooled effluent.

High approach velocities along with unscreened intake structures can create an unnatural current, making it difficult for fish species and their prey to escape. These structures may withdraw most larval and post-larval marine fishery organisms, and some proportion of more advanced life stages. Periods of low light (e.g, turbid waters, nocturnal periods) may also entrap adult and subadult species, many of which are caught by commercial or recreational fishers or serve as the prey of these species. Freshwater withdrawal also reduces the volume and perhaps timing of freshwater reaching estuarine environments, thereby potentially altering circulation patterns, salinity, and the upstream migration of the saltwater wedge.

The following reference was used in compiling this description: Helvey (1985)

4.4.5 Aquaculture

The culture of estuarine, marine, and freshwater species in coastal areas can reduce or degrade habitats used by native stocks. The location and operation of these facilities will determine the level of impact on the marine environment.

Aquaculture operations may discharge organic waste and/or antibiotics from the farms into the marine environment. Wastes are composed primarily of feces and excess feed and the buildup of waste products into the receiving waters will depend on water depths and circulation patterns. The release of these wastes may introduce nutrients or organic materials into the surrounding water body and lead to a high BOD, which may reduce dissolved oxygen, thereby potentially affecting the survival of many aquatic organisms in the area. Nutrient overloads at the discharge site can also favor one group of organisms to the detriment of other, more desirable prey types such as polychaete worms.

In the case of cage mariculture operations, cultured organisms may escape into the environment. Such operations may also impact the sea floor below the cages or pens. The composition and diversity of the bottom-dwelling community (e.g., prey organisms) due to the build-up of organic materials on the sea floor may be impacted. Growth of submerged aquatic vegetation, which may provide shelter and nursery habitat for a number of fish species and their prey, may be inhibited by shading effects.

The following reference was used in compiling this description: Water Management Branch (1990)

4.4.6 Wastewater Discharge

The discharge of wastewater from commercial activities, including municipal wastewater treatment plants, power generating stations, industrial plants (e.g., pulp mills, desalination plants), and storm water from drains into open ocean waters, bay, or estuarine waters can introduce chemical constituents or salinities potentially detrimental to estuarine and marine habitats. These constituents include pathogens, nutrients, sediments, heavy metals, oxygen demanding substances, hydrocarbons, and toxics. Historically, wastewater discharges have been one of the largest sources of contaminants into coastal waters. However, whereas wastewater discharges have been regulated under increasingly more stringent requirements over the last 25 years, non-point source/stormwater runoff has not been regulated to the same degree and continues to be a significant remaining source of pollution to the coastal areas and ocean. Changes in community structure and function, and health and abundance may result due to these discharges. Many of these changes can be long lasting.

Wastewater effluent and non-point source/stormwater discharges may affect the growth and condition of groundfish, other species of fish, and prey species if high contaminant levels are discharged (e.g., chlorinated hydrocarbons, trace metals, polynuclear aromatic hydrocarbons, pesticides, and herbicides). If contaminants are present, their effects may be manifested by absorption across the gills or through bioaccumulation as a result of consuming contaminated prey. Outfall sediments may alter the composition and abundance of benthic community invertebrates living in or on the sediments. Due to bioturbation, diffusion, and other upward transport mechanisms that move buried contaminants to the surface layers and eventually to the water column, pelagic and nektonic biota may also be exposed.

The use of biocides (e.g., chlorine, heat treatments) to prevent biofouling or the discharge of brine as a byproduct of desalinization can reduce or eliminate the suitability of water bodies for fish species and their prey in the general vicinity of the discharge pipe. The impacts of chlorination and heat treatments, if any, are minimized due to their intermittent use and regulation pursuant to state and/or federal National Pollutant Discharge Elimination System (NPDES) permit requirements. These compounds may change the chemistry and the physical characteristics of the receiving water at the disposal site by introducing chemical constituents in suspended or dissolved form. In addition to chemical and thermal effects, discharge sites may also create adverse impacts to sensitive areas, such as emergent marshes, sea grasses, and kelp beds, if located improperly.

Extreme discharge velocities of the effluent may also cause scouring at the discharge point as well as entrain particulates and thereby create turbidity plumes. These turbidity plumes may reduce light penetration and lower the rate of photosynthesis (e.g., in adjacent eelgrass beds or kelp beds) and the primary productivity of an aquatic area if suspension persists. Groundfish and other fish may suffer reduced feeding ability, especially if suspended particulates persist. The contents of the suspended material may react with the dissolved oxygen in the water and result in oxygen depletion.

Mass emissions of suspended solids, contaminants and nutrient overloading from these outfalls may also affect submerged aquatic vegetation sites, including eelgrass beds and kelp beds. These beds are frequently utilized by groundfish and other fish species for shelter and protection from predators and for food by consuming organisms associated with these beds.

The byproduct of desalinated seawater is brine, which has a salinity about double that of seawater. The waste brine may be discharged directly to the ocean or discharged through sewage outfalls (where it may be diluted). Because this technology is fairly new, little is known about the toxicity of waste brine, but its potential impacts to early life stages of fish and their prey should be considered .

Storm water runoff, which can include both urban and agricultural runoff, is also a large source of particular contaminants to the marine environment affecting both water column and benthic habitats. These contaminants may find their way into the food web through benthic infaunal communities and subsequently bioaccumulate in numerous fish species.

The following references were used in compiling this description: Bay and Greenstien (1994), USEPA (1995), Ferraro, et al. (1991), Leonard (1994), Stull and Haydock (1989), USEPA (1993), Raco-Rands (1996).

4.4.7 Discharge of Oil or Release of Hazardous Substances

Accidental spills of oil or the release of a hazardous substance into estuarine and marine habitats can create significant pollution events. These inadvertent releases occur during the production, transportation, refining and use of hazardous materials from both facilities and vessels.

Exposure to petroleum products and hazardous substances from spills or other unauthorized releases can have both acute and chronic effects on groundfish, other fish species, and prey organisms, and also potentially reduce the marketability of target species. Direct physical contact with discharged oil or released hazardous substances (e.g., toxics such as oil dispersants and mercury) or indirect exposure resulting from food chain processes can produce a number of biological responses in fish resources and their prey. Exposure can occur in a variety of habitats, including the water column, sea floor, bays, and estuaries. Depending on the biological pathway involved, these biological responses may include death, disease, behavioral abnormalities, cancer, genetic mutations, physiological malfunctions (including malfunctions in reproduction), or physical deformations of fish that are important to commercial and recreational fishers.

Other issues related to the category include efforts to cleanup spills or releases that in themselves can create serious harm to the habitat. For example, the use of potentially toxic dispersants to break up an oil spill may adversely effect the egg and larval stages of most groundfish species.

The following references were used in compiling this description: Armstrong, et al. (1995), Sowby (1998), SCCWRP (1992).

4.4.8 Fish Enhancement Structures

Construction of fish enhancement structures, commonly called artificial reefs, is a popular management tool employed by state and federal governments and private groups. These structures have been used for centuries to enhance fishery resources and fishing opportunities and usually entail placing miscellaneous materials in ocean or estuarine environments void of physical or “hard-bottom” relief. While scientists still debate whether reefs attract and/or produce fish biomass, the proliferation of artificial reefs continues. This popularity results from increased demands on fish stocks by both commercial and recreational fishermen and losses of habitat productivity due to development and pollution. However, the introduction of artificial reef material into the marine or estuarine environment can also produce negative impacts.

The use of artificial reefs can adversely impact the aquatic environment in at least two ways. First, habitat upon which the reef material is placed is lost. Usually, reef materials are set upon flat, relatively barren sandy sea floor; such placement may bury or smother faunal and bottom-dwelling organisms at the site or even prevent mobile forms (e.g., benthic-oriented fish species) from using the area. This effect has been shown in Hawaii. The second potential adverse impact results from use of inappropriate materials, such as automobile tires or compressed incinerator ash, which may degrade the marine habitat degradation. For example, automobile tires may release toxic substances into the marine environment and may cause physical damage to existing habitat if they break free of their anchoring systems.

The following references were used in compiling this description: Buckley (1989), Livingston (1994), McGurrin, et al. (1989), Nelson, et al. (1994), Polovina (1989).

4.4.9 Coastal Development Impacts

Coastal development involves changes in land use by the construction of urban, suburban, commercial, and industrial centers and the corresponding infrastructure. Vegetated areas are removed by cut-and-fill activities for enhancing the development potential of the land. Portions of the natural landscape are converted to impervious surfaces resulting in increased runoff volumes. Runoff from these developments may include heavy metals, sediments, nutrients, and organics, including synthetic and petroleum hydrocarbons, yard trimmings, litter, debris, and pet droppings. As residential, commercial and industrial growth continues, the demand for water escalates. As groundwater resources become depleted or contaminated, greater demands are placed on surface water through dam and reservoir construction or other methods of freshwater diversion. The consumptive use and redistribution of significant volumes of surface freshwater causes reduced river flows that can affect salinity regimes as saline waters intrude further upstream.

Development activities within watersheds and in coastal marine areas often impact groundfish habitat and other fish species on both long-term and short-term scales. Toxic runoff from development sites reduces the quality and quantity of suitable fish habitat by the introduction of pesticides, fertilizers, petrochemicals, and construction chemicals (e.g., concrete products, seals and paints). Sediment runoff can also restrict tidal flows resulting in losses of important fauna and flora (e.g., submerged aquatic vegetation). Shoreline stabilization projects that affect reflective wave energy can impede or accelerate natural movements of sand, thereby harming intertidal and sub-tidal habitats. Wetlands serve an important function for exporting nutrients and energy, as well as serving as fish nursery areas, and loss or reduction of this function results from both reduction of geographic size and by input material exceeding processing capacity. Reduced freshwater flow into estuaries and wetlands can reduce productivity and habitat quality for fish by impacting the extent and location of the mixing or entrapment zone.

The following references were used in compiling this description: Baird (1996), Drinkwater and Frank (1994), McLusky, et al. (1992), Paul, et al. (Paul *et al.* 1992), Rozengurt, et al. (Rozengurt *et al.* 1994), Turek, et al. (1987), USEPA (1993).

4.4.10 Introduction of Exotic Species

Over the past two decades, there has been an increase in introductions of exotic species into marine habitats. Introductions can be intentional (e.g., for the purpose of stock or pest control) or unintentional (e.g., fouling organisms).

Exotic species introductions create five types of negative impacts: (1) habitat alteration, (2) trophic alteration; (3) gene pool alteration, (4) spatial alteration, and (5) introduction of diseases. Habitat alteration includes the excessive colonization of exotic species (e.g., San Diego bivalve and *Spartina* grass), which preclude endemic organisms (e.g., eelgrass). The introduction of exotic species may alter community structure by predation on native species (e.g., Japanese oyster drill, Chinese mitten crab, *Tilapia,* Oriental goby, striped bass) or by population explosions of the introduced species (e.g., Asian clam, green crab). Spatial alteration occurs when territorial introduced species compete with and displace native species. Although hybridization is rare, gene pool deterioration may occur between native and introduced species. One of the most severe threats to a native fish community is the introduction of bacteria, viruses, and parasites that reduce the quality of the habitat.

The following reference was used in compiling this description: Kohler and Courtenay (1986).

4.4.11 Agricultural Practices

Agricultural operations can result in the introduction of fertilizers, herbicides, insecticides, and other chemicals into the aquatic environment from the uncontrolled nonpoint source runoff draining agricultural lands. Additionally, agricultural runoff transports animal wastes and sediments into riverine, estuarine, and marine environments. Excessive uncontrolled or improper irrigation practices often exacerbate contaminant flushing.

The introduction of fertilizers, herbicides, insecticides, animal wastes, and other chemicals into the aquatic environment, especially estuaries, can affect the growth of aquatic plants, which in turn affects groundfish and other fish, invertebrates and the general ecological balance of the water body. Pollutants associated with these products include oxygen demanding substances; nutrients such as nitrogen and phosphorous, organic solids, microorganisms like bacteria and viruses, and salts. These pollutants and wastes may make habitat unsuitable for shelter, feeding, spawning; and if conditions are extreme, they result in fish kills.

The following reference was used in compiling this description: USEPA (1993).

4.4.12 Large Woody Debris Removal

Natural events (e.g., storms) and timber practices create situations where fallen trees end up in river systems and eventually work their way into estuaries and coastal waters. This timber or woody debris play a significant role in salt marsh ecology.

for a variety of reasons—including dam operations, aesthetics and commercial use of the wood—woody debris are often removed before reaching estuarine and coastal waters. Reductions in woody debris inputs to estuarine and coastal ecosystems may affect the ecological balance. For example, large woody debris play a significant role in benthic ocean ecology, where deep-sea wood borers convert the wood to fecal matter, supplying carbon from terrestrial sources to the ocean food chain. The dwindling supply of wood may jeopardize the ecological link between the forest and the sea.

The following reference was used in compiling this description: Maser and Sedell (1994).

4.4.13 Kelp Harvesting

The giant kelp forest canopy serves as a nursery, feeding grounds, and/or shelter for a variety of groundfish species and their prey. In addition, when kelp plants are naturally broken free of their holdfasts, the kelp is carried by waves and currents along the bottom to deep-water habitats and in surface waters to beaches and rocky intertidal areas. Kelp detritus supports high secondary production and prey for many fishes.

The commercial harvest of giant kelp forests has been a thriving industry in California since 1910. Harvesting is undertaken by ships designed specifically for cutting the surface canopy no lower than 1.2 m below the surface in a strip eight meters wide, much like a lawn mower. Regulations are imposed by the State of California to ensure that harvesting activities have a minimal impact on kelp forests. Kelp canopies cut according to this regulation generally grow back within several weeks to a few months.

Kelp harvesting can have a variety of possible impacts on kelp forests and nearshore communities. For example, giant kelp is a source of food for other marine communities, and unregulated harvest of kelp can potentially remove a substantial portion of this source. The kelp canopy also serves as habitat for canopy-dwelling invertebrates and has may have an enhancing effect on fish recruitment and abundance; these functions can be severely impeded by unregulated harvesting operations. Removal of the canopy can displace fish such as young-of-the-year rockfishes. Extensive or permanent loss of kelp canopy could have adverse impacts on local fish recruitment and abundance.

The following references were used in compiling this description: California Department of Fish and Game (1995), Cross and Allen (1993), Feder, et al. (1974), Foster and Schiel (1985), and Vetter (1995).

4.5 Current Efforts to Identify and Conserve EFH

NMFS is currently preparing an EIS to comprehensively evaluate groundfish habitat and the effects of groundfish fishing on that habitat, in response to litigation (*American Oceans Campaign v. Daley et al*., Civil Action No 99-982(GK)). This EIS is gathering more information about the effects of fishing in order to evaluate alternatives to minimize fishing effects on EFH to the extent practicable, as required by the MSA. A predictive risk assessment model is being developed for this project (MRAG Americas Inc. and TerraLogic GIS Inc. 2003), which will be used to develop alternatives for the designation and protection of EFH. In addition to any direct outcome of this EIS, such as establishing additional protection measures for EFH, it may be possible to adapt the assessment model to predict the effects of other actions, such as setting harvest specifications. The DEIS is scheduled for release in February 2005, and the EIS process will be completed (by signing of the Record of Decision) in February 2006.

5.0 Protected Species

Protected species fall under three overlapping categories, reflecting four mandates: the Endangered Species Act of 1973 (ESA), the Marine Mammal Protection Act of 1972 (MMPA), the Migratory Bird Treaty Act (MBTA), and EO 13186. These mandates, and the species thus protected, are described below.

5.1 ESA-listed Species

The ESA protects species in danger of extinction throughout all or a significant part of their range and mandates the conservation of the ecosystems on which they depend. "Species" is defined by the Act to mean a species, a subspecies, or—for vertebrates only—a distinct population. Under the ESA, a species is listed as endangered if it is in danger of extinction throughout a significant portion of its range and threatened if it is likely to become an endangered species within the foreseeable future throughout all, or a significant part, of its range.

5.1.1 Salmon

Salmon caught in West Coast fisheries have life cycle ranges that include coastal streams and river systems from Central California to Alaska and marine waters along the U.S. and Canada seaward into the north central Pacific Ocean, including Canadian territorial waters and the high seas. Some of the more critical portions of these ranges are the freshwater spawning grounds and migration routes.

Chinook, or king salmon (*Oncorhynchus tshawytscha*), and coho, or silver salmon (*O. kisutch*), are the main species caught in Council-managed ocean salmon fisheries. In odd-numbered years, catches of pink salmon (*O. gorbuscha*) can also be significant, primarily off Washington and Oregon. NMFS issues a Biological Opinion for fisheries with a potential interaction with protected salmon species listed under the ESA (Table 5-1), specifying the allowable take given ESA conservation constraints. Additional information on Council-managed salmon fisheries and affected stocks may be found in the most recent environmental assessment for the ocean salmon fishery, prepared each April by the Council (available upon request from Council offices).

Salmon are caught incidentally in both the at-sea and shore-based segments of the whiting fishery. This bycatch is closely monitored through an at-sea observer program and dockside sorting of shore deliveries. A salmon bycatch reduction plan has also been implemented in this fishery. Because several chinook salmon runs are listed under the ESA, bycatch of chinook salmon is a concern in the at-sea whiting fishery. In 2002, the catcher-processor fleet caught 970 chinook for a bycatch rate of 0.0235 chinook per metric ton of whiting, the non-tribal mothership fleet caught 709 chinook for a bycatch rate of 0.0269 , and the tribal whiting fishery caught 1,018 chinook for a bycatch rate of 0.467 (NMFS 2003a). Vessels supplying fish to shore-based processors caught 1,062 chinook for a bycatch rate of .023 (NMFS 2003d). Table 5-2 provides the equivalent data for the years 1999-2001. It can be seen that bycatch rates both fluctuate year-to-year and differ among sectors.

The estimated coastwide bycatch of chinook in the whiting fishery, including the shore-based component, has averaged 7,067 annually since 1991. Limits on chinook bycatch in the whiting fishery were established as result of the September 27, 1993, Biological Opinion (BO) issued pursuant to the ESA. This opinion established the bycatch rate of 0.05 chinook salmon/mt of whiting with an 11,000 fish threshold for the entire whiting fishery (at-sea and shore-base sectors combined). Re-initiation of the BO is required if both the bycatch rate and bycatch limit are exceeded (NMFS 2003c). Table 5-3 shows the incidental annual catch of chinook salmon for all sectors of the whiting fleet combined (at-sea and shore-based), from 1991 to 2001. Values in bold indicate years in which the threshold established in the biological opinion was exceeded.

5.1.2 Sea Turtles

Sea turtles are highly migratory, and four of the six species found in U.S. waters have been sighted off the West Coast. These are loggerhead *(Caretta caretta*), green (*Chelonia mydas),* leatherback (*Dermochelys coriacea*), and olive ridley (*Lepidochelys olivacea*) sea turtles. Little is known about the interactions between sea turtles and West Coast fisheries. Directed fishing for sea turtles in West Coast groundfish fisheries is prohibited because of their ESA listings; however, incidental take of sea turtles by longline or trawl gear may occur. (Green, leatherback, and olive ridely sea turtles are listed as endangered; loggerheads are listed as threatened.) The management and conservation of sea turtles is shared between NMFS and the U.S. Fish and Wildlife Service (FWS).

The following species descriptions are taken from Appendix A to the groundfish bycatch mitigation draft programmatic EIS (DPEIS) (NMFS 2004b).

5.1.2.1 Loggerhead Sea Turtle

Loggerhead sea turtles (*Caretta caretta)* are widespread, inhabiting shallower continental areas in the subtropical and temperate waters (Eckert 1993; MMS 1992). Their population is estimated at about 300,000 (NMFS and USFWS 1998c; Pitman 1990) and with peak abundance summer and fall off southern California (NMFS and USFWS 1998c). The loggerhead turtle is listed as a threatened species throughout its range under the ESA.

Juvenile and subadult loggerheads are omnivorous, foraging on pelagic crabs, molluscs, jellyfish, and vegetation captured at or near the surface. The maximum recorded diving depth for a loggerhead is 233 meters (Eckert 1993).

The primary fishery threats to the loggerheads in the Pacific are longline and gillnet fisheries (NMFS and USFWS 1998c).

5.1.2.2 Green Sea Turtle

Green sea turtles *(Chelonia mydas)* are a cosmopolitan, highly migratory species, nesting mainly in tropical and subtropical regions. Green turtles have been declining throughout the Pacific Ocean, probably due to overexploitation and habitat loss (Eckert 1993) and are listed as threatened, except for breeding populations found in Florida and the Pacific coast of Mexico, which are listed as endangered.

The maximum recorded dive depth for an adult green turtle was 110 meters, while subadults routinely dive 20 m for 9 to 23 minutes, with a maximum recorded dive of 66 minutes (Eckert 1993). It is presumed that drift lines or surface current convergences are preferential zones due to increased densities of likely food items.

The primary green turtle nesting grounds in the eastern Pacific are located in Michoacán, Mexico, and the Galapagos Islands, Ecuador. More than 165,000 turtles were harvested from 1965 to 1977 in the Mexican Pacific. The nesting population at the two main nesting beaches in Michoacán decreased from 5,585 females in 1982 to 940 in 1984 (NMFS and USFWS 1998b).

5.1.2.3 Leatherback Sea Turtle

Leatherback sea turtles *(Dermochelys coriacea)* are distributed in most open ocean waters and range into higher latitudes than other sea turtles, as far north as Alaska (NMFS and USFWS 1998a), possibly associated with El Niño events. Leatherbacks are commonly sighted near Monterey Bay, mainly in August (Starbird *et al.* 1993). The leatherback turtle is listed as an endangered species under the ESA throughout its range.

Leatherbacks are the largest of the sea turtles, possibly to maintain warmer body temperature over longer time periods. Prey include jellyfish, siphonophores, and tunicates (Eckert 1993). Leatherbacks are reported diving to depths exceeding 1000 m (Lutz and Musick 1997).

Primary threats to leatherbacks in the Pacific are the killing of nesting females and eggs at the nesting beaches and the incidental take in coastal and high seas fisheries (NMFS and USFWS 1998a).

5.1.2.4 Olive Ridley Sea turtle

Olive Ridley sea turtles *(Lepidochelys olivacea)* are the most abundant sea turtle in the Pacific basin. However, although these turtles remain relatively widespread and abundant, most nest sites support only small or moderate-scale nesting, and most populations are known or thought to be depleted. The olive ridley populations on the Pacific coast of Mexico are listed as endangered; all other populations are listed as threatened.

This sea turtle species appears to forage throughout the eastern tropical Pacific Ocean, often in large groups, or flotillas. Occasionally they are found entangled in scraps of net or other floating debris. Despite its abundance, there are surprisingly few data relating to the feeding habits of the olive ridley. However, those reports that do exist suggest that the diet in the western Atlantic and eastern Pacific includes crabs, shrimp, rock lobsters, jellyfish, and tunicates. In some parts of the world, it has been reported that the principal food is algae. Although they are generally thought to be surface feeders, olive ridleys have been caught in trawls at depths of 80 to 110 m (NMFS and USFWS 1998d).

5.2 Marine Mammals

The waters off Washington, Oregon, and California support a wide variety of marine mammals. Approximately 30 species, including seals and sea lions, sea otters, whales, dolphins, and porpoise, occur within the EEZ. Many marine mammal species seasonally migrate through West Coast waters, while others are year-round residents. Table 5-4 lists marine mammal species occurring off the West Coast.

5.2.1 Regulatory Status of Marine Mammals

In addition to the ESA, the federal MMPA guides marine mammal species protection and conservation policy. Under the MMPA, on the West Coast NMFS is responsible for the management of cetaceans and pinnipeds, while the FWS manages sea otters. Stock assessment reports review new information every year for strategic stocks and every three years for non-strategic stocks. (Strategic stocks are those whose human-caused mortality and injury exceeds the potential biological removal [PBR].) Marine mammals, whose abundance falls below the optimum sustainable population (OSP), are listed as "depleted" according to the MMPA.

Fisheries that interact with species listed as depleted, threatened, or endangered (Table 5-4) may be subject to management restrictions under the MMPA and ESA. NMFS publishes an annual list of fisheries in the *Federal Register* separating commercial fisheries into one of three categories based on the level of serious injury and mortality of marine mammals occurring incidentally in that fishery. The categorization of a fishery in the list of fisheries determines whether participants are subject to certain provisions of the MMPA, such as registration, observer coverage, and take reduction plan requirements. West Coast groundfish fisheries are in Category III, denoting a remote likelihood of, or no known, serious injuries or mortalities to marine mammals.

5.2.2 Species Descriptions

The following species descriptions are taken from Appendix A to the groundfish bycatch mitigation DPEIS (NMFS 2004b). Those descriptions are drawn from the most recent Stock Assessment Reports (SAR) prepared by NMFS as required by the MMPA.

5.2.2.1 California Sea Lion

California sea lions *(Zalophus californianus)* range from British Columbia south to Tres Marias Islands off Mexico. Breeding grounds are mainly on offshore islands from the Channel Islands south into Mexico. Breeding takes place in June and early July within a few days after the females give birth. NMFS conducts annual pup censuses at established rookeries (Lowry 1999) and uses a correction factor to obtain a total estimated population of 214,000 sea lions (Carretta *et al.* 2001). The stock appears to be increasing at about 6.2% per year while fishery mortality also is increasing (Lowry *et al.* 1992). California sea lions are not endangered or threatened under the Endangered Species Act (ESA) nor depleted under the MMPA. This stock is also not listed as a strategic under the MMPA and total human-caused mortality (1,352 sea lions) is less than the 6,591 sea lions allowed under the Potential Biological Removal formula (Carretta *et al.* 2001).

During the summer breeding season, most adults are present near rookeries principally located on the southern California Channel Islands and Año Nuevo Island near Monterey Bay. Males migrate northward in the fall, going as far north as Alaska and returning to their rookeries in the spring. Adult females generally do not migrate far away from rookery areas. Juveniles remain near rookery areas or move into waters off central California. Diet studies indicate that California sea lions feed on squid, octopus, and a variety of fishes: anchovies, sardine, mackerel, herring, rockfish, hake, and salmon (Antonelis *et al.* 1984; Lowry *et al.* 1990; NMFS 1997).

Incidental mortalities of California sea lions have been documented in set and drift gillnet fisheries (Carretta *et al.* 2001; Hanan *et al.* 1993). Skippers' logs and at-sea observations have shown that California sea lions have been incidentally killed in Washington, Oregon, and California groundfish trawls and during Washington, Oregon, and California commercial passenger fishing vessel fishing activities (Carretta *et al.* 2001).

5.2.2.2 Harbor Seal

Harbor seals *(Phoca vitulina richardsi)* inhabit nearshore and estuarine areas ranging from Baja California, Mexico, to the Pribilof Islands, Alaska. MMPA stock assessment reports recognize six stocks along the U.S. west coast: California, Oregon/ Washington outer coastal waters, Washington inland waters, and three stocks in Alaska coastal and inland waters (Carretta *et al.* 2001). Using the latest complete aerial survey (Hanan 1996) and appropriate corrections for counting bias, Carretta, *et al.* (2001) estimates the California stock at 30,293 seals, the Oregon/ Washington Coast stock at 26,180 seals, and the Washington inland-water stock at 16,056 seals. These estimates combine for a West Coast total of 72,529 seals. The population appears to be growing and fishery mortality is declining. Harbor seals are not endangered or threatened under the ESA nor depleted under the MMPA. This stock is also not listed as a strategic under the MMPA and total human-caused mortality (666 seals) is less than the 1,678 harbor seals allowed under the Potential Biological Removal formula (Carretta *et al.* 2001).

Harbor seals do not migrate extensively, but have been documented to move along the coast between feeding and breeding locations (Brown 1988; Herder 1986; Jeffries 1985). The harbor seal diet includes herring, flounder, sculpin, cephalopods, whelks, shrimp, and amphipods (Bigg 1981; NMFS 1997).

Combining mortality estimates from California set net, northern Washington marine set gillnet, and groundfish trawl results in an estimated mean mortality rate in observed groundfish fisheries of 667 harbor seals per year along Washington, Oregon, and California (Carretta *et al.* 2001).

5.2.2.3 Northern Elephant Seal

Northern elephant seals *(Mirounga angustirostris*) range from Mexico to the Gulf of Alaska. Breeding and whelping occurs in California and Baja California, during winter and early spring (Stewart and Huber 1993) on islands and recently at some mainland sites. Stewart *et al*. (1994) estimated the population at 127,000 elephant seals in the U.S. and Mexico during 1991. The population is growing and fishery mortality may be declining, and the number of pups born may be leveling off in California during the last five years (Carretta *et al.* 2001). Northern elephant seals are not endangered or threatened under the ESA nor depleted under the MMPA. This stock is also not listed as a strategic under the MMPA and total human-caused mortality (33 seals) is less than the 2,142 elephant seals allowed under the Potential Biological Removal formula (Carretta *et al.* 2001).

Northern elephant seals are polygynous breeders with males forming harems and defending them against other mature males in spectacular battles on the beach. Female give birth in December and January, mate about three weeks later, after which the pups are weaned (Reeves *et al.* 2002). They were hunted for their oil to near extinction and the current population is composed of the descendants of a few hundred seals that survived off Mexico (Stewart *et al.* 1994). They feed mainly at night in very deep water, consuming whiting, hake, skates, rays, sharks, cephalopods, shrimp, euphasiids, and pelagic red crab (Antonelis *et al.* 1987). Males feed in waters off Alaska, and females off Oregon and California (Le Boeuf *et al.* 1993; Stewart and Huber 1993).

There are no recent estimated incidental kills of Northern elephant seals in groundfish fisheries along Washington, Oregon, and California; however, they have been caught in setnet fisheries (Carretta *et al.* 2001).

5.2.2.4 Guadalupe Fur Seal

The historical distribution and abundance of the Guadalupe fur seal *(Arctocephalus townsendi)* are uncertain because commercial sealers and other observers failed to distinguish between this species and northern fur seals. However, the species likely ranged from Islas Revillagigedo, Mexico (18° N) to Point Conception, California (34° N latitude) and possibly as far north as the Farallon Islands, California (37° N). At the present time, this species ranges from Cedros Island, Mexico, to the northern Channel Islands. Remains have been found in Indian trash middens throughout the southern California bight and individual seals frequent Channel Island sea lion colonies (Stewart *et al.* 1987). This species was once thought to be extinct; however, Gallo (1994) estimated a total of about 7,408 animals in 1993, and a growth rate of about 13.7% per year (Carretta *et al.* 2001). Guadalupe fur seals are protected under Mexican law (Guadalupe Island is a marine sanctuary), the U.S. MMPA (depleted and strategic), the U.S. ESA (threatened), the California Fish and Game Code (fully protected), and the California Fish and Game Commission (threatened).

In 1892, only seven of these seals could be found; they were presumed extinct until 1926, when a group of 60 animals was discovered on Isla de Guadalupe, Mexico (Hubbs and Wick 1951). Although the primary breeding colony is on Guadalupe Island, Mexico, a pup was born at San Miguel Island, California (Melin and DeLong 1999). Males defend territories during May through July and mate with the females approximately one week after the birth of single pups. Guadalupe fur seals are reported to feed on fish including hake, rockfish, and cephalopods (Fleischer 1987) and probably require about 10% of their own body weight in fish per day.

There have been no U.S. reports of mortalities or injuries for Guadalupe fur seals (Cameron and Forney 1999; Julian 1997; Julian and Beeson 1998), although there have been reports of stranded animals with net abrasions and imbedded fish hooks (Hanni *et al.* 1997).

5.2.2.5 Northern Fur Seal

Northern fur seals *(Callorhinus ursinus)* range in the eastern north Pacific Ocean, from southern California to the Bering Sea. Two separate stocks of northern fur seals are recognized within U.S. waters: an Eastern Pacific stock and a San Miguel Island stock. Nearly hunted to extinction for its fur, the San Miguel Island stock is estimated at 4,336 seals (Carretta *et al.* 2001) and the Eastern Pacific stock at 941,756 seals (Angliss and Lodge 2002). The San Miguel Island stock is not endangered or threatened under the ESA nor depleted under the MMPA. This stock is also not listed as a strategic under the MMPA and total human-caused mortality (zero seals) is less than the 100 fur seals allowed under the Potential Biological Removal formula (Carretta *et al.* 2001). "The Eastern Pacific stock is classified as strategic because it is designated as depleted under the MMPA" (Angliss and Lodge 2002).

Prior to harvesting, northen fur seal populations were mainly located on the Pribilof Islands of Alaska, and were estimated at two million animals. Northern fur seals were harvested commercially from the 1700s to 1984. San Miguel Island is the only place in California where northern fur seals breed and pup. Offshore, they dive to depths of 20 to 130 m, usually at night, to feed opportunistically on pollock, herring, lantern fish, cod, rockfish, squid, loons, and petrels (Fiscus 1978; Gentry 1981; Kajimura 1984; Kooyman *et al.* 1976).

Fur seals are a pelagic species spending many months at sea migrating throughout the eastern North Pacific Ocean including off Oregon and California (Roppel 1984). There were no reported mortalities of northern fur seals in any observed fishery along the west coast of the continental U.S. during the period 1994-1998 (Carretta *et al.* 2001), although there were incidental mortalities in trawl and gillnet fisheries off Alaska (Angliss and Lodge 2002).

5.2.2.6 Northern or Steller Sea Lion

The northern or Steller sea lion *(Eumetopias jubatus*) ranges along the North Pacific Ocean from Japan to California (Loughlin *et al.* 1984). Two stocks are designated in U.S. waters with the eastern stock extending from Cape Suckling, Alaska to southern California (Loughlin 1997) with a total of 6,555 animals off Washington, Oregon and California. The eastern stock of Steller sea lion has a threatened listing under the ESA, depleted under the MMPA, and therefore is classified as a strategic stock (Angliss and Lodge 2002).

They do not make large migrations, but disperse after the breeding season (late May-early July), feeding on rockfish, sculpin, capelin, flatfish, squid, octopus, shrimp, crabs, and northern fur seals (Fiscus and Baines 1966).

Eastern stock Steller sea lions were observed taken incidentally in West Coast groundfish trawls and marine set gillnet fisheries (Angliss and Lodge 2002). Total estimated mortalities of this stock (44) is less than the 1,396 Steller sea lions allowed under the Potential Biological Removal formula (Angliss and Lodge 2002).

5.2.2.7 Southern Sea Otter

Southern sea otters (*Enhydra lutris nereis*) range along the mainland coast from Half Moon Bay, San Mateo County south to Gaviota, Santa Barbara County; an experimental population currently exists at San Nicolas Island, Ventura County (VanBlaricom and Ames 2001). Prior to the harvest that drove the population to near extinction, sea otters ranged from Oregon to Punta Abreojos, Baja California, Mexico (Wilson *et al.* 1991).

The 2002 spring survey of 2,139 California sea otters reflects an overall decrease of 1.0% from the 2001 spring survey of 2,161 individuals, according to scientists at the U.S. Geological Survey. Observers recorded 1,846 independents in 2002 (adults and subadults), down 0.9% from the 2001 count of 1,863 independents; 293 pups were counted in 2002, down by 1.7% from the 2001 count of 298 pups (USGS 2002). The U.S. Fish and Wildlife Service declared the southern sea otter a threatened species in 1977 under the ESA and therefore the stock is also designated as depleted under the MMPA (VanBlaricom and Ames 2001).

Harvest for their fur reduced the sea otter population to very few animals and presumed extinction until California Department of Fish and Game biologists and wardens discovered a remnant group near Point Sur. In 1914, the total California population was estimated to be about 50 animals (CDFG 1976). Sea otters eat large-bodied bottom dwelling invertebrates such as sea urchins, crabs, clams, mussels, abalone, other shellfish, as well as market squid. Otters can dive up to 320 feet to forage (VanBlaricom and Ames 2001).

During the 1970s and 1980s considerable numbers of sea otters were observed caught in gill and trammel entangling nets in central California. This was projected as a significant source of mortality for the stock until gillnets were prohibited within their feeding range. During 1982 to 1984 an average of 80 sea otters were estimated to drown in gill and trammel nets (Wendell *et al.* 1986). More recent mortality data (Pattison *et al.* 1997) suggest similar patterns during a period of increasing trap and pot fishing for groundfish and crabs (Estes *et al.* In Press). This elevated mortality appears to be the main reason for both sluggish population growth and periods of decline in the California sea otter population (Estes *et al.* In Press).

5.2.2.8 Sea Otter

Sea otters *(Enhydra lutris kenyoni*, Washington stock) range from Pillar Point south to Destruction Island. In an effort to return the extirpated sea otters to Washington state waters, otters were transplanted from Amchitka Island, Alaska in 1969 and 1970; 59 otters were introduced (Jameson *et al.* 1982). The experiment worked, sea otter numbers increased, and they are re-occupying former range (Richardson and Allen 2000). The highest count for the 2001 survey was 555 sea otters, an increase of 10% from 2000 (USGS 2002). The rate of increase for this population since 1989 is about 8.8%. The Washington sea otter has no formal Federal listing under ESA or MMPA but is designated as endangered by the State of Washington.

Sea otters eat bottom dwelling invertebrates such as sea urchins, crabs, sea cucumbers, clams, mussels, abalone, and other shellfish, as well as market squid. Otters can dive up to 320 feet to forage (VanBlaricom and Ames 2001).

Gillnet and trammel net entanglements were a significant source of mortality for southern sea otters (Wendell *et al.* 1986) and some sea otters were taken incidentally in setnets off Washington (Kajimura 1990). Evidence from California and Alaska suggests that incidental take of sea otter in crab pots and tribal set-net fisheries may also occur. Sea otters are also quite vulnerable to oil spills due to oiled fur interfering with thermoregulation, ingested oil disintegrating the intestinal track, and inhaled fumes eroding the lungs (Richardson and Allen 2000).

5.2.2.9 Harbor Porpoise

Harbor porpoises *(Phocoena phocoena)* are small and inconspicuous. They range in nearshore waters from Point Conception, California, into Alaska and do not make large scale migrations (Gaskin 1984). Harbor porpoise in California are split into two separate stocks based on fisheries interactions: the central California stock, Point Conception to the Russian River, and the northern California stock in the remainder of northen California (Barlow and Hanan 1995). Oregon and Washington harbor porpoise are combined into a coastal stock and an inland Washington stock is also designated for inland waterways. The most recent abundance estimates, based on aerial surveys are 7,579 in central California, 15,198 in northern California, 44, 644 in Oregon/Washington coastal, and 3,509 in inland Washington. There are no clear trends in abundance for these stocks (Carretta *et al.* 2001). Harbor porpoise are not listed as threatened or endangered under the ESA nor as depleted under the MMPA. "The average annual mortality for 1996-99 (80 harbor porpoise) is greater than the calculated PBR (56) for central California harbor porpoise; therefore, the central California harbor porpoise population is strategic under the MMPA" (Carretta *et al.* 2001).

Although usually found in nearshore waters, "distinct seasonal changes in abundance along the west coast have been noted, and attributed to possible shifts in distribution to deeper offshore waters during late winter" (Barlow 1988; Carretta *et al.* 2001; Dohl *et al.* 1983). The harbor porpoise diet is mainly composed of cephalopods and fishes, and they prefer schooling non-spiny fishes, such as herrings, mackerels, and sardines (Reeves *et al.* 2002).

Harbor porpoise are very susceptible to incidental capture and mortalities in setnet fisheries (Julian and Beeson 1998). Off Oregon and Washington, fishery mortalities of harbor porpoise have been recorded in the northern Washington marine set and drift gillnet fisheries (Carretta *et al.* 2001).

5.2.2.10 Dall's Porpoise

Dall's porpoises *(Phocoenoides dalli*) are common in shelf, slope and offshore waters in the north eastern Pacific Ocean down to southern California (Morejohn 1979). As a deep-water oceanic porpoise, they are often sighted nearshore over deep-water canyons. These porpoise are abundant and widely distributed, with at least 50,000 off California, Oregon, and Washington; however, because of their habit of approaching vessels at sea, it may be difficult to obtain an unbiased estimate of abundance (Reeves *et al.* 2002). They are not endangered or threatened under the ESA nor depleted under the MMPA. This stock is also not listed as strategic under the MMPA and total human-caused mortality (12) is less than the 737 porpoise allowed under the Potential Biological Removal formula (Carretta *et al.* 2001).

Dall's porpoise calf between spring and fall after a 10 to 11 month gestation period (Reeves *et al.* 2002). Carretta, *et al*. (2001) observe that "north-south movement between California, Oregon and Washington occurs as oceanographic conditions change, both on seasonal and inter-annual time scales." Dall's porpoise feed on squid, crustaceans, and many kinds of fish including jack mackerel (Leatherwood *et al.* 1982; Scheffer 1953).

There is a harpoon fishery for Dall's porpoise in Japan where large numbers are killed (Reeves *et al.* 2002). Observers document that Dall's porpoise have been caught in the California, Oregon, and Washington domestic groundfish trawl fisheries (Perez and Loughlin 1991) but the estimated annual take is less than two porpoise per year.

5.2.2.11 Pacific White-sided Dolphin

Pacific white-sided dolphins *(Lagenorhynchus obliquidens*) are abundant, gregarious and found in the cold temperate waters of the North Pacific Ocean. Along the west coast of north America they are rarely observed south of Baja California, Mexico. Aerial surveys have exceeded 100,000 white-sided dolphins over the California continental shelf and slope waters (Reeves *et al.* 2002). These dolphins are not endangered or threatened under the ESA nor depleted under the MMPA. The stock is not listed as strategic under the MMPA and total human-caused mortality (seven) is less than the 157 dolphins allowed under the Potential Biological Removal formula (Carretta *et al.* 2001).

Little is known of their reproductive biology, although a 29 year old pregnant female is reported, indicating a relatively long reproductive span (Reeves *et al.* 2002). White-sided dolphins inhabit California waters during winter months moving northward into Oregon and Washington during spring and summer (Green *et al.* 1992). Shifts in abundance likely represent changes in prey abundance or migration of prey species. They are opportunistic feeders and often work collectively to concentrate and feed small schooling fish, including anchovies, hakes, herrings, sardines, and octopus.

Observers have documented mortalities in the California, Oregon, and Washington groundfish trawl fisheries for whiting (Perez and Loughlin 1991). The total estimated kill of white-sided dolphins in these fisheries averages less than one dolphin per year (Carretta *et al.* 2001).

5.2.2.12 Risso's Dolphin

Risso's dolphins (*Grampus griseus*) have world-wide distribution in warm-temperate waters of the upper continental slope in waters depths averaging 1,000 feet. They commonly move into shallow areas in pursuit of squid (Reeves *et al.* 2002). Reeves *et al*. (2002) also report up to 30,000 Risso's dolphins off the U.S. west coast. They are not endangered or threatened under the ESA nor depleted under the MMPA. The stock is not listed as strategic under the MMPA and total human-caused mortality (six) is less than the 105 dolphins allowed under the Potential Biological Removal formula (Carretta *et al.* 2001).

The reproductive biology of this species is not well known. Risso's dolphins feed at night on fish, octopus and squid, but they concentrate on squid. They are usually observed in groups of 10-40 animals and may form loose aggregations of 100 to 200 animals (Reeves *et al.* 2002). It has been speculated that changes in ecological conditions and an El Niño event off southern California may have resulted in this species filling a niche previously occupied by pilot whales (Reeves *et al.* 2002).

There have been no recent Risso's dolphin moralities in west coast groundfish fisheries (Carretta *et al.* 2001), although Reeves *et al*. (2002) report that Risso's are a bycatch in some longline and trawl fisheries.

5.2.2.13 Short-beaked Common Dolphin

Short-beaked common dolphins *(Delphinus delphis)* commonly inhabit tropical and warm temperate oceans. Their distribution along the U.S. west coast extends from southern California to Chile and westward to 135° W longitude (Reeves *et al.* 2002). "The 1991-96 weighted average abundance estimate for California, Oregon and Washington waters based on the three ship surveys is 373,573 short-beaked common dolphins" (Barlow 1997; Carretta *et al.* 2001). They are not endangered or threatened under the ESA nor depleted under the MMPA. The stock is not listed as strategic under the MMPA and total human-caused mortality (79) is less than the 3,188 dolphins allowed under the Potential Biological Removal formula (Carretta *et al.* 2001).

Reproductive activity is non-seasonal in tropical waters calving peaks in spring and summer in more temperate waters (Reeves *et al.* 2002). Short-beaked common dolphins feed nearshore on squid, octopus, and schooling fish like anchovies, hake, lantern fish, deep-sea smelt or herring. These dolphins are often seen in very large schools of hundreds or thousands and are active bow riders.

Common dolphin mortality has been estimated for set gillnets in California (Julian and Beeson 1998); however, the two species (short-beaked and long-beaked) were not reported separately. Reeves *et al*. (2002) relate that short-beaked common dolphins are also a bycatch in some trawl fisheries.

5.2.2.14 Long-beaked Common Dolphin

Long-beaked common dolphins *(Delphinus capensis)* were recognized as a distinct species in 1994 (Heyning and Perrin 1994; Rosel *et al.* 1995). Their distribution overlaps with the short-beaked common dolphin, although they are more typically observed in nearshore waters. "The 1991-96 weighted average abundance estimate for California, Oregon and Washington waters based on the three ship surveys is 32,239 long-beaked common dolphins" (Barlow 1997; Carretta *et al.* 2001). They are not endangered or threatened under the ESA nor depleted under the MMPA. The stock is not listed as strategic under the MMPA and total human-caused mortality (14) is less than the 250 dolphins allowed under the Potential Biological Removal formula (Carretta *et al.* 2001).

Reproductive activity is similar to short-beaked: non-seasonal in tropical waters spring and summer peaks in more temperate waters (Reeves *et al.* 2002). Long-beaked common dolphins feed nearshore on squid, octopus, and schooling fish like anchovies or herring. They are also active bow riders and break the water surface frequently when swimming in groups averaging 200 animals.

Common dolphin mortality has been estimated for set gillnets in California (Julian and Beeson 1998); however, short-beaked and long-beaked dolphin mortalities were not reported separately. Reeves *et al.* (Reeves *et al.* 2002) relate that long-beaked common dolphins are also a bycatch in some trawl fisheries.

5.2.2.15 Short-finned Pilot Whale

Short-finned pilot whales *(Globicephala macrorhynchus*) favor a tropical and warm temperate distribution and are considered abundant (Reeves *et al.* 2002). They were common to Southern California, especially the isthmus of Santa Catalina Island during the winter (Dohl *et al.* 1980). However, following the 1982-83 El Niño they have been rarely observed (Barlow 1997). "The 1991-96 weighted average abundance estimate for California, Oregon and Washington waters based on three ship surveys is 970 short-finned pilot whales" (Barlow 1997; Carretta *et al.* 2001). They are not endangered or threatened under the ESA nor depleted under the MMPA. The stock is not listed as strategic under the MMPA and total human-caused mortality (three) is less than the six short-finned pilot whales allowed under the Potential Biological Removal formula (Carretta *et al.* 2001).

They form social groups of 15- 50 individuals often traveling in long lines two to three animals wide. A typical sex ratio is one mature male to eight mature females; mating occurs in August through January with a 15 month gestation period (Reeves *et al.* 2002).

Short-finned pilot whales feed somewhat exclusively on market squid, *Loligo opalescens,* and were believed by fishermen to significantly compete with squid purse seine operations off Southern California. There were many records and observations of short-finned pilot whale shootings by fishermen (Heyning and Perrin 1994; Miller *et al.* 1983). Although the squid fishery has become the largest fishery in California since 1992 (Vojkovich 1998), coinciding with reduced short-finned pilot whales numbers, there have been no recent reports of mortalities in this fishery (Carretta *et al.* 2001).

5.2.2.16 Gray Whale

The gray whale *(Eschrichtius robustus*) is represented as the Eastern Pacific stock along the west coast of North America. Currently, the population is estimated at about 26,000 whales (Reeves *et al.* 2002) with rates of increase just above two percent (Angliss and Lodge 2002). They are not endangered or threatened under the ESA nor depleted under the MMPA. The stock is not listed as strategic under the MMPA and total human-caused mortality (48) is less than the 432 gray whales allowed under the Potential Biological Removal formula (Angliss and Lodge 2002).

Gray whales breed as they migrate through warmer waters; gestation lasts 12 to 13 months with females calving every 2 to 3 years (Reeves *et al.* 2002). At 5,000 miles, their migration from summer feeding grounds in the waters of Alaska to calving areas in bays and estuaries of Baja California, Mexico, is one of the longest for any mammal. The Eastern North Pacific stock feeds by filtering from the bottom sediments small, bottom-dwelling amphipods, crustaceans, and polychaete worms off Alaska during summer months (Rice and Wolman 1971).

The Eastern Pacific gray whale stock was removed from the ESA List of Endangered and Threatened Wildlife in 1994. They have been an incidental catch in set net fisheries, but there have been no recent takes in groundfish fisheries (Angliss and Lodge 2002).

5.2.2.17 Minke Whale

Minke whales *(Balaenoptera acutorostrata*) are one of the most widely distributed of baleen whales, ranging from South America to Alaska. For management, NMFS recognizes a California, Oregon, and Washington stock within the EEZ. "The number of minke whales is estimated as 631 (CV = 0.45) based on ship surveys in 1991, 1993, and 1996 off California and in 1996 off Oregon and Washington" (Barlow 1997; Carretta *et al.* 2001). They are not endangered or threatened under the ESA nor depleted under the MMPA. The stock is not listed as strategic under the MMPA and total human-caused mortality (zero) is less than the four minke whales allowed under the Potential Biological Removal formula (Carretta *et al.* 2001).

Little is known of their reproductive biology; presumably they calve in winter in tropical waters after about a ten-month gestation (Reeves *et al.* 2002). They are the smallest of the rorqual whales and only the pygmy right whale is smaller. Some migrate as far north as the ice edge in summer. The diet of Minke whales consists of plankton, krill, and small fish, including schools of sardines, anchovies and herring.

They have occasionally been caught in coastal gillnets off California (Hanan *et al.* 1993), in salmon drift gillnet in Puget Sound, Washington, and in drift gillnets off California and Oregon (Carretta *et al.* 2001). There have been no recent takes in groundfish fisheries off California, Oregon, or Washington (Carretta *et al.* 2001).

5.2.2.18 Sperm Whale

Sperm whales occur throughout the oceans and seas of the world near canyons and the continental slope. They are observed along the coasts of Oregon, and Washington (Carretta *et al.* 2001; Dohl *et al.* 1983). "Recently, a combined visual and acoustic line-transect survey conducted in the eastern temperate North Pacific in spring 1997 resulted in estimates of 24,000 (CV=0.46) sperm whales based on visual sightings, and 39,200 (CV=0.60) based acoustic detections and visual group size estimates" (Carretta *et al.* 2001). Sperm whales are ESA listed as endangered; therefore, this stock is automatically considered as depleted and strategic under the MMPA. Annual human-caused mortality (1.7 whales) is less than the 2.1 sperm whales allowed under the Potential Biological Removal formula (Carretta *et al.* 2001).

Mating occurs in the spring, and the calving interval is a minimum of four to six years. Combined with a gestation period of 18 months, this results in extremely low population growth rates (Reeves *et al.* 2002). All age classes and both sexes move throughout tropical waters, while males range farther and farther from the equator. Sperm whales feed near the ocean bottom, diving as deep as one mile to eat large squid (including giant squid), octopuses, rays, sharks, and fish (Reeves *et al.* 2002).

There are no recent observations of sperm whale incidental catches in West Coast groundfish fisheries.

5.2.2.19 Humpback Whale

Humpback whales *(Megaptera novaeangliae)* have a worldwide distribution and along Washington, Oregon, and California. NMFS recognizes the eastern North Pacific stock which is observed frequently in coastal areas. "The North Pacific total now almost certainly exceeds 6,000 humpback whales" (Calambokidis *et al.* 1997; Carretta *et al.* 2001). Humpback whales are ESA listed as endangered; therefore, this stock is automatically considered as depleted and strategic under the MMPA. Annual human-caused mortality (>0.2 whales) is less than the 1.9 whales allowed under the Potential Biological Removal formula (Carretta *et al.* 2001).

male humpback whale songs are one of the most famous breeding behaviors of all the marine mammals. They breed during winter with a two to three year gestation and calving in the tropics (Reeves *et al.* 2002). Their migrations can be as long as 5,000 miles (one way) from the higher latitude feeding grounds to the tropics for breeding and calving. They feed on krill and pelagic schooling fish.

There are no recent observations of humpback whale incidental catches in West Coast groundfish fisheries.

5.2.2.20 Blue Whale

The blue whale *(Balaenoptera musculus*) is the largest animal ever to exist on this planet. They inhabit most oceans and seas of the world. The eastern north Pacific stock summers off California to feed and migrates as far south as the Costa Rica Dome. "The best estimate of blue whale abundance is the average of the line transect and mark-recapture estimates, weighted by their variances, or 1,940" (Carretta *et al.* 2001) whales in this stock. Blue whales are ESA listed as endangered; therefore, this stock is automatically considered as depleted and strategic under the MMPA. Annual human-caused mortality (zero whales) is less than the 1.7 whales allowed under the Potential Biological Removal formula (Carretta *et al.* 2001).

Blue whale mating is unknown but calving takes place in winter after an eleven-month gestation. Calving interval is about two to three years. They feed on krill and possibly pelagic crabs (Reeves *et al.* 2002).

There are no recent observations of blue whale incidental catches in West Coast groundfish fisheries.

5.2.2.21 Fin Whale

Fin whales *(Balaenoptera physalus)* occur in the major oceans of the world and tend to be more prominent in temperate and polar waters. The California, Oregon, and Washington Stock was estimated at 1,851 fin whales, based on ship surveys in summer/autumn of 1993 and 1996 (Barlow and Taylor 2001). Fin whales are ESA listed as endangered; therefore, this stock is automatically considered as depleted and strategic under the MMPA. Annual human-caused mortality (1.5 whales) is less than the 3.2 whales allowed under the Potential Biological Removal formula (Carretta *et al.* 2001).

Little is known of their reproductive behavior, breeding, or calving areas. The female calving cycle is two to three years with an eleven or twelve-month gestation period following winter breeding. They probably do not make large-scale migrations and feed on krill and small pelagic fish such as herring (Reeves *et al.* 2002).

There are no recent observations of fin whale incidental catches in West Coast groundfish fisheries.

5.2.2.22 Killer Whale

Killer whales *(Orcinus orca*) inhabit most oceans and seas without respect to water temperature or depth, but are more prevalent in the higher colder latitudes (Reeves *et al.* 2002). Off Washington, Oregon, and California three stocks are recognized, based on behavior, photographic identification, and genetics differences. Those stocks are: Eastern North Pacific Offshore Stock, Eastern North Pacific Transient Stock, and Eastern North Pacific Southern Transient Stock (Carretta *et al.* 2001). "Based on summer/fall shipboard line-transect surveys in 1991, 1993 and 1996 (Barlow 1997), the total number of killer whales within 300 nm of the coasts of California, Oregon and Washington was recently estimated to be 819 animals. There is currently no way to reliably distinguish the different stocks of killer whales from sightings at sea..." (Carretta *et al.* 2001). Killer whales are not listed as endangered or threatened under the ESA nor depleted under the MMPA. None of the three stocks is listed as strategic under the MMPA and total human-caused mortality is less than that allowed under the Potential Biological Removal formula (Carretta *et al.* 2001).

A coalition of environmental groups recently filed a petition to protect the southern population of resident killer whales under the ESA. (This population lives in both U.S. and Canadian waters.) In June 2002, NMFS ruled this population of killer whales does not merit protection under the ESA. NMFS said the stock met two criteria: that it was a separate group and that it was in danger of extinction. But the third criteria—that of being a "significant" group—was not met because the southern population is considered part of the general killer whale population in the North Pacific, which is considered healthy. NMFS favors depleted status, with some protections under the MMPA. In December 2002, environmental groups filed a lawsuit on agency's ruling.

Killer whales give birth in all months with the peak in calving during winter. Movement seems to track prey items; along the West Coast, movements from Southeast Alaska to central California are documented (Goley and Straley 1994). Resident killer whales feed on fish, including salmon, and other large bodied fish. Transient killer whales feed on other marine mammals including sea otters, seals, porpoise, and baleen whales (Baird 2000). Offshore killer whales probably feed on squid and fish.

The only incidental take recorded by groundfish fishery observers was in the Bering Sea/Aleutian Islands (BSAI) groundfish trawl fishery (Carretta *et al.* 2001). There are also reports of interactions between killer whales and longline vessels (Perez and Loughlin 1991). (Longline fishers in the Aleutian Islands reported several cases where orcas removed sablefish from longlines as the gear was retrieved.) There are no other reports of killer whale takes in West Coast groundfish fisheries (Carretta *et al.* 2001).

5.2.2.23 Sei Whale

Sei whales *(Balaenoptera borealis)* occur in subtropical and tropical waters and into the higher latitudes, occupying both oceanic and coastal waters. "Seis are known worldwide for their unpredictable occurrences, with a sudden influx into an area followed by disappearance and subsequent absence for years or even decades" (Reeves *et al.* 2002). They are rare off Washington, Oregon, and California and there are no estimates of abundance or population trends for this stock. Sei whales in the eastern North Pacific (east of 180° W longitude) are considered a separate stock and listed as endangered under the ESA. Consequently, the eastern North Pacific stock is automatically considered as a depleted and strategic stock under the MMPA (Carretta *et al.* 2001).

Sei whales usually travel alone or in small groups and little is known of their behavior. They breed and calve in winter after a 11 to 12 month gestation. They forage on small fish, squid, krill, and copepods.

There are no observations of sei whale incidental catches in west coast fisheries, therefore no estimated groundfish fishery related losses.

5.2.2.24 Common Bottlenose Dolphin

Common bottlenose dolphins *(Tursiops truncatus)* are distributed worldwide in tropical and warm-temperate waters. For the MMPA stock assessment reports, bottlenose dolphins within the Pacific U.S. EEZ are divided into three stocks: California coastal stock; California, Oregon, and Washington offshore stock; and Hawaiian stock.

California coastal bottlenose dolphins are found within about one kilometer of shore, primarily from Point Conception south into Mexican waters. El Niño events appear to influence the distribution of animals along the California coast; since the 1982-83 El Niño they have been consistently sighted in central California as far north as San Francisco. Studies have documented north-south movements of coastal bottlenose dolphins (Defran *et al.* 1999; Hansen 1990). Coastal bottlenose dolphins spend an unknown amount of time in Mexican waters, where they are subject to mortality in Mexican fisheries. The best estimate of the average number of coastal bottlenose dolphins in U.S. waters is 169, based on two surveys conducted in 1994 and 1999 that covered virtually the entire U.S. range of this species. The minimum population size estimate for U.S. waters is 154 coastal bottlenose dolphins. The PBR level for this stock is 1.5 coastal bottlenose dolphins per year. This is calculated by multiplying the minimum population size by one half the default maximum net growth rate for cetaceans (half of 4%) times a recovery factor of 0.50 (for a species of unknown status with no known fishery mortality (Wade and Angliss 1997).

Due to its exclusive use of coastal habitats, this bottlenose dolphin population is susceptible to fishery-related mortality in coastal set net fisheries. However, from 1991 to 1994 observers saw no bottlenose dolphins taken in this fishery, and in 1994 the Sate of California banned coastal set gillnet fishing within 3 nm of the Southern California coast. In central California, set gillnets have been restricted to waters deeper than 30 fathoms (56 m) since 1991 in all areas except between Point Sal and Point Arguello. These closures greatly reduced the potential for mortality of coastal bottlenose dolphins in the California set gillnet fishery. Coastal gillnet fisheries are still conducted in Mexico and probably take animals from this population, but no details are available.

Coastal bottlenose dolphins are not listed as threatened or endangered under the ESA nor as depleted under the MMPA. Because no recent fishery takes have been documented, coastal bottlenose dolphins are not classified as a strategic stock under the MMPA, and the total fishery mortality and serious injury for this stock can be considered to be insignificant and approaching zero.

California/Oregon/Washington Offshore Stock: On surveys conducted off California, offshore bottlenose dolphins have been found at distances greater than a few kilometers from the mainland and throughout the Southern California Bight. They have also been documented in offshore waters as far north as about 41° N latitude, and they may range into Oregon and Washington waters during warm water periods. Sighting records off California and Baja California, Mexico (Lee 1993; Mangels and Gerrodette 1994) suggest that offshore bottlenose dolphins have a continuous distribution in these two regions. The most comprehensive multi-year average abundance for California, Oregon, and Washington waters, based on the 1991-96 ship surveys, is 956 offshore bottlenose dolphins (Barlow 1997). The minimum population size estimate of offshore bottlenose dolphins is 850. The PBR level for this stock is 8.5 offshore bottlenose dolphins per year.

In 1997, a Take Reduction Plan for the California drift gillnet (non-groundfish) fishery was implemented, which included skipper education workshops and required the use of pingers and minimum 6-fathom extenders. Overall cetacean entanglement rates in the drift gillnet fishery dropped considerably (Barlow and

Cameron 1999). Based on 1997-98 data, the estimate of offshore bottlenose dolphins taken annually in the U.S. fishery is zero. Drift gillnet fisheries for swordfish and sharks are also conducted along the entire Pacific coast of Baja California and may take animals from the same population.

Offshore bottlenose dolphins are not listed as threatened or endangered under the ESA nor as depleted under the MMPA. Because no recent fishery takes have been documented, offshore bottlenose dolphins are not classified as a strategic stock under the MMPA, and the total fishery mortality and serious injury for this stock can be considered to be insignificant and approaching zero.

5.2.2.25 Striped Dolphin

Striped dolphins *(Stenella coeruleoalba)* are distributed world-wide in tropical and warm-temperate pelagic waters. For the MMPA stock assessment reports, striped dolphins within the Pacific U.S. EEZ are divided into two discrete, noncontiguous areas: 1) waters off California, Oregon, and Washington and 2) waters around Hawaii.

California/Oregon/Washington Stock: On recent shipboard surveys extending about 300 nmi offshore of California, striped dolphins were sighted within about 100-300 nmi from the coast. No sightings have been reported for Oregon and Washington waters, but striped dolphins have stranded in both states (Oregon Department of Fish and Wildlife, unpublished data; Washington Department of Fish and Wildlife, unpublished data). Striped dolphins are also commonly found in the central North Pacific, but sampling between this region and California has been insufficient to determine whether the distribution is continuous. Based on sighting records off California and Mexico, striped dolphins appear to have a continuous distribution in offshore waters of these two regions (Mangels and Gerrodette 1994; Perrin *et al.* 1985).

The abundance estimate for California, Oregon and Washington waters is 20,235 striped dolphins (Barlow 1997). The minimum population size estimate is 17,995. The PBR level for this stock is 180 striped dolphins per year, calculated as the minimum population size (17,995) times one half the default maximum net growth rate for cetaceans (half of 4%) times a recovery factor of 0.50 (for a species of unknown status with no known fishery mortality; Wade and Angliss 1997).

Drift gillnet fisheries for swordfish and sharks conducted along the Pacific coast of Baja California, Mexico, may take animals from this population.

Striped dolphins are not listed as threatened or endangered under the ESA nor as depleted under the MMPA. Including U.S. driftnet information only for years after implementation of the Take Reduction Plan (1997-98), the average annual human-caused mortality in the years 1994 to 1998 is zero. Because recent mortality is zero, striped dolphins are not classified as a strategic stock under the MMPA, and the total fishery mortality and serious injury for this stock can be considered to be insignificant and approaching zero.

5.3 Seabirds

5.3.1 Overview and Regulatory Status

The highly productive California Current System, an eastern boundary current that stretches from Baja California, Mexico, to southern British Columbia, supports more than two million breeding seabirds and at least twice that number of migrant visitors. Tyler, *et al.* (1993) reviewed seabird distribution and abundance in relation to oceanographic processes in the California Current System and found that over 100 species have been recorded within the EEZ, including albatross, shearwaters, petrels, storm-petrels, cormorants, pelicans, gulls, terns, and alcids (murres, murrelets, guillemots, auklets, and puffins). In addition to these “classic” seabirds, millions of other birds are seasonally abundant in this oceanic habitat including: waterfowl, waterbirds (loons and grebes), and shorebirds (phalaropes). Not surprisingly, there is considerable overlap of fishing areas and areas of high bird density in this highly productive upwelling system. The species composition and abundance of birds varies spatially and temporally. The highest seabird biomass is found over the continental shelf, and bird density is highest during the spring and fall when local breeding species and migrants predominate.

The FWS is the primary federal agency responsible for seabird conservation and management. Four species found off the Pacific Coast are listed under the ESA, as noted in Table 5-5. In 2002, the FWS classified several seabird species that occur off the Pacific Coast as "Species of Conservation Concern." These species include the black-footed albatross (*Phoebastria nigripes*), ashy storm-petrel (*Oceanodroma homochroa*), gull-billed tern (*Sterna nilotica*), elegant tern (*Sterna elegans*), arctic tern (*Sterna paradisaea*), black skimmer (*Rynchops niger*), and Xantus's murrelet (*Synthliboramphus hypoleucus*).

The Migratory Bird Treaty Act (MBTA) implements various treaties and conventions between the U.S. and Canada, Japan, Mexico, and the former Soviet Union for the protection of migratory birds. Under the Act, taking, killing, or possessing migratory birds is unlawful. In addition to the MBTA, an Executive Order, Responsibilities of Federal Agencies to Protect Migratory Birds (EO 13186), directs federal agencies to negotiate Memoranda of Understanding with the FWS that would obligate agencies to evaluate the impact on migratory birds as part of any NEPA process. The FWS and NMFS are working on a Memorandum of Understanding concerning seabirds.

Under the Magnuson-Stevens Act, NMFS must ensure fishery management actions comply with other laws designed to protect seabirds. NMFS is also required to consult with FWS if fishery management plan actions may affect seabird species listed as endangered or threatened. Taken together, these laws and directives underscore the need to consider impacts to seabirds in decision making and consider ways to reduce potential impacts of the proposed action. In February 2001, NMFS adopted a National Plan of Action (NPOA) to Reduce the Incidental Take of Seabirds in Longline Fisheries. This NPOA contains guidelines that are applicable to relevant groundfish fisheries and would require seabird incidental catch mitigation if a significant problem is found to exist. During the first two years of NPOA implementation, NMFS regions were tasked with assessing the incidental take of seabirds in longline fisheries. In the limited entry groundfish longline fleet off the coast of Washington, Oregon, and California during September 2001–October 2002, there were no incidental seabird takes documented by West Coast Groundfish Observers. (During the assessment period, approximately 30% of landings by the limited entry fixed gear fleet had observer coverage.)

5.3.2 Seabird Species Descriptions

The following species descriptions are taken from Appendix A to the groundfish bycatch mitigation DPEIS (NMFS 2004b).

5.3.2.1 Albatross

Albatross range extensively throughout waters off the Pacific Coast. In particular, three albatross species, the short-tailed albatross (*Phoebastria albatrus*), the black-footed albatross (*Phoebastria nigripes*), and the Laysan albatross (*Phoebastria immutabilis*) occur in the waters off Washington, Oregon, and California.

Once considered the most common albatross ranging over the continental shelf, the short-tailed albatross was hunted to near extinction in the early 1900s and is now thought to be one of the rarest birds in the world.

Short-tailed albatross range widely in the North Pacific: breeding occurs off Japan and sightings extend from the Aleutian Islands to southern California (West Coast Groundfish Observer Program, NMFS, unpublished data, 2002). There are two known short-tailed albatross breeding colonies, one on Torishima Island and one on Minami-kojima Island, in the waters off Japan. Historical records indicate that there were over 100,000 individuals at the Torishima Island colony at the turn of the century and during 1998 and 1999 just over 400 breeding adults were found at the colony. The population on Torishima Island is now growing at an annual rate of 7.8%. The current estimate of the short-tailed albatross world population is about 1700 individuals (Hasegawa 2002; START 2002).

The short-tailed albatross feeds at the water's surface on squid, crustaceans, and various fish species. They sometimes follow fishing vessels and feed on offal. Chicks are fed a mixture of stomach oil and partially digested food that is regurgitated; nestlings are often fed squid, flying fishes, and crustaceans. Threats to short-tailed albatross include volcanic eruptions on the primary nesting island, Torishima, incidental take in commercial fisheries, ingestion of plastic, and the potential threat of oil spills.

Much like the short-tailed albatross, the black-footed albatross ranges throughout the North Pacific. Breeding occurs in the Northwestern Hawaiian Islands and Torishima Island, and the species disperses from the Bering Sea south along the Pacific Coast to California.

The black-footed albatross is the most numerous albatross species along the Pacific Coast and is present throughout the year (Briggs *et al.* 1987). The global black-footed albatross population is estimated at about 56,500 breeding pairs and thought to be decreasing (Naughton 2003). This species is classified as vulnerable by the IUCN (International Union for the Conservation of Nature and Natural Resources) based on a 19% population decrease during 1995 to 2000 and a projected future decline of more than 20% over the next 60 years owing to interactions with longline fisheries for tuna, billfish, and groundfish in the North Pacific (2001).

Black-footed albatross fed on fish, sea urchins, amphipods, and squid; foraging is done at night and prey is caught at the ocean's surface. This species will also follow fishing vessels and feed on discard. Besides interactions with longline fisheries, other threats to black-footed albatross include nest loss due to waves, pollution, introduced predators, oiling, ingestion of plastic, and volcanic eruptions on Torishima (2001).

The most abundant North Pacific albatross species is the Laysan albatross. The vast majority of the Laysan albatross population breeds in the Northwestern Hawaiian Islands, fewer numbers breed on the Japanese Ogasawara Islands, and still fewer pairs breed on islands off Baja California, Mexico (Guadalupe Island, Alijos Rocks, and in the Revillagigedo Islands). When at sea, the Laysan albatross ranges from the Bering Sea, to California, to Japan.

The FWS counts this species at Midway Atoll once every four years and counts or samples density at French Frigate Shoals and Laysan Island every year. These monitoring sites account for 93% of the world population of about 393,000 breeding pairs. At these three sites breeding populations have declined at an average rate of 3.2% per year since 1992. This represents a 32% decline in annual breeding attempts over a 10-year period (Naughton 2003).

Similar to the other North Pacific albatross species, Laysan albatross feed on schooling fish and squid at the ocean's surface. The primary threat to their population is interactions with fisheries.

5.3.2.2 California brown pelican

Brown pelicans *(Pelecanus occidentalis californicus)* range along the Pacific Coast from British Columbia south to central America. Historically, breeding colonies were found at Point Lobos, California, and from the Channel Islands south to Baja California, Mexico. They are found in coastal areas, on rocky shores and cliffs, in sloughs, and may also be found on breakwaters, jetties, pilings, and sandbars in harbors. While the California brown pelican still occurs throughout its original range, the breeding colonies in California, located in the Channel Islands National Park, West Anacapa Island, and the Santa Barbara Islands, are in decline (CDFG 2000).

In the 1970s, California brown pelicans were threatened with extinction by the widespread use of the pesticide DDT (dichlorodiphenyltrichloroethane). This chemical is transmitted via the food chain and becomes concentrated in top predators. DDT affects the pelican's ability to metabolize calcium, resulting in thin-shelled eggs that break during incubation. The use of DDT was banned in 1972 and the California brown pelican population subsequently began its recovery (CDFG 2000).

In the early 2000s, it was estimated that the brown pelican breeding population in California was about 9,000 adults (CDFG 2001). While the brown pelican population is thought stable, food availability is a cause for concern. Pacific mackerel, Pacific sardine, and the northern anchovy are important prey for brown pelicans, especially during the breeding season. However, commercial over-harvesting of these coastal pelagic species has reduced the quantity of prey that is available to pelicans (CDFG 2000).

The primary threats to California brown pelicans are human development in coastal regions, entanglement in abandon recreational fishing gear, and oil spills (CDFG 2000).

5.3.2.3 Terns

Nine species of terns occur along the West Coast, they are the arctic tern (*Sterna paradisaea*), common tern (*Sterna hirundo*), black tern (*Chlidonias niger*), California least tern (*Sterna antillarum browni*), Caspian tern (*Sterna caspia*), Forster's tern (*Sterna forsteri*), gull-billed tern (*Sterna nilotica*), royal tern (*Sterna maxima*), and elegant tern (*Sterna elegans*).

The populations of most tern species found along the Pacific Coast are stable; however, some tern species are listed under the ESA or are considered Species of Conservation Concern by the USFWS.

The range of the California least tern is limited to California and Baja California. During 1988 and 1989 in California, the population was estimated to be about 1,250 pairs. As with most species of terns, California least tern are found along seacoasts, beaches, bays, estuaries, lagoons, lakes, and rivers. Terns usually nest on open, flat beaches along lagoons or estuary margins. California least terns usually nest in the same area during successive years and tend to return to the natal site to nest.

Terns obtain their prey by diving from the air into shallow water and their diet is predominately small fishes (e.g., anchovy, surf-perch).

Primary threats to the California least tern population, and possible threats to other tern populations, include human development of nesting habitat and predation of adults, eggs, and young by other birds and introduced mammals.

5.3.2.4 Murrelets

Four species of murrelets occur along the Pacific coast, they are the marbled murrelet (*Brachyramphus marmoratus*), Craveri's murrelet (*Synthliboramphus craveri*), Xantus's murrelet (*Synthliboramphus hypoleucus*), and the ancient murrelet (*Synthliboramphus antiquus*).

The marbled murrelet has an extensive range along the Pacific Coast, extending from Alaska to California and breeding occurs throughout their range. These birds are found in coastal areas, mainly in salt water, often in bays and sounds. They are also found up to 5 km offshore and are occasionally sighted on lakes and rivers within 20 km of the coast. Most populations are dependent upon large coniferous trees in old-growth forests as suitable nesting habitat.

The marbled murrelet population has probably declined substantially throughout the region and it is estimated that 10,000 to 20,000 individuals remain (Carter *et al.* 1995).

The diet of marbled murrelets includes fishes (e.g., sandlance, capelin, herring), crustaceans, and mollusks. Birds may also feed exclusively on freshwater prey for several weeks. Marbled murrelets typically forage in waters up to 80 m in depth and two kilometers from shore. Birds dive to capture prey; dives may extend down 30 m below the water's surface.

The continued harvest of old-growth and mature coastal coniferous forest threatens critical nesting habitat throughout the marbled murrelet range. Additional threats to this population are interactions with gillnet fisheries and oil spills.

The ancient murrelet ranges along the Pacific Coast from Alaska to California. The estimated global population is on the order of half a million breeding pairs, with just over half found on the Queen Charlotte Islands of British Columbia. This species nests in rocky offshore islands in crevices, under rocks, at the base of trees, and in burrows. Declines in the ancient murrelet population are often attributed to the introduction of predators onto offshore islands used for breeding. Rats, raccoons, and foxes have reduced what was once the world's the largest colony (Langara Island, British Columbia) from about 200,000 pairs in 1969 to 15,000 pairs in 1994. Ancient murrelets are also threatened by food availability, which is subject to pesticide pollution, and changes in marine currents controlling local productivity.

Xantus's and Craveri's murrelets have relatively restricted ranges, when compared to other Pacific Coast murrelets, and are primarily found in California. Both species breed on islands; the Craveri's breeds in the Gulf of California and along the western coast of Baja California, Mexico, while the Xantus's breeds on islands off central California and western Baja California.

The population of the Craveri's murrelets is estimated to be between 6,000 and 10,000 individuals. Xantus's murrelets persist in very low numbers and the breeding population is estimated to be between 2,000 and 5,000 individuals. Both species are threatened by predators introduced onto breeding islands—specifically, rats and feral cats—and oil spills, especially from offshore platforms in Santa Barbara Channel and oil tanker traffic in Los Angeles harbor (Carter *et al.* 1995).

5.3.2.5 Northern fulmars

Northern fulmars (*Fulmarus glacialis*) range along the Pacific Coast from Alaska to Oregon and they are primarily pelagic.

The estimated total population of northern fulmars in the North Pacific is between 3 and 3.5 million individuals (Hatch 1993). This species primarily breeds in Alaska at colonies on sea cliffs and, less frequently, on low, flat rocky islands. Northern fulmars show strong mate and nest site fidelity (Shallenberger 1984). Nests are often raided by weasels and gulls.

Northern fulmars are surface feeders, they swim or float upon the ocean's surface while feeding on organisms found just below the surface. The diet of this species includes fishes, mollusks, crustaceans, and cephalopods. Northern fulmars have also been observed following fishing vessels, presumably to feed on offal.

Primary threats to northern fulmars are oil pollution, plastic debris, entanglement in fishing gear, and introduced predators and human disturbance on breeding islands (Hatch 1993).

5.3.2.6 Storm-petrels

Seven species of storm-petrels occur along the Pacific Coast, they include the black storm-petrel (*Oceanodroma melania*), fork-tailed storm-petrel (*Oceanodroma furcata*), ashy storm-petrel (*Oceanodroma homochroa*), least storm-petrel (*Oceanodroma microsoma*), Galapagos storm-petrel (*Oceanodroma tethys*), Wilson's storm-petrel (*Oceanites oceanicus*), and Leach's storm-petrel (*Oceanodroma leucorhoa*).

Populations of storm-petrel species found along the Pacific Coast, along with the amount of information known about different populations, varies considerably. In the North Pacific, Leach's storm-petrel is the most abundant species (a conservative total population estimate is between 10 and 15 million individuals) followed by the fork-tailed storm-petrel (total population estimate is between 5 and 10 million individuals). Conversely, the populations of ashy storm-petrels (total population estimated at fewer than 10,000 individuals), black storm-petrels (population estimate ranges between 10, 000 and 100,000 individuals), and least storm-petrels (population estimate ranges between 10,000 and 50,000 individuals) may be at risk (Boersma and Groom 1993).

Storm-petrels are pelagic, spending the majority of their lives at sea and returning to land only to breed. When at the breeding colonies, storm-petrels are nocturnal, an adaptation that reduces their susceptibility to diurnal predators (e.g., gulls) (Speich and Wahl 1989). Nests are often located in burrows, rocky crevices, or grassy slopes on small coastal islands. Some species of storm-petrels nest in the same burrow in successive years (Spendelow and Patton 1988).

Storm-petrels feed at the water's surface, rarely diving beneath the surface in pursuit of food. They catch prey by "dipping and pattering," that is they hover on outstreched wings, paddle the water with their webbed feet, and dip their bills into the water (Ainley 1984b). The diet of storm-petrels includes such things as plankton, small fishes, crustaceans, and small squid.

Primary threats to storm-petrels include introduced predators on breeding islands, pesticides and contaminants, pollution, and oil spills.

5.3.2.7 Shearwaters

Eight species of shearwaters range along the Pacific Coast, they include Townsend's shearwater (*Puffinus auricularis*), black-vented shearwater (*Puffinus opisthomelas*), wedge-tailed shearwaters (*Puffinus pacificus*), sooty shearwater (*Puffinus griseus*), short-tailed shearwater (*Puffinus tenuirostris*), pink-footed shearwater (*Puffinus creatopus*), flesh-footed shearwater (*Puffinus carneipes*), and Buller's shearwater (*Puffinus bulleri*).

The populations of most shearwater species found along the Pacific Coast are stable; however, some shearwater populations are considered at risk by the IUCN. Many species of shearwaters move between hemispheres to take advantage of the best feeding conditions (Shallenberger 1984).

The black-vented shearwater breeds on a handful of small islands off the coast of Baja California; the wedge-tailed and Townsend's shearwater breed on islands off the coasts of Mexico and Hawaii. The five remaining species of shearwater breed in the southern hemisphere on islands off the coast of Chile, Australia, and New Zealand. Much like storm-petrels, shearwaters nest in burrows and rocky crevices and their activities at breeding colonies are largely nocturnal.

When foraging, shearwaters may feed at the water's surface, plunge from just above the water's surface, or dive to depths of 50 m. Their diet includes small fishes (e.g., northern anchovies, Pacific sardines), squid, plankton, and crustaceans.

Shearwater populations are primarily threatened by predation by feral mammals (e.g., cats, pigs, mongoose, rats) and loss of habitat on breeding islands. Other threats associated with urbanization include collisions with power lines and attraction to lights.

5.3.2.8 Cormorants

Three species of cormorants occur along the Pacific Coast: Brandt's cormorant (*Phalacrocorax penicillatus*), double-crested cormorant (*Phalacrocorax auritus*), and pelagic cormorant (*Phalacrocorax pelagius*).

Brandt's cormorants are by far the most abundant cormorant species nesting along the coast of Oregon and California. In Washington, however, they have never been numerous or widespread (Spendelow and Patton 1988). Brant's cormorants are typically found in inshore, coastal areas, especially in areas having kelp beds, brackish bays, sheltered inlets, and quiet bays. Large numbers of birds breed in California and Oregon with fewer numbers breeding in Washington. Brandt's cormorant usually nests on offshore islands or, less frequently, on inaccessible mainland bluffs and wide cliff ledges near the water (Speich and Wahl 1989). Resident throughout the year near nesting areas, birds range more widely during non-breeding periods.

Double-crested cormorants are widespread and breeding populations along the Pacific Coast seem to be increasing in number (Carter *et al.* 1995; Spendelow and Patton 1988). They can be found along seacoasts, marine islands, coastal bays, swamps, lagoons, rivers, and lakes. Double-crested cormorants nest in variety of habitats. Along the coast, they nest on offshore rocks and islands, exposed dunes, abandoned wharf timbers, and power poles. Birds nesting inland often use trees or snags (Sowls *et al.* 1980; Speich and Wahl 1989). Birds are usually found within a few hours of their roosting or breeding sites (Ainley 1984a).

Breeding populations of pelagic cormorants are relatively evenly distributed from Washington to California (Spendelow and Patton 1988), and in recent years populations have been increasing in number. Pelagic cormorants occur in outer coastal habitats, bays, and inlets, especially in rock-bottom habitats and often in water less than 100 m and within 1 - 2 km of shore. These birds will often nest with other pelagic cormorants or near other species of seabirds. Nesting occurs on island cliff ledges, crevices, and in sea caves by building nests out of seaweed (Sowls *et al.* 1980).

Cormorants are classified as diving birds; their strong swimming ability enables them to pursue and capture their prey underwater. Their diet includes small fishes, squid, crabs, marine worms, and amphipods.

Cormorant populations are threatened by pesticides, human disturbance at nesting sites, oiling, and interactions with fisheries.

5.3.2.9 Jaegers

Three species of jaegers occur along the Pacific Coast: the pomarine jaeger (*Stercorarius pomarinus*), parasitic jaeger (*Stercorarius parasiticus*), and long-tailed jaeger (*Stercorarius longicaudus*).

All three species of jaegers are primarily pelagic, but may be found in bays and harbors. Jaegers breed in the arctic and sub-arctic. Non-breeding birds and breeders during the non-breeding season can be found off Washington, Oregon, and California.

The diet of jaegers includes small mammals, birds, bird eggs, fishes, invertebrates, and offal from fishing vessels. Jaegers are well known for their habit of pursing other seabirds on the wing (Maher 1984), forcing the other birds to disgorge their food, and then stealing the food before it hits the ground.

5.3.2.10 Gulls

Eleven species of gulls occur along the Pacific Coast, these include the glaucous gull (*Larus hyperboreus*), glaucous-winged gull (*Larus glaucescens*), western gull (*Larus accidentalis*), herring gull (*Larus argentatus*), California gull (*Larus californicus*), Thayer's gull (*Larus thayeri*), ring-billed gull (*Larus delawarensis*), mew gull (*Larus canus*), Heermann's gull (*Larus heermanni*), Bonaparte's gull (*Larus philadelphia*), and Sabine's gull (*Larus sabini*).

For most marine-nesting species in the North Pacific, only rough estimates of nesting populations exist and reproductive success has only been investigated for one to two years (Vermeer *et al.* 1993). However, it is thought that most gull populations along the Pacific Coast are stable and not considered to be at risk.

Most gulls along the Pacific Coast occur during the non-breeding season or are non-breeding individuals. Birds can be found at sea, along the coast, on rocky shores or cliffs, bays, estuaries, beaches, and garbage dumps. Only two species of gulls breed along the Pacific Coast. The glaucous-winged gull has breeding colonies in British Columbia and Washington and the western gull has breeding colonies in California (most are located on the Farallon Islands), Oregon, and Washington (Drury 1984). Breeding habitat for these gulls includes coastal cliffs, rocks, grassy slopes, or offshore rock or sandbar islands.

Pacific Coast gulls feed at the ocean's surface and their diet typically includes fishes, mollusks, crustaceans, carrion, and garbage.

Primary threats to gulls include human disturbance at nesting locations.

5.3.2.11 Black-legged Kittiwakes

Black-legged kittiwakes *(Rissa tridactyla)* range along the Pacific Coast from Alaska to Mexico (Drury 1984). While they are primarily pelagic, black-legged kittiwakes can also be found along sea coasts, bays, and estuaries.

It is estimated that there are approximately 2.6 million black-legged kittiwakes at colonies in the North Pacific. This species breeds on mainland and island sites in the Arctic and along the Aleutian islands.

Black-legged kittiwakes feed at the ocean's surface and their diet typically includes small fishes, mollusks, crustaceans, and plankton (Hatch 1993).

Primary threats to black-legged kittiwakes are unknown.

5.3.2.12 Common Murres

Common murres *(Uria aalge)* range along the Pacific Coast from Alaska to central California. While they are primarily pelagic, common murres can also be found along rocky sea coasts.

Common murres are the dominant member of the breeding seabird community along the Pacific Coast, but numbers have declined substantially in central California and Washington. In the mid-1800s, over 14 million murre eggs were harvested from Southeast Farallon Island to feed residents of the San Francisco Bay area (Manuwal 1984). The Washington population has been almost extirpated over the last decade due to a combination of oceanographic conditions, gillnets, low-flying aircrafts, and oil spills, and has not recovered. In contrast, the population of common murres in Oregon and California has been stable or increasing despite human disturbance (Carter *et al.* 1995). In the late 1980s, the Pacific Coast population was estimated to be greater than 600,000 individuals. Nesting typically occurs in large, dense colonies on mainland and island cliff ledges or on rocky, low-lying islands. Common murres do not build nests but lay their eggs directly on the bare soil or rock (Spendelow and Patton 1988).

Common murres are diving birds, capturing their prey underwater, and can descend to depths of 180 m. Their diet includes fishes, squid, mysids, and shrimp.

Primary threats to common murres include predators on breeding islands, increasing sea surface temperature, oil spills, gill-net mortality, and military practice bombing activity.

5.3.2.13 Pigeon Guillemots

Pigeon guillemots *(Cepphus columba)* range along the Pacific Coast from Alaska to southern California. While these birds are primarily pelagic, they can be found along rocky coasts and in bays and inlets.

In the late 1980s, the pigeon guillemot breeding population along the Pacific Coast was estimated to be greater than 20,000 individuals. Breeding occurs along coasts, on islands, on cliffs, in rock crevices, in abandoned burrows, or they may dig their own burrows. Pigeon guillemots have a spectacular courtship behavior (Manuwal 1984) and may use the same nest in successive years (Spendelow and Patton 1988).

Pigeon guillemots forage underwater; their diet includes small fishes, and inshore benthic species, mollusks, such as crustaceans, and marine worms.

Primary threats to pigeon guillemots include introduced predators on breeding islands, inshore gillnet fisheries, and oil spills (Erwins *et al.* 1993).

5.3.2.14 Auklets

Three species of auklets occur along the Pacific Coast: the parakeet auklet (*Aethia psittacula*), the rhinoceros auklet (*Cerorhinca monocerata*), and the Cassin's auklet (*Ptychoramphus aleuticus*).

In the eastern North Pacific, the estimated population of Cassin's auklets is over three million and the estimated population of parakeet auklets is approximately 200,000 (Springer *et al.* 1993). The estimated breeding population of rhinoceros auklets along the Pacific Coast is just over 60,000 (Spendelow and Patton 1988).

Auklets are primarily pelagic; however, they are also found along rocky coasts. The parakeet auklet only breeds in Alaska, while the rhinorceros and Cassin's auklets breed on offshore islands between Alaska and Baja California. Nesting generally occurs in areas with low vegetation, in burrows, or under rocks. Some nesting sites are used in successive years. Auklets may be diurnal as well as nocturnal.

Auklets dive from the water's surface when foraging. Their diet generally includes small fishes, crustaceans, and squid.

Primary threats to auklets include introduced predators on nesting islands; long-term oceanographic changes in the California Current System, which caused a decline in zooplankton populations; and oil spills.

5.3.2.15 Puffins

Two species of puffins occur along the Pacific Coast: the horned puffin (*Fratercula corniculata*) and the tufted puffin (*Fratercula cirrhata*). These colorful puffins are primarily pelagic but they can also be found along the coast (Manuwal 1984).

In the North Pacific, the estimated breeding population of tufted puffins and horned puffins is 3.5 million and 1.5 million, respectively (Byrd et al. 1993). Puffins breed on offshore islands or along the coast; nesting occurs in ground burrows, under and among rocks, and occasionally under dense vegetation. Horned puffins only nest in Alaska, while tufted puffins nest all along the Pacific Coast from Alaska to California.

Puffins are diving birds and capture their prey underwater. Their diet includes fish, cephalopods, crustaceans, and polychatetes.

Primary threats to puffins include introduced predators on breeding islands, oil spills, and gillnet fisheries. The low numbers of tufted puffins in California may be due to oil pollution and/or declines in the sardine population.

5.3.2.16 South Polar Skuas

South polar skuas (*Stercorarius maccormicki*) range along the Pacific Coast from Alaska to Mexico. While these birds are primarily pelagic and solitary, they can sometimes be found in small, loose groupings in and around harbors.

South polar skuas breed in and around Antarctica. Non-breeders can be found spring through fall along the Pacific Coast.

The diet of south polar skuas is diverse (Maher 1984). At sea, they pursue foraging seabirds until the other birds relinquish their prey, as well as following fishing vessels to forage on offal. On the breeding grounds, their diet includes fish, seabirds, small mammals, krill, penguin eggs and young, and carrion.

Because south polar skuas breed in such remote locations, there are relatively few threats to the breeding population. Additionally, they are relatively immune to threats during the non-breeding season because they spend the majority of their time at sea.

5.3.2.17 Black Skimmers

Black skimmers (*Rynchops niger*) can be found in California. This species is primarily found nearshore in coastal waters including bays, estuaries, lagoons, and mudflats.

In the late 1970s to early 1980s, the estimated breeding population of black skimmers throughout the United States was about 65,000 individuals and increasing. In California, however, less than 100 breeding individuals were found (Spendelow and Patton 1988).

Nesting generally occurs near coasts on sandy beaches, shell banks, coastal and estuary islands, salt pond levees, and on dredged material sites. Black skimmers are often nesting in association with or near terns.

As their name suggests, black skimmers forage by flying low over the water and skimming food off the surface with their lower mandible. The diet primarily includes small fish and crustaceans.

Primary threats to black skimmers include predation and human disturbance on nesting islands.

TABLE 5-1. Protected salmon species on the West Coast with their protected species designations. (Page 1 of 1)

Species and Stock	Scientific Name
Salmon species listed as endangered under the ESA	
Chinook salmon- Sacramento River Winter; Upper Columbia Spring	*Oncorhynchus tshawytscha*
Sockeye salmon- Snake River	*Oncorhynchus nerka*
Steelhead- Southern California; Upper Columbia	*Oncorhynchus mykiss*
Salmon species listed as threatened under the ESA	
Coho salmon- Central California, Southern Oregon, and Northern California Coasts	*Oncorhynchus kisutch*
Chinook salmon- Snake River Fall, Spring, and Summer; Puget Sound; Lower Columbia; Upper Willamette; Central Valley Spring; California Coastal	*Oncorhynchus tshawytscha*
Chum salmon- Hood Canal Summer; Columbia River	*Oncorhynchus keta*
Sockeye salmon- Ozette Lake	*Oncorhynchus nerka*
Steelhead- South-Central California, Central California Coast, Snake River Basin, Lower Columbia, California Central Valley, Upper Willamette, Middle Columbia, Northern California	*Oncorhynchus mykiss*

TABLE 5-2. Total catch of salmon (number) and chinook salmon bycatch rates (number of salmon/mt of whiting) taken by the at-sea and shore-based processing fleets, 1999-2001. (Page 1 of 1)

	Catcher-processors		Non-tribal Motherships		Tribal Mothership		Shore-based	
Species	Catch (no.)	Bycatch Rate	Catch (no.)	Bycatch Rate	Catch (no.)	Bycatch Rate	Catch (no.)	Bycatch Rate
2001								
Chinook	847	0.014	1,721	0.048	959	0.158	2,634	0.036
Other Salmon	146		624		16		371	
2000								
Chinook	1,839	0.027	4,420	0.094	1,947	0.312	3,321	0.039
Other Salmon	88	0.001	27	0.001	16	0.003	24	
1999								
Chinook	2,704	0.040	1,687	0.036	4,497	0.174	1696	0.020
Other Salmon	296		506		278		16	

Sources: NMFS. 2003. Implementation of an observer program for at-sea processing vessels in the Pacific Coast groundfish fishery. National Marine Fisheries Service, Northwest Region, Seattle, June 2003. NMFS. 2003. Implementing a monitoring program to provide a full retention opportunity in the shore-based whiting fishery; Preliminary draft environmental assessment. National Marine Fisheries Service, Northwest Region, Seattle, September 2003.

TABLE 5-3. Incidental catch of chinook salmon in the whiting fishery 1991-2001, all sectors. (Page 1 of 1)

Year	Whiting (mt)	Chinook Salmon (no.)[a/]	Bycatch Rate (no/mt whiting)[a/]
1991	222,114	6,194	0.0279
1992	201,168	4,753	0.0236
1993	135,516	5,387	0.0398
1994	248,768	4,605	0.0185
1995	175,255	**15,062**	**0.0859**
1996	212,739	2,327	0.0109
1997	232,958	5,896	0.0253
1998	232,587	5262	0.0226
1999	224,459	10,579	0.0471
2000	202,527	**11,516**	**0.0569**
2001	173,857	6,161	0.0354
2002	130,004	3,759	0.0289

a/ Values in bold indicate years in which the threshold established in the biological opinion was exceeded. Source: NMFS. 2003. Implementation of an observer program for at-sea processing vessels in the Pacific Coast groundfish fishery. National Marine Fisheries Service, Northwest Region, Seattle, June 2003.

TABLE 5-4. Marine mammals occurring off the West Coast. (Page 1 of 2)

Common Name	Scientific Name	ESA Status	MMPA Status
Pinnipeds			
California sea lion	*Zalophus californianus*		
Pacific harbor seal	*Phoca vitulina richardsi*		
Northern elephant seal	*Mirounga angustirostris*		
Guadalupe fur seal	*Arctocephalus townsendi*	T	D
Northern fur seal	*Callorhinus ursinus*		
Northern or Steller sea lion	*Eumetopias jubatus*	T	D
Sea otters			
Southern	*Enhydra lutris nereis*	T	
Washington	*Enhydra lutris kenyoni*		
Cetaceans			
Minke whale	*Balaenoptera acutorostrata*		
Short-finned pilot whale	*Globicephala macrorhyncus*		
Gray Whale	*Eschrichtius robustus*		
Harbor porpoise	*Phocoena phocoena*		
Dall's porpoise	*Phocoenoides dalli*		
Pacific white-sided dolphin	*Lagenorhynchus obliquidens*		
Short-beaked common dolphin	Delphinus delphis		
Long-beaked common dolphin	*Delphinus capensis*		
The following cetaceans are present within the area managed by this FMP but not likely to interact with groundfish fisheries or have not been documented having had interactions in observed groundfish fisheries:			
Bottlenose dolphin	*Tursiops truncatus*		
Striped Dolphin	*Stenella coeruleoalba*		
Sei whale	*Balaenoptera borealis*	E	
Blue whale	*Balaenoptera musculus*	E	D
Fin whale	*Balaenoptera physalus*	E	D
Sperm whale	*Physeter macrocephalus*	E	D
Humpback whale	*Megaptera novaeangliae*	E	D
Bryde's whale	*Balaenoptera edeni*		
Sei whale	*Balaenoptera*	E	
Killer whale	*Orcinus orca*		D
Baird's beaked whale	*Berardius bairdii*		
Cuvier's beaked whale	*Ziphius cavirostris*		
Pygmy sperm whale	*Kogia breviceps*		

TABLE 5-4. Marine mammals occurring off the West Coast. (Page 2 of 2)

Common Name	Scientific Name	ESA Status	MMPA Status
Risso's dolphin	*Grampus griseus*		
Striped dolphin	*Stenella coeruleoalba*		
Northern right-whale dolphin	*Lissodelphis borealis*		

(Source: Groundfish bycatch draft programmatic EIS, 2004.)

TABLE 5-5. Protected seabirds on the West Coast with their protected species designations.

Species	Scientific Name
Seabirds listed as endangered under the ESA	
Short-tail albatross	*Phoebastria (=Diomedea) albatrus*
California brown pelican	*Pelecanus occidentalis*
California least tern	*Sterna antillarum browni*
Seabirds listed as threatened under the ESA	
Marbled murrelet	*Brachyramphs marmoratus*

6.0 Harvest Sectors

The Pacific Coast groundfish fishery is a multi-species fishery that takes place off the coasts of Washington, Oregon, and California. Maintaining year-round fishing opportunities for groundfish has been one of the primary management objectives for the fishery. Pacific Coast groundfish support or contribute to a wide range of commercial, recreational, and tribal fisheries. These activities have a secondary impact on the fish buyers and processors, and ultimately the fishing-dependent communities where vessels dock and fishing families live. These parts of the socioeconomic environment are described in Sections 7 and 8.

According to PacFIN data, of 4,579 vessels active during November 2000 through October 2001, 1,341 (37% of the fleet) landed some groundfish and were responsible for 47% of the value of all West Coast landings (groundfish and nongroundfish species). Commercial fisheries targeting groundfish are, for the most part, regulated under a license limitation (or limited entry) program implemented in 1994 (see Section 1.2.4). Other fisheries, which either target groundfish or catch them incidentally, but do not hold groundfish limited entry permits, are considered "open access" fisheries. (As noted in Section 1.2.4, these vessels may possess limited entry licenses for other, nongroundfish fisheries.) The Council allocates harvest limits (expressed as optimum yields, or OYs) between different regulatory and fishery sectors, including limited entry and open access fisheries.

Marine recreational fisheries consist of both charter and private vessels. Charter vessels are larger vessels for hire, which typically can fish farther offshore than most vessels in the private recreational fleet. Fishing opportunity both in nearshore areas and farther out on the continental shelf are important for West Coast recreational groundfish fishermen. Recreational fisheries are described in Section 6.2.

Indian tribes in Washington, primarily the Makah, Quileute, and Quinault, also harvest groundfish in the EEZ. There are set tribal allocations for sablefish and Pacific whiting, while the other groundfish species' allocations are determined through the Council process in coordination with the tribes, states, and NMFS. Commercial tribal groundfish fisheries are described in Section 6.3.

Tables 6-1a, 6-1b, and 6-1c list 1981–2002 commercial landings by round weight, exvessel revenue in current dollars, and exvessel revenue in inflation-adjusted dollars for commercially important species on the West Coast. Tables 6-2a, 6-2b, and 6-2c summarize commercial groundfish landings by state, also in round weight and exvessel value terms. Table 6-3 lists historical landings separately for the limited entry trawl, limited entry fixed gear, and open access fleets.

6.1 Commercial Fisheries

In 1994, NMFS implemented Amendment 6 to the groundfish FMP, a license limitation program intended to restrict vessel participation in the directed commercial groundfish fisheries off Washington, Oregon, and California. The limited entry permits that were created through that program specify the gear type a permitted vessel may use to participate in the limited entry fishery and the vessel length associated with the permit.

Most of the Pacific Coast non-tribal commercial groundfish harvest is taken by the limited entry fleet. The groundfish limited entry program includes most vessels using trawl, longline, and trap (or pot) gears. There are also several open access fisheries that take groundfish incidentally or in small amounts; participants in those fisheries may use, among other gear types, longline, vertical hook-and-line, troll, pot, setnet, trammel net, shrimp and prawn trawl, California halibut trawl, and sea cucumber trawl. Vessels in the open access sector are described in Section 6.1.3. These vessels do not hold groundfish limited entry permits yet may target groundfish or catch them incidentally; although their groundfish landings are much smaller, they are part of the economic make-up for West Coast groundfish vessels

As of March, 2002, there were 450 vessels with Pacific Coast groundfish limited entry permits, of which approximately 54% were trawl vessels, 40% were longline vessels, and 6% were trap vessels. The number of vessels registered for use with limited entry permits has decreased since because of the implementation of the permit stacking program for sablefish-endorsed limited entry fixed gear permits 2001 and the limited entry trawl vessel buyback program, completed in late 2003. (Section 1.2.4 describes these programs.)

Limited entry permits may be sold and leased out by their owners, so the distribution of permits between the three states often shifts. In 2002, roughly 23% of the limited entry permits were assigned to vessels making landings in California, 39% to vessels making landings in Oregon, and 37% to vessels making landings in Washington. In 1999, this division of permits was approximately 41% for California, 37% for Oregon, and 21% for Washington. This change in state distribution of limited entry permits may also be due to the implementation of the permit stacking program. Vessels operating from northern ports may have purchased or leased sablefish-endorsed permits from vessels that had been operating out of California ports.

Figure 6-1 graphs historical groundfish landings data from Table 6-1a and Figure 6-2 shows equivalent information, in inflation adjusted dollars, from Table 6-1c. The large volume of Pacific whiting landings dominate Figure 6-1 and the emergence of shore-based processing of this species is evident. (Note that the at-sea sector includes joint venture fisheries occurring in the 1980s. “Americanization” ultimately replaced foreign processors with domestic ones.) Landings peaked in 1994, although landings of species other than whiting continued a long-term declining trend during this period. (Note that flatfish, sablefish, and rockfish landings all peaked in 1982, the first full year of groundfish FMP management. Some decline in landings is to be expected, however, as standing stocks are “fished down” to MSY biomass.) Landings in all species categories declined steeply after 1998, when various groundfish began to be designated overfished; rockfish show the most precipitous fall—by about three-quarters from 1998 to 2002. Figure 6-2 provides a different perspective; inflation adjusted values allow direct comparison of landings value between years. Low-value whiting is a much less prominent component of landings when measured this way. Rockfish have been, and continue to be, an important part of landings value, as have sablefish, and to a lesser degree, flatfish. Measured in constant dollars, the change in rockfish landings between 1998 and 2002 is still severe, falling by a little more than half , but the decline in value of sablefish catches is slight while flatfish landings actually increased very slightly during this period. Overall, groundfish landings measured by weight peaked in 1994 at 305,312 mt and have declined by about half since then; measured in constant dollars, landings value was greatest in 1997 at almost $93 million and by 2002 had fallen by about 45%.

Figures 6-3 through 6-9 graph the seasonal distribution of landings and at-sea deliveries of groundfish and non-groundfish species during 2002. Figures 6-9 through 6-14 repeat the same information in terms of exvessel revenue. Figures 6-3 and 6-8 highlight the relative unimportance of groundfish in total landings in California, and the relatively high level of nongroundfish landings there, especially during the winter months. Figures 6-4 shows the pronounced spike in total groundfish landings in Oregon during the summer months. However figure 6-10 confirms that these landings are primarily relatively low-value species, such as whiting. Comparing these two figures also shows an increase in relatively high-value landings of nongroundfish species (mostly Dungeness crab) in Oregon during December and January. Figures 6-5 and 6-11 show a similar pattern of landings in Washington as in Oregon, except with a much lower midsummer spike in groundfish landings. Figures 6-6 and 6-12 show the seasonal landings distribution coastwide, combining the data for the three states. Figure 6-12 shows how the pronounced midsummer spike in groundfish landings has a much smaller effect on total exvessel revenues. Figures 6-7 and 6-13 show the additional landings and revenue generated in 2002 by the at-sea whiting sector. Note the near absence of non-groundfish species landed by the at-sea sector. Finally Figures 6-8 and 6-14 combine the at-sea data from figures 6-7 and 6-13 with the coastwide totals in figures 6-6 and 6-12. Note the additional spike in groundfish caught during May due to the inclusion of the at-sea data.

6.1.1 Limited Entry Trawl Fisheries

West Coast limited entry trawl vessels use midwater gear to target Pacific whiting and yellowtail and widow rockfish, or bottom gear for flatfish species (on the continental shelf and slope) and the Dover sole–thornyhead–sablefish (DTS) complex in deep water. Some continental shelf and slope rockfish species have also been important targets in the limited entry trawl fishery. Although trawlers may catch a wide range of species, the following species account for the bulk of landings (other than Pacific whiting) measured by weight: Dover sole, arrowtooth flounder, petrale sole, sablefish, thornyheads, and yellowtail rockfish. Although some rockfish species were important component of landings in the past, management measures intended to reduce the directed and incidental catch of overfished rockfish and other depleted species have significantly reduced the rockfish catches in recent years (see Table 6-4).

Trawlers take the vast majority of the groundfish harvest measured by weight but somewhat less if measured by value. In 2002, groundfish trawlers landed 98% of total groundfish harvest by weight but only 74% by value. Non-trawl vessels, in contrast, while only taking the remaining 3%, realized greater value per landed weight, primarily due to relatively large landings of high-value sablefish. Pacific whiting, although accounting for a large share of groundfish landings—83% by weight in 2002—are a low-value product, accounting for only 26% of groundfish exvessel revenue in that year. Since whiting are caught almost exclusively by limited entry trawl vessels, they skew the overall value per unit weight calculations for this sector.

The whiting trawl fishery, prosecuted by limited entry permit holders, is concentrated in the Columbia area and the U.S. portion of the Vancouver area (see Figure 1-6). Large-scale harvesting of Pacific whiting in the U.S. EEZ began in 1966 when factory trawlers from the then Soviet Union began targeting Pacific whiting. During the mid-1970s, factory trawlers from Poland, the Federal Republic of Germany, the former German Democratic Republic, and Bulgaria also participated in the fishery. From 1966 to 1979, the catch in U.S. waters averaged 137,000 mt per year. A joint-venture fishery began in 1978 with two U.S. trawlers supplying fish to Soviet factory trawlers acting as motherships. By 1982, the joint-venture catch surpassed the foreign catch. In the late 1980s, joint-ventures involved fishing companies from Poland, Japan, the former Soviet Union, the Republic of Korea, and the People's Republic of China. In 1989 the U.S. fleet capacity had grown to a level sufficient to harvest the entire quota, and no foreign fishing was allowed.

Historically, the foreign and joint-venture fisheries produced fillets and headed-and-gutted products. In 1989, Japanese motherships began producing surimi from Pacific whiting, using a newly developed process to inhibit deterioration of the flesh resulting from myxozoan-induced proteolysis. In 1990, domestic catcher-processors and motherships entered the Pacific whiting fishery in the U.S. zone. Previously, these vessels had engaged primarily in Alaskan pollock fisheries. The development of surimi production techniques made Pacific whiting a viable alternative. In 1991 the joint-venture fishery for Pacific whiting ended, because of the high level of participation by domestic catcher-processors and motherships and the growth of shore-based processing capacity. Shore-based processors of Pacific whiting had been constrained historically by a limited domestic market for Pacific whiting fillets and headed-and-gutted products. The construction of surimi plants in Newport and Astoria led to a rapid expansion of shore-based landings in the early 1990s.

Table 6-4 shows groundfish and nongroundfish limited entry trawl landings in major species categories north and south of 40° 10' N latitude. This line of latitude, about 20 miles south of Cape Mendocino, is the primary demarcation used in groundfish management. Cumulative trip limits, for example, usually differ north and south of this line. For management purposes this line supplanted the boundary between the Eureka and Monterey management areas, at 40º 30' N latitude. Because important fishing grounds straddle that boundary, using a line slightly to the south simplifies management and enforcement.

As shown in Table 6-4, most limited entry trawl landings occur north of 40º 10' N latitude—146,660 mt of groundfish in 2002, or 97% of that year's landings. Again, Pacific whiting account for a large part of these landings since that fishery occurs almost exclusively in the north. Excluding whiting, limited entry trawlers landed 16,418 mt of groundfish in the north, worth $18.2 million, compared to 4,986 mt, worth $6.2 million, in the south. Important groundfish trawl fisheries, aside from whiting, include the deepwater DTS fishery, and bottom trawling on the continental shelf for flatfish—principally arrowtooth flounder, petrale sole and Dover sole—and other bottom-dwellers. Fisheries targeting rockfish by bottom and midwater trawl were more important in the past; management restrictions necessary to prevent overfishing and rebuild overfished stocks, which are mostly rockfish species, have diminished these fisheries. Rockfish were a more important component of trawl landings in the south as recently as 2002, however. Looking at Table 6-4, rockfish accounted for 33% of non-whiting landings in the south versus 22% in the north. In 1998, before overfishing declarations triggered more restrictive management measures, the share was more comparable—55% in the north versus 46% in the south.

6.1.2 Limited Entry Fixed Gear Fisheries

Vessels deploying longlines and traps (pots) comprise the bulk of the limited entry fixed gear sector. These gear types also may be used by vessels in the open access sector, but preferential harvest limits favor license holders. High-value sablefish have been the principal target species for these vessels; this species accounts for the bulk of landings, especially when measured by exvessel value. (According to Table 6-5, sablefish generated $7.5 million in revenues in 2002, close to three-quarters of the $10.6 million in landings generated by this sector during the year.) Not unexpectedly, this sector has been plagued by overcapacity, although a series of management initiatives have largely addressed the problem. In the early to mid 1990s the fishery was a "derby" managed by very short seasons of two weeks or less. Amendment 9, requiring an permit endorsement to participate in the primary sablefish fishery, and Amendment 14, introducing permit stacking, have helped to alleviate the symptoms of over capacity in the fixed gear sablefish fishery, effectively eliminating the short, derby season. (Permit stacking allows up to three sablefish-endorsed permits to be used per vessel. Through a tier system, landing limits vary with the number and type of permits held. Section 1.2.4 describes this management regime in more detail.)

Table 6-5 shows limited entry fixed gear landings by major species groups north and south of 40° 10' N latitude. Overall, landings were about three times greater in the north than in the south in 2002, although rockfish landings are almost equal in the two regions, making these species a more important component of catches in the south.

6.1.3 The Open Access Sector

The open access sector comprises vessels that do not hold a federal groundfish limited entry permit and target or incidentally catch groundfish with a variety of gears, excluding groundfish trawl gear. As discussed in Section 1.2.4, the "open access" appellation can be confusing because vessels in this sector may hold limited entry permits for other, nongroundfish fisheries issued by the federal or state governments. However, groundfish catches by these vessels are regulated under the groundfish FMP. For example, open access vessels must comply with cumulative trip limits established for this sector and are subject to the operational restrictions imposed by the Groundfish Conservation Areas.

Fishery managers divide this sector into directed and incidental categories. The directed fishery comprises vessels targeting groundfish while the incidental fishery category applies to vessels targeting other groundfish but landing some groundfish in the process. (Section 3 describes nongroundfish species and associated fisheries that may also land some groundfish.) In practice it can be difficult to segregate vessels into these two categories because, ultimately, the choice depends on the intention of the fisher (which the manager does not know). Over the course of a year—or even during a single trip—a fisher may engage in several different strategies, switching between the directed and incidental categories. Such changes in strategy are likely the result of a variety of factors, but especially the potential economic return from landing a particular mix of species. Because of these complexities, managers typically distinguish directed from incidental vessels by applying a 50% threshold value to the landings composition for a particular vessel (or trip, depending on the kind of analysis): open access vessels with more than half of their total landings value coming from groundfish are considered in the directed fishery while the remainder are assumed to be landing groundfish incidentally while targeting other species. Based on this criterion, the number of unique vessels targeting groundfish in the open access fishery between 1995 and 1998 coastwide was 2,723, while 2,024 unique vessels landed groundfish as incidental catch (1,231 of these vessels participated in both) (SSC Economic Subcommittee 2000).

Fisheries are generally distributed along the coast in patterns governed by factors such as location of target species and ports with supporting marine supplies and services, and restrictions or regulations imposed by state and federal governments. The majority of landings by the directed groundfish fishery, by weight, occur off California, while Oregon shows the next highest landings, followed by Washington. In the incidental groundfish fisheries, Washington also has the lowest groundfish landings by the incidental fishery, by weight of incidental groundfish (Hastie 2001). A research report reiterates these findings:

> [participation in] both directed and bycatch contents of the open access fishery is much greater in California than in Oregon and Washington combined. For instance, in 1998, 779 California boats, 232 Oregon boats, and 50 Washington boats participated in the directed fishery. In that same year, 520 California boats, 305 Oregon boats, and 40 Washington boats participated in the bycatch fishery (SSC Economic Subcommittee 2000).

Table 6-6 shows open access landings by major species groups north and south of 40° 10' N latitude. It can be seen that this sector is more important in the south, meaured by landings and landings revenue. Also, open access fishers in the south earned more per pound of landed fish, reflecting more lucrative markets—for live fish among others—in that region. Overall, open access groundfish landings in 2002 (472 mt) were down 59% compared to 1998 (1,162 mt). But the fall in landings during this period in the south—a 70% decline—is much steeper than in north. The net result is that the landings differential between the two regions is now less dramatic. In 1998 vessels in the south landed almost three and a half times as much groundfish as those in the north; by 2002 it was less than one and half times as much. Shrinking cumulative trip limits for open access vessels during this period are the main contributor to these changes (aside from the effects of groundfish license limitation). Rockfish were an important component of open access groundfish landings in the south—75% of landings by weight in 1998. Limits imposed because of overfishing declarations for certain rockfish species, bocaccio and cowcod in particular, partly explain the steep drop in landings in the south. to declines in this sector.

Participation in the directed open access fishery segment decreased from 1,357 vessels in 1994 to 1,032 in 1999. Participants may be moving into other, more profitable fisheries, or may have quit fishing altogether. Fishers use various gears types to target particular groundfish species. Hook-and-line gear, the most common gear type, is generally used to target sablefish, rockfish, and lingcod; pot gear generally is used when targeting sablefish and some thornyheads and rockfish. Though largely restricted from use under current regulations, in the past in Southern and Central California setnet gear has been used to target rockfish, including chilipepper, widow rockfish, bocaccio, yellowtail rockfish, and olive rockfish, and to a lesser extent vermillion rockfish.

Another important distinction in the directed segment is between fishers landing fish alive. Although groundfish targeted by open access fishers are typically landed and sold dead, higher prices for live fish have stimulated landings in this category. Live fish harvests are a recent but growing component of the directed fishery: in 2001, 20% of fish landed (by weight, coastwide) by directed open access fishers was alive, compared to only 6% in 1996.[17/] In the live-fish fishery the fish are caught using pots, stick gear, and rod-and-reel, and kept aboard the vessel in a seawater tank, to be delivered to foodfish markets—such as the large immigrant Asian communities in California—that pay a premium for live fish. Currently, Oregon and California are drafting nearshore fishery management plans that would transition some species of groundfish landed in the live fish fishery from federal to state management.

Many fishers catch groundfish incidentally when targeting other species, because of the kind of gear they use and the co-occurrence of target and groundfish species in a given area. Managers classify vessels in the open access incidental fishery if groundfish comprise 50% or less of their landings, measured by dollar value. Fisheries targeting pink shrimp, spot prawn, ridgeback prawn, California and Pacific halibut, Dungeness crab, salmon, sea cucumber, coastal pelagic species, California sheephead, highly migratory species, and the mix of species caught in the gillnet complex comprise this incidental segment of the open access sector. These fisheries and associated target species are described in Section 3.

6.2 Recreational Fisheries

Recreational fishing has been part of the culture and economy of West Coast fishing communities for more than 50 years. Along the northern coast, recreational fishing traditionally targeted salmon, but rockfish and lingcod often provided a bonus to anglers. Recreational fisheries have contributed substantially to fishing communities, bringing in dollars and also contributing to tourism in general.

The distribution of resident and non-resident ocean anglers among the West Coast states in 2000 is shown in Table 6-7. The table demonstrates the importance of recreational fishing, especially in Southern California. The estimated number of recreational marine anglers in Southern California was two and a half times the number in the next most numerous region, Washington state. While the bulk of recreational fishers in all areas were residents of those areas, a significant share were non-residents. Oregon had the greatest share of non-resident fishers at more than one-fifth of total ocean anglers.

Recreational fishing in the open ocean has generally been on an increasing trend since 1996 (see Table 6-8); however, charter effort has decreased while private effort increased during that period. Part of this increase is likely the result of longer salmon seasons associated with increased abundance. Some effort shift from salmon to groundfish likely occurred prior to 1996 when salmon seasons were shortened. Groundfish are both targeted and caught incidentally when other species, such as salmon, are targeted. While the contribution of groundfish catches to the overall incentive to engage in a recreational fishing trip is uncertain, it seems likely that the possibility or frequency of groundfish catch on a trip adds to overall enjoyment and perceived value.

Almost half of the total recreational groundfish harvest occurred in Northern California on the West Coast in 2002 and nearshore rockfish species accounted for one half of this groundfish catch (PFMC 2004). More than two-thirds of shelf rockfish species caught were in Southern California. California claimed more than two thirds of the recreational groundfish harvested, and almost three quarters of the total recreational harvest. Half of the total salmon recreational harvest was landed in Washington. This comprised more than 80% of

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[17/] Managers are faced with a similar problem as discussed above in determining landings from this fishery. Landings data do distinguish live fish sales, but the price information suggests that this classification is inaccurate. Therefore, in practice, only those sales of species other than sablefish that garner a landed price above $2.50 per pound are classified in the live fish sector (see Table 3.5.2-10 in PFMC 2004 for a price breakdown).

Washington's total recreational harvest. While Northern California's salmon catch was nearly as great as Washington's, it comprised less than half of the region's total recreational harvest.

Fishing effort is related to weather, with relatively more effort occurring in the milder months of summer, and relatively less in winter (Table 6-9). As might be expected, this effect is more pronounced in higher latitudes, although the reasons include opportunity as well as climate. Salmon seasons are longer in California than in Oregon, which in turn are longer than in Washington. Until recently, groundfish seasons were also more restrictive in Washington, with the lingcod season being closed from November through March.

6.2.1 Recreational Charter Industry

The distribution of West Coast charter vessels engaged in ocean fishing in 2001 is shown in Table 6-10. More than half of the charter vessels operated from California ports, again demonstrating the importance of recreational fishing industry in that state.

6.2.2 Private Vessels and the Recreational Fishing Experience Market

Just as West Coast commercial groundfish is only one segment of a broader food market, the groundfish recreational fishery represents only one segment of a broader recreational market. Other types of marine recreational angler trips, freshwater angling, and other recreational activities are, to varying degrees, potential substitutes for ocean groundfish fishing.

Demand for recreational trips and estimates of the economic impacts resulting from recreational fishing are related to numbers of anglers. Unfortunately, reliable data are not available on the number of West Coast anglers targeting specific species.

However, data are available on the total number of saltwater anglers, and it is evident the presence of opportunities to catch species other than directly targeted ones increases the propensity of anglers to fish and the value of the overall recreational fishing experience. In the U.S., over 9 million anglers took part in 76 million marine recreational fishing trips in 2000. The West Coast accounted for about 22% of these participants and 12% of trips. Seventy percent of West Coast trips were made off California, 19% off Washington, and 11% from Oregon.

Although California's marine recreational fishery dominates the other West Coast states both in terms of numbers of anglers and trips, Oregon attracts the largest share of non-resident anglers, probably chiefly due to the access it affords to the seasonal salmon fisheries at the mouth of the Columbia River.

Table 6-8 shows that in three of the four West Coast regions, groundfish catch, either targeted or incidental, accompanied a significant share of both charter and private recreational trips. This effect was greatest in Oregon where groundfish catch was consistently associated with over half the recreational trips each year. Only in Southern California did groundfish appear to be a relatively minor part of regional marine recreational effort.

6.3 Tribal Fisheries

In 1994 the U.S. government formally recognized that four Washington coastal tribes (Makah, Quileute, Hoh, and Quinault) have treaty rights to fish for groundfish. In general terms, they may take half of the harvestable surplus of groundfish available in the tribes' usual and accustomed (U&A) fishing areas (described at 60 CFR 660.324, also see Section 1.1.3.2). West Coast treaty tribes have formal allocations for sablefish, black rockfish, and Pacific whiting. Members of the four coastal treaty tribes participate in commercial, ceremonial, and subsistence fisheries for groundfish off the Washington coast. Participants in the tribal commercial fisheries use similar gear to non-tribal fishers. Groundfish caught in the tribal commercial fishery pass through the same markets as non-tribal commercial groundfish catch.

There are several groundfish species taken in tribal fisheries for which the tribes have no formal allocations, and some species for which no specific allocation has been determined. Rather than try to reserve specific allocations of these species, the tribes annually recommend trip limits for these species to the Council, who try to accommodate these fisheries. Tribal trip limits for groundfish species without tribal allocations are usually intended to constrain direct catch and incidental retention of overfished species in the tribal groundfish fisheries.

Twelve western Washington tribes possess and exercise treaty fishing rights to halibut, including the four tribes that possess treaty fishing rights to groundfish. Tribal halibut allocations are divided into a tribal commercial component and the year-round ceremonial and subsistence component.

The bulk of tribal groundfish landings occur during the March-April halibut and sablefish fisheries. Most continental shelf species taken in the tribal groundfish fisheries are taken during the halibut fisheries, and most slope species are similarly taken during the tribal sablefish fisheries. Approximately one-third of the tribal sablefish allocation is taken during an open competition fishery, in which vessels from the four tribes on the Washington coast have access to this portion of the overall tribal sablefish allocation. The open competition portion of the allocation tends to be taken during the same period as the major tribal commercial halibut fisheries in March and April. The remaining two-thirds of the tribal sablefish allocation is split between the tribes according to a mutually agreed-upon allocation scheme. Specific sablefish allocations are managed by the individual tribes. The fishery begins in March and goes until some time in the autumn, depending on the number of vessels participating in the fishery. Participants in the halibut and sablefish fisheries tend to use hook-and-line gear, as required by the IPHC. For equity reasons, the tribes have agreed to also use snap-line gear in the fully competitive halibut and sablefish fisheries. Therefore, someone participating in a fully competitive sablefish fishery, and did not land any halibut, would not have to meet any IPHC requirements. But according to tribal regulations, they would still have to use snap-line gear.

In addition to these hook-and-line fisheries, the Makah tribe annually harvests a whiting allocation using mid-water trawl gear. Since 1996, a portion of the U.S. whiting OY has been allocated to the Pacific Coast treaty tribes. The tribal allocation is subtracted from the whiting OY before allocation to the nontribal sectors. Since 1999, the tribal allocation has been based on a sliding scale related to the U.S. whiting OY. To date, only the Makah tribe has fished on the tribal whiting allocation. Makah vessels fit with mid-water trawl gear have also been targeting widow rockfish and yellowtail rockfish in recent years.

Table 6-11 shows recorded landings of groundfish species by treaty tribes from 1995 to 2002. Since 1996, Pacific whiting have comprised the vast bulk of tribal landings, even though in 2000 and 2001 whiting landings were relatively low due to reduced coastwide allocations. As shown in Table 6-12, in terms of exvessel revenue, sablefish landings provided well over half of total tribal groundfish revenue each year except 1998, 1999, and 2002.

6.4 Impact-related Fishery Characteristics

6.4.1 Bycatch of Overfished Species

6.4.1.1 Limited Entry Trawl Bycatch

Of the West Coast limited entry trawl fisheries, those targeting Pacific whiting have the best accountability of overfished species bycatch (Table 6-13). Bycatch rates of overfished species appear to have declined in recent years, possibly due to industry efforts to avoid bycatch of overfished species. Much of the bycatch often occurs in single "disaster tows" in which the dominant species is not Pacific whiting. The at-sea sectors (motherships and catcher-processors) have had a long-standing, 100% observer program with direct estimation of bycatch. The Council and NMFS have annually adopted an exempted fishing permit (EFP) that suspends at-sea sorting requirements in the shoreside whiting fishery, enabling port sampling of the entire catch. The tribes, primarily the Makah Tribe, account for their landings and report them to PacFIN.

Limited entry trawl landings of overfished shelf rockfish species in the non-whiting trawl fisheries were reduced dramatically by small footrope restrictions imposed in 2000 (Table 6-14, also see Section 1.4.2.2). However, with the absence of direct observations to determine discarded bycatch, other methods were needed to estimate the total catch of overfished groundfish species in the West Coast limited entry trawl fishery. NMFS began developing a trawl bycatch model in 2001 (Hastie 2001; Hastie [2003]). Endorsed by the SSC and Council in November 2001, it was first used to estimate total catch mortality (landed catch plus bycatch) of five overfished groundfish species (bocaccio, canary rockfish, darkblotched rockfish, lingcod, and Pacific ocean perch) based on the application of proposed management measures. It also predicts trawl vessel participation and effort shifts given different fishing opportunities (vessel landing limits by species and species complex). The model uses co-occurrence rates for overfished species relative to the weight of key target groundfish species and complexes. The model has been updated and refined to incorporate overfished additional species, changing management measures, and newly available data. When RCAs were implemented in late 2002, information on catch of species by depth was integrated into the model in order to estimate the effect of different closed area configuration on bycatch. When observer data became available early in 2003, bycatch rates from these observations substituted for rates then in use and thought to be less reliable. Originally bycatch (or co-occurrence catch rates) was stratified by time period, area, and fishery, based on data from logbooks and other reporting; in 2003 only one year of observer data was available and coverage was not sufficient to allow this degree of stratification. The data were therefore grouped in fewer categories. In 2004 this bycatch model will be further updated, using data from the second year of the groundfish observer program to expand bycatch projections to the limited entry fixed gear sector.

6.4.1.2 Limited Entry Fixed Gear Bycatch

Two major classes of fishing gear are used in the limited entry fixed gear sector: traps and longlines. These gears are both effective in catching sablefish, the most important target species in this sector, but have different rates of observed bycatch of the overfished species. Baited longlines, whether deployed horizontally on the bottom or deployed vertically in the water column, are much more effective at capturing rockfish, and therefore, more prone to incidentally catch overfished rockfish species than traps.

Limited entry fixed gear fisheries have primarily targeted rockfish and sablefish on the shelf and slope. Groundfish landings of overfished species by this sector are depicted in Table 6-14. With no corresponding bycatch model for this fishery, discard in the fishery is not as well known as in the limited entry trawl fishery. Fixed gear fisheries do not account for a significant proportion of overfished slope rockfish bycatch. Limited entry and open access fixed gears have accounted for only 3.0% and 0.2% of the average total landings of darkblotched rockfish and Pacific ocean perch, respectively, during 1981 through 2001 on the West Coast. Therefore, fixed gear opportunities targeting slope rockfish and sablefish on the continental slope may not pose a risk for overfished groundfish species.

The proportion of shelf rockfish species landed with fixed gear has increased in recent years. This has been especially true since the small footrope restrictions were imposed on the trawl fishery in 2000. Yelloweye rockfish landings in 1999-2001 were higher in this sector than in other groundfish sectors (PFMC 2004), which is a management concern given the low harvest levels considered for rebuilding this stock. Some shelf rockfish species, such as canary rockfish and yelloweye rockfish, have been a highly valued target for this sector of the fishery. Yelloweye rockfish are particularly vulnerable to targeting due to their sedentary nature. Longline gears are particularly effective gears for targeting yelloweye rockfish in the high relief habitats they inhabit. In Washington, where yelloweye are most abundant, 97.5% of all rockfish landed in commercial directed line fisheries in 2001 were yelloweye rockfish. In 1999, there were 23 mt of yelloweye rockfish landed in Washington fixed gear fisheries.

6.4.1.3 Open Access Sector Bycatch

Directed open access fisheries that target groundfish use the same fixed gear types and fish in the same areas as the limited entry fixed gear sector. Rockfish and sablefish are primary target species for this sector as well. Table 6-14 shows landings of overfished species by open access vessels (distinguishing the shrimp fishery and other open access fisheries). These landings include both targeted and incidentally caught groundfish. An open access vessel may combine opportunities to target federally-managed groundfish and nongroundfish species during a single trip. Further disaggregation of landings data between the direct open access and the incidental open access sectors is therefore somewhat arbitrary and dependent on the filtering criterion. (In other words, if more than 50% of the landed catch in a trip is groundfish, the trip qualifies as directed open access.) It is, therefore, more difficult to infer the proportion of recent landings of overfished groundfish species that were targeted versus incidentally-caught in open access fisheries.

Section 3 describes fisheries targeting nongroundfish stocks that may harvest groundfish incidentally. The 2004 groundfish harvest specifications EIS (PFMC 2004) provides additional information on groundfish bycatch in these fisheries.

6.4.1.4 Recreational Fisheries Bycatch

Table 6-15 shows estimated recreational catch of overfished groundfish species from 1998 through 2002 by subregion and type of vessel. Values in the table were derived from RecFIN data gathered through MRFSS and other port sampling programs. (Note that catch estimates for 2002 are preliminary.)

There is no recreational fishery where darkblotched rockfish is either targeted or taken incidentally. Also, no significant amounts of POP are caught recreationally. There are, however, significant recreational catch of several other species. For example, canary rockfish are harvested primarily in Northern California and Oregon, with smaller amounts taken in Southern California and Washington. The bulk of canary rockfish were taken by charter vessels in all years shown except for 2002.

Lingcod is landed coastwide, but the majority of harvest occurs in Northern California and Oregon. Unlike canary rockfish, the bulk of lingcod were taken by private boats. Of the overfished species, lingcod were by far the most commonly caught species in the ocean recreational fisheries each year.

Other overfished groundfish species caught in the recreational fishery include bocaccio, cowcod, widow rockfish, and yelloweye rockfish. Note that bocaccio is only considered overfished in Southern California. Cowcod are encountered almost exclusively in Southern California. Cowcod catch has diminished in recent years due to more restrictive management measures. Widow rockfish are caught primarily in Northern California, and occasionally in Oregon, but rarely in Southern California or Washington. Yelloweye rockfish are caught throughout Washington, Oregon, and Northern California, especially north of Cape Mendocino. Yelloweye rockfish are rarely caught in Southern California. The estimated discard mortality of yelloweye rockfish in the Oregon recreational fishery during 2002 was equivalent to about 23% of the landed catch. Discard mortality of canary was estimated to be about 8% of the landed catch (PFMC 2004).

6.4.1.5 Tribal Sector Bycatch

Tribal directed groundfish fisheries are subject to full retention. For some rockfish species, where the tribes do not have formal allocations, trip limits proposed by the tribes are adopted by the Council to accommodate incidental catch in directed fisheries for Pacific halibut, sablefish, and yellowtail rockfish. These trip limits are intended to constrain direct catches while allowing for small incidental catches. Such trip limits are in place for longspine and shortspine thornyheads combined, canary rockfish, yelloweye rockfish, minor shelf rockfish, and minor slope rockfish. For all other species, limited entry trip limits apply. Rockfish trip limits do not apply during fully competitive fisheries for Pacific halibut nor in the tribal Pacific whiting fishery (where all rockfish are retained and forfeited to the tribe for charitable contribution). Groundfish bycatch in the Pacific whiting fishery is estimated by NMFS observers. Trip limit overages in all other fisheries are forfeited to the tribes. In 2002, the midwater yellowtail fishery accounted for all of the rockfish trip limit overages.

6.4.2 Dependence On and Involvement In Groundfish Fisheries

The concepts of dependence and involvement in fisheries are derived from national standard 8 in the MSA. This standard requires consideration of the effect of conservation and management measures on fishing communities. The Act defines a fishing community as “a community which is substantially dependent on or substantially engaged in the harvest or processing of fishery resources.” These concepts are, by extension, used to characterize fishing fleets and processors coastwide, with the term involvement substituting for engagement, which is not defined in guidelines. Dependence refers to the proportion of a fishery sector’s revenues derived from fishery management unit species. Vessels and processors having a higher proportion of groundfish in their catch or product, for example, are more dependent on groundfish. Involvement refers to the relative importance of a fishery sector in terms of the proportion of the total catch of managed species they account for. A fishery sector or community that accounts for a relatively high proportion of the total groundfish catch, for example, is considered more involved in groundfish fisheries. A community or fishery sector may be heavily involved in groundfish fisheries even if income from these species account for a relatively small proportion of the local economy or, in the case of a fishery sector, a small proportion of total exvessel revenue. Seattle, for example, is substantially involved in groundfish fisheries, but groundfish - related revenue and income account for a small part of the local economy.

Dependence and involvement may vary seasonally. Catcher vessel owners and captains employ a variety of strategies to fill out a year of fishing. Fishers from the northern ports may fish in waters off of Alaska, as well as in the West Coast groundfish fishery. Others may change their operations throughout the year, targeting on salmon, shrimp, crab, or albacore, in addition to various high-value groundfish species, so as to spend more time in waters close to their communities. Factory trawlers and motherships fishing for or processing Pacific whiting off of the West Coast usually also participate in the Alaska pollock seasons, allowing the vessels and crews to spend a greater percentage of the year at work on the ocean. Commercial fisheries landings for species other than groundfish vary along the length of the coast. Dungeness crab landings are particularly high in Washington state. Squid, anchovies, and other coastal pelagics figure heavily in California commercial landings. Landings of salmon, shrimp, and highly migratory species like albacore are more widely distributed, and vary from year to year.

There is some degree of gear loyalty for groundfish vessels participating in nongroundfish fisheries. For example, a notable proportion of the nongroundfish fishery participation by groundfish trawl vessels occurs in the shrimp and prawn trawl fisheries. Similarly, the hook-and-line groundfish fisheries show high participation in the troll albacore and troll salmon fisheries. And, while all three gear groups participate in pot fisheries for crab, groundfish pot vessels show the greatest percentage of gear group participation in pot fisheries for crab and other crustaceans.

Table 6-16 summarizes vessel involvement in groundfish and other West Coast fisheries by relating vessels making the greatest landings, measured in dollars, in all fisheries compared to groundfish fisheries.

Tables 6-17a and 6-17b provide information on the number of vessels and gross revenues by level of dependence in the fishery.

Tables 6-18a and b 6-18b provide similar information by vessel size and level of dependence.

Table 6-19 relates vessel size to gear type and the species harvested by typical depth range for the species.

TABLE 6-1a. Total domestic shoreside landings and at-sea deliveries (round weight mt) from West Coast (WA, OR, CA) ocean area fisheries (0-200 miles) coastwide, 1981-2002 (includes commercial tribal fisheries, based on PacFIN data and Council [1997]). (page 1 of 2)

Year	Lingcod	Whiting, At Sea	Whiting, Shoreside	Flatfish	Sablefish	Rockfish	Other Groundfish	Total Groundfish	Total Groundfish - Less Whiting	Total Groundfish - Less At Sea Whiting	Pink Shrimp	Spot Prawn, Trawl	Spot Prawn, Pot	Ridgeback Prawn, Trawl	Pacific Halibut
1981	3,307	73,557	838	25,972	11,419	59,774	1,729	176,596	102,201	103,039	18,202	174	4	87	160
1982	3,822	67,465	1,027	32,613	18,625	61,470	1,277	186,299	117,807	118,834	12,704	162	8	61	164
1983	4,163	72,100	1,051	29,639	14,685	48,157	889	170,684	97,533	98,584	6,052	58	1	70	322
1984	4,060	78,889	2,721	27,703	14,077	40,020	1,079	168,549	86,939	89,660	4,488	29	0	259	598
1985	3,883	31,692	3,894	30,400	14,308	37,347	967	122,491	86,905	90,799	12,408	26	4	357	536
1986	1,894	81,639	3,463	26,127	13,290	37,012	661	164,086	78,984	82,447	26,330	12	13	130	748
1987	2,586	105,997	4,795	28,796	12,784	40,242	2,644	197,844	87,052	91,847	31,060	21	14	85	307
1988	2,656	135,781	6,867	27,043	10,876	40,980	3,788	227,991	85,343	92,210	32,334	23	41	55	260
1989	3,580	203,578	7,414	29,880	10,439	45,334	2,694	302,919	91,927	99,341	35,550	30	48	61	212
1990	2,932	175,685	8,115	27,701	9,179	43,265	1,813	268,690	84,890	93,005	24,553	19	101	34	153
1991	3,167	200,594	21,040	30,515	9,496	35,282	2,978	303,072	81,438	102,478	19,064	21	103	52	169
1992	1,883	148,186	56,127	24,796	9,360	37,000	3,255	280,607	76,294	132,421	35,710	35	65	27	217
1993	2,200	91,640	42,108	22,107	8,145	38,252	3,483	207,935	74,187	116,295	22,451	51	105	33	252
1994	2,834	162,923	73,611	19,284	7,661	35,361	3,638	305,312	68,778	142,389	14,981	133	66	71	179
1995	1,700	98,376	74,967	19,706	7,951	32,171	2,135	237,006	63,663	138,630	11,342	136	42	187	142
1996	1,790	123,419	85,127	20,807	8,339	30,487	2,559	272,528	63,982	149,109	13,800	178	54	264	150
1997	1,652	142,726	87,410	19,508	7,951	25,576	2,271	287,094	56,958	144,368	17,456	263	79	177	201
1998	506	142,810	88,601	16,722	4,410	22,619	2,180	277,848	46,437	135,038	4,342	257	117	197	223
1999	441	139,940	83,637	20,213	6,660	16,408	1,627	268,926	45,349	128,986	12,404	185	93	632	220
2000	145	120,411	85,843	16,315	6,296	11,702	1,498	242,210	35,956	121,799	14,653	121	81	705	223
2001	156	99,875	73,475	13,863	5,646	7,806	1,427	202,248	28,898	102,373	17,595	92	95	161	331
2002	205	84,494	45,808	13,220	3,830	5,974	2,115	155,646	25,344	71,151	25,302	99	79	215	422
1981-2002 Avg	*2,253*	*117,354*	*38,997*	*23,770*	*9,792*	*34,193*	*2,123*	*228,481*	*72,130*	*111,127*	*18,763*	*97*	*55*	*178*	*281*
1991-2002 Avg	*1,390*	*129,616*	*68,146*	*19,755*	*7,145*	*24,887*	*2,430*	*253,369*	*55,607*	*123,753*	*17,425*	*131*	*82*	*227*	*227*
1998-2002 Avg	*291*	*117,506*	*75,473*	*16,067*	*5,368*	*12,902*	*1,769*	*229,376*	*36,397*	*111,869*	*14,859*	*151*	*93*	*382*	*284*

NOTE: For 1981-1990, at-sea whiting catch estimates are from Council 1997.

TABLE 6-1a. Total domestic shoreside landings and at-sea deliveries (round weight mt) from West Coast (WA, OR, CA) ocean area fisheries (0-200 miles) coastwide, 1981-2002 (includes commercial tribal fisheries, based on PacFIN data and Council [1997]). (page 2 of 2)

Year	California Halibut	Salmon	Sea Cucumber	California Sheephead	Gillnet Complex	CPS Squid	CPS Wetfish	HMS	Dungeness Crab	Other Crus-taceans	Other Species	Total Non-groundfish	Total
1981	191	7,967	0	0	1,258	23,510	105,357	152,465	9,011	1,480	38,365	360,212	534,827
1982	180	8,831	63	0	1,173	16,360	79,436	115,923	7,623	1,233	46,247	292,150	476,468
1983	289	2,936	74	0	678	1,959	32,076	114,644	7,169	1,403	48,437	218,151	386,852
1984	239	2,180	24	0	829	993	38,084	85,203	6,239	1,849	37,260	180,258	346,822
1985	149	5,043	0	0	1,954	11,071	26,657	34,004	7,703	1,754	43,790	147,441	267,947
1986	197	7,384	35	0	1,801	21,290	28,817	36,916	7,402	1,567	51,113	185,741	347,841
1987	224	9,410	49	0	1,370	19,985	36,860	35,902	8,464	1,447	56,546	203,731	399,588
1988	249	12,518	72	0	1,082	37,232	37,902	36,616	16,715	1,430	59,874	238,391	464,392
1989	273	6,869	0	0	875	40,936	35,160	27,446	16,045	1,806	67,110	234,410	535,341
1990	190	4,682	67	0	775	28,447	39,198	16,088	13,529	2,223	49,672	181,721	448,422
1991	235	3,734	264	0	851	37,388	45,047	11,135	6,185	2,035	31,752	160,026	461,107
1992	272	2,049	0	0	379	13,116	39,219	13,899	15,125	1,607	26,641	150,353	428,968
1993	218	2,214	295	0	309	42,889	31,397	17,300	17,411	1,773	20,341	159,032	364,974
1994	188	1,802	298	118	208	55,489	26,669	20,349	17,682	1,221	17,421	158,869	462,186
1995	262	4,756	268	115	276	70,363	52,963	18,538	16,937	1,462	17,857	197,641	432,652
1996	306	3,306	381	115	347	80,715	49,154	29,396	24,564	1,498	18,931	225,155	495,685
1997	415	3,700	209	141	340	70,471	70,617	26,406	12,347	2,010	22,731	229,560	514,655
1998	415	1,850	349	119	255	2,931	68,576	29,640	11,748	1,720	10,671	135,408	411,294
1999	385	2,709	272	63	394	92,122	76,092	17,702	15,783	1,478	11,901	234,434	501,575
2000	218	3,707	291	79	333	117,984	103,360	14,534	13,015	1,619	13,496	286,419	526,692
2001	245	3,358	323	68	264	85,959	106,105	14,816	11,234	1,643	12,530	256,820	457,100
2002	309	4,660	426	52	353	72,958	106,754	12,908	15,505	1,465	16,639	260,148	415,793
1981-2002 Avg	*257*	*4,803*	*171*	*40*	*732*	*42,917*	*56,159*	*40,083*	*12,611*	*1,624*	*32,697*	*211,466*	*440,054*
1991-2002 Avg	*289*	*3,154*	*281*	*73*	*359*	*61,865*	*64,663*	*18,885*	*14,795*	*1,628*	*18,409*	*202,492*	*456,057*
1998-2002 Avg	*314*	*3,257*	*332*	*76*	*320*	*74,391*	*92,177*	*17,920*	*13,457*	*1,585*	*13,047*	*232,646*	*462,491*

NOTE: For 1981-1990, at-sea whiting catch estimates are from Council 1997.

TABLE 6-1b. Total domestic shoreside landings and at-sea deliveries (exvessel revenue, thousands of current dollars) from West Coast (WA, OR, CA) ocean area fisheries (0-200 miles) coastwide, 1981-2002 (includes commercial tribal fisheries, based on PacFIN data and Council [1997]). (page 1 of 2)

Year	Lingcod	Whiting, At Sea	Whiting, Shoreside	Flatfish	Sablefish	Rockfish	Other Groundfish	Total Groundfish	Total Groundfish - Less Whiting	Total Groundfish - Less At Sea Whiting	Pink Shrimp	Spot Prawn, Trawl	Spot Prawn, Pot	Ridgeback Prawn, Trawl	Pacific Halibut
1981	1,662	12,264	141	14,834	5,258	22,339	757	57,254	44,850	44,991	20,160	780	38	165	411
1982	2,088	11,863	182	19,727	10,282	26,479	695	71,315	59,271	59,452	14,278	811	87	157	433
1983	2,284	12,783	186	17,735	7,691	23,775	529	64,983	52,014	52,200	9,753	370	13	141	805
1984	2,184	11,739	406	16,361	6,684	22,111	637	60,122	47,977	48,383	4,526	217	1	327	1,105
1985	2,241	4,631	571	18,633	10,564	23,223	576	60,440	55,238	55,809	9,648	245	47	483	1,226
1986	1,321	10,605	452	17,425	10,985	25,675	479	66,943	55,886	56,338	30,975	118	117	234	2,489
1987	2,151	14,662	664	22,235	13,423	31,069	1,949	86,153	70,827	71,491	46,534	203	176	209	1,250
1988	2,137	22,440	1,136	20,796	12,499	29,323	2,241	90,572	66,996	68,132	29,129	240	444	154	1,106
1989	2,768	29,256	1,071	20,521	10,796	32,137	1,570	98,119	67,792	68,863	28,615	215	503	176	863
1990	2,290	22,583	1,049	17,253	9,661	32,496	983	86,315	62,683	63,732	26,577	159	1,101	101	905
1991	2,457	23,437	2,396	21,246	14,330	28,922	1,669	94,457	68,624	71,020	23,407	222	1,189	148	1,077
1992	1,617	17,968	5,885	16,452	13,633	31,616	1,838	89,009	65,156	71,041	27,293	433	878	131	1,037
1993	1,846	7,071	2,843	14,669	10,009	32,530	1,774	70,742	60,827	63,670	16,472	610	1,545	140	972
1994	2,421	12,931	4,904	13,069	13,970	35,811	2,023	85,130	67,294	72,198	19,326	1,713	1,000	212	908
1995	1,683	10,194	7,821	15,367	23,640	39,581	1,721	100,007	81,992	89,814	18,088	1,898	670	476	676
1996	1,821	13,604	5,107	15,597	25,897	33,805	1,940	97,770	79,060	84,167	18,171	2,578	844	777	764
1997	1,740	19,195	8,162	14,323	27,878	27,883	2,044	101,224	73,867	82,029	15,224	3,721	1,235	690	891
1998	718	13,538	4,845	12,514	11,380	24,997	2,946	70,938	52,554	57,400	5,052	3,697	1,859	762	794
1999	715	11,723	6,871	13,679	17,103	20,497	2,547	73,134	54,541	61,411	12,822	2,682	1,577	1,545	962
2000	345	10,885	7,969	13,980	20,325	17,398	2,639	73,540	54,686	62,656	12,951	2,182	1,635	1,793	1,209
2001	387	10,569	5,748	12,631	17,512	12,880	1,957	61,684	45,367	51,115	10,293	1,703	1,905	532	1,474
2002	506	9,119	4,540	11,828	11,810	11,066	2,615	51,485	37,825	42,365	15,358	1,755	1,592	633	1,818
1981-2002	*1,699*	*14,230*	*3,316*	*16,403*	*13,879*	*26,619*	*1,642*	*77,788*	*60,242*	*63,558*	*18,848*	*1,207*	*839*	*454*	*1,053*
1991-2002	*1,355*	*13,353*	*5,591*	*14,613*	*17,290*	*26,416*	*2,143*	*80,760*	*61,816*	*67,407*	*16,205*	*1,933*	*1,327*	*653*	*1,048*
1998-2002	*534*	*11,167*	*5,995*	*12,926*	*15,626*	*17,368*	*2,541*	*66,156*	*48,995*	*54,989*	*11,295*	*2,404*	*1,714*	*1,053*	*1,251*

NOTE: For 1981-1990, at-sea whiting catch estimates are from Council 1997.

TABLE 6-1b. Total domestic shoreside landings and at-sea deliveries (exvessel revenue, thousands of current dollars) from West Coast (WA, OR, CA) ocean area fisheries (0-200 miles) coastwide, 1981-2002 (includes commercial tribal fisheries, based on PacFIN data and Council [1997]). (page 2 of 2)

Year	California Halibut	Salmon	Sea Cucumber	California Sheephead	Gillnet Complex	CPS Squid	CPS Wetfish	HMS	Dungeness Crab	Other Crustaceans	Other Species	Total Non-groundfish	Total
1981	567	31,772	0	0	2,082	5,080	14,183	199,799	18,259	3,401	28,852	327,528	382,801
1982	551	37,410	25	0	1,897	3,581	9,636	134,490	18,155	3,944	27,199	254,636	323,970
1983	929	9,090	26	0	1,161	838	5,460	117,933	23,427	3,827	28,978	204,734	267,735
1984	897	10,748	10	0	1,397	500	6,852	95,099	21,798	6,705	17,509	169,674	227,811
1985	592	20,869	0	0	2,669	4,065	4,880	42,061	24,628	4,180	22,910	140,488	198,943
1986	865	25,187	16	0	2,483	4,527	4,857	44,987	22,709	5,309	23,395	170,254	235,213
1987	1,067	46,073	23	0	2,282	3,960	5,508	49,233	25,735	5,178	29,109	218,528	302,694
1988	1,246	68,050	32	0	1,936	7,868	6,461	59,069	43,507	5,758	34,883	261,873	350,457
1989	1,340	26,754	0	0	1,919	6,962	6,020	39,944	39,896	6,308	40,777	202,279	298,409
1990	985	21,966	36	0	1,649	4,748	5,420	24,676	45,598	7,187	47,905	191,004	275,329
1991	1,247	14,203	187	0	1,766	6,086	7,063	17,225	21,446	6,860	51,898	156,015	248,481
1992	1,443	9,271	0	0	939	2,497	6,270	26,177	38,884	6,710	47,608	171,562	258,580
1993	1,146	8,931	353	0	904	10,194	3,824	31,130	42,735	5,966	38,135	165,050	233,797
1994	1,117	7,260	424	750	541	14,369	3,882	37,482	52,617	5,742	35,903	185,237	268,371
1995	1,566	15,443	416	701	797	22,342	5,368	27,140	63,482	7,567	38,784	207,408	305,419
1996	1,738	9,337	544	694	982	21,908	5,452	45,587	74,352	8,091	39,254	233,068	328,845
1997	2,180	10,105	232	860	1,315	20,707	8,259	40,516	51,854	10,528	34,802	205,117	304,343
1998	2,107	5,712	456	693	892	1,631	6,860	40,274	46,281	8,658	11,416	139,141	208,080
1999	2,080	9,688	418	452	1,482	33,405	7,408	33,021	67,236	6,167	17,862	200,806	271,944
2000	1,349	13,943	605	593	1,280	27,076	11,935	32,941	61,658	8,197	20,248	201,595	273,136
2001	1,545	10,578	581	515	1,095	16,866	12,322	31,505	51,301	8,515	17,890	170,621	230,303
2002	1,988	13,015	792	391	1,504	18,261	11,944	22,032	57,848	8,257	15,082	174,272	225,757
1981-2002 Avg	*1,297*	*19,337*	*235*	*257*	*1,499*	*10,794*	*7,267*	*54,196*	*41,518*	*6,502*	*30,473*	*195,776*	*273,655*
1991-2002 Avg	*1,626*	*10,624*	*417*	*471*	*1,125*	*16,278*	*7,549*	*32,086*	*52,475*	*7,605*	*30,740*	*182,161*	*263,088*
1998-2002 Avg	*1,814*	*10,587*	*570*	*529*	*1,251*	*19,448*	*10,094*	*31,954*	*56,865*	*7,959*	*16,500*	*175,287*	*241,844*

NOTE: For 1981-1990, at-sea whiting catch estimates are from Council 1997.

TABLE 6-1c. Total domestic shoreside landings and at-sea deliveries (exvessel revenue, thousands of inflation adjusted 2002 dollars) from West Coast (WA, OR, CA) ocean area fisheries (0-200 miles) coastwide, 1981-2002 (includes commercial tribal fisheries, based on PacFIN data and Council [1997]). (page 1 of 2)

Year	Lingcod	Whiting, At Sea	Whiting, Shoreside	Flatfish	Sablefish	Rockfish	Other Groundfish	Total Groundfish	Total Groundfish - Less Whiting	Total Groundfish - Less At Sea Whiting	Pink Shrimp	Spot Prawn, Trawl	Spot Prawn, Pot	Ridgeback Prawn, Trawl	Pacific Halibut
1981	945	6,975	80	8,437	2,990	12,705	430	32,564	25,508	25,589	11,466	443	21	94	234
1982	1,260	7,159	110	11,904	6,205	15,979	419	43,036	35,767	35,877	8,616	490	53	95	261
1983	1,432	8,019	117	11,126	4,825	14,915	332	40,766	32,629	32,746	6,118	232	8	88	505
1984	1,422	7,641	264	10,649	4,351	14,391	415	39,132	31,227	31,491	2,946	141	0	213	719
1985	1,503	3,106	383	12,497	7,085	15,575	386	40,536	37,046	37,430	6,471	164	31	324	823
1986	905	7,269	310	11,944	7,530	17,599	329	45,886	38,308	38,617	21,232	81	80	161	1,706
1987	1,514	10,324	467	15,657	9,453	21,878	1,372	60,667	49,875	50,343	32,768	143	124	147	880
1988	1,556	16,341	827	15,144	9,102	21,353	1,632	65,955	48,787	49,614	21,212	175	324	112	805
1989	2,092	22,110	810	15,509	8,159	24,287	1,187	74,153	51,234	52,043	21,625	163	380	133	652
1990	1,798	17,726	823	13,543	7,583	25,507	772	67,752	49,202	50,026	20,861	124	864	80	710
1991	1,996	19,040	1,946	17,260	11,642	23,496	1,356	76,736	55,750	57,696	19,016	180	966	120	875
1992	1,344	14,932	4,891	13,672	11,330	26,275	1,527	73,972	54,149	59,040	22,682	360	730	109	861
1993	1,569	6,013	2,417	12,472	8,510	27,659	1,508	60,149	51,719	54,137	14,005	518	1,314	119	826
1994	2,102	11,229	4,259	11,348	12,130	31,096	1,757	73,921	58,434	62,692	16,781	1,488	868	184	788
1995	1,491	9,033	6,931	13,617	20,947	35,073	1,525	88,617	72,654	79,584	16,028	1,682	593	422	599
1996	1,644	12,283	4,611	14,082	23,382	30,523	1,752	88,277	71,383	75,994	16,406	2,327	762	702	690
1997	1,597	17,619	7,492	13,147	25,590	25,595	1,876	92,916	67,805	75,297	13,974	3,416	1,134	633	818
1998	667	12,565	4,497	11,614	10,562	23,200	2,734	65,838	48,776	53,273	4,689	3,432	1,725	707	737
1999	673	11,038	6,469	12,879	16,103	19,299	2,398	68,859	51,352	57,821	12,072	2,525	1,485	1,455	906
2000	332	10,471	7,667	13,449	19,553	16,738	2,539	70,749	52,611	60,278	12,459	2,100	1,573	1,725	1,163
2001	381	10,409	5,661	12,440	17,247	12,685	1,927	60,751	44,681	50,342	10,137	1,677	1,876	524	1,452
2002	506	9,119	4,540	11,828	11,810	11,066	2,615	51,485	37,825	42,365	15,358	1,755	1,592	633	1,818
1981-2002	*1,306*	*11,383*	*2,981*	*12,919*	*11,640*	*21,223*	*1,399*	*62,851*	*48,487*	*51,468*	*14,860*	*1,074*	*750*	*399*	*856*
1991-2002	*1,192*	*11,979*	*5,115*	*13,151*	*15,734*	*23,559*	*1,960*	*72,689*	*55,595*	*60,710*	*14,467*	*1,788*	*1,218*	*611*	*961*
1998-2002	*512*	*10,720*	*5,767*	*12,442*	*15,055*	*16,598*	*2,443*	*63,536*	*47,049*	*52,816*	*10,943*	*2,298*	*1,650*	*1,009*	*1,215*

NOTE: For 1981-1990, at-sea whiting catch estimates are from Council 1997.

TABLE 6-1c. Total domestic shoreside landings and at-sea deliveries (exvessel revenue, thousands of inflation adjusted 2002 dollars) from West Coast (WA, OR, CA) ocean area fisheries (0-200 miles) coastwide, 1981-2002 (includes commercial tribal fisheries, based on PacFIN data and Council [1997]). (page 2 of 2)

Year	California Halibut	Salmon	Sea Cucumber	California Sheephead	Gillnet Complex	CPS Squid	CPS Wetfish	HMS	Dungeness Crab	Other Crus-taceans	Other Species	Total Non-groundfish	Total
1981	322	18,070	0	0	1,184	2,889	8,067	113,636	10,385	1,934	16,409	187,137	217,719
1982	332	22,575	15	0	1,144	2,161	5,815	81,158	10,956	2,380	16,413	154,447	195,501
1983	583	5,702	16	0	728	525	3,425	73,982	14,696	2,401	18,179	129,173	167,956
1984	584	6,995	6	0	909	325	4,460	61,897	14,188	4,364	11,396	111,129	148,276
1985	397	13,996	0	0	1,790	2,726	3,273	28,209	16,517	2,803	15,365	94,875	133,425
1986	593	17,265	11	0	1,702	3,103	3,329	30,837	15,566	3,639	16,036	117,327	161,229
1987	751	32,444	17	0	1,607	2,789	3,879	34,669	18,122	3,646	20,498	154,471	213,151
1988	907	49,555	24	0	1,410	5,730	4,705	43,015	31,682	4,193	25,402	191,239	255,207
1989	1,013	20,219	0	0	1,450	5,261	4,550	30,187	30,151	4,767	30,817	153,357	225,522
1990	773	17,242	29	0	1,294	3,727	4,255	19,369	35,792	5,641	37,602	150,353	216,115
1991	1,013	11,538	152	0	1,435	4,944	5,738	13,993	17,423	5,573	42,161	127,119	201,864
1992	1,199	7,705	0	0	781	2,075	5,211	21,754	32,315	5,576	39,566	142,916	214,896
1993	974	7,594	300	0	769	8,668	3,252	26,469	36,336	5,072	32,425	140,635	198,790
1994	970	6,304	368	651	470	12,477	3,371	32,547	45,689	4,986	31,175	161,110	233,035
1995	1,388	13,684	369	621	706	19,798	4,756	24,049	56,251	6,705	34,367	184,013	270,633
1996	1,569	8,430	491	627	887	19,781	4,922	41,161	67,133	7,305	35,443	210,631	296,915
1997	2,001	9,276	213	790	1,207	19,008	7,581	37,190	47,598	9,664	31,946	188,446	279,365
1998	1,956	5,301	423	643	828	1,513	6,367	37,378	42,954	8,035	10,596	129,281	193,121
1999	1,959	9,121	393	426	1,395	31,452	6,975	31,090	63,306	5,807	16,817	189,183	256,045
2000	1,298	13,413	582	571	1,232	26,048	11,482	31,691	59,318	7,886	19,480	194,020	262,770
2001	1,522	10,418	572	507	1,078	16,611	12,136	31,029	50,525	8,386	17,619	168,071	226,820
2002	1,988	13,015	792	391	1,504	18,261	11,944	22,032	57,848	8,257	15,082	174,272	225,757
1981-2001	*1,095*	*14,539*	*217*	*238*	*1,160*	*9,540*	*5,886*	*39,425*	*35,216*	*5,410*	*24,309*	*154,972*	*217,914*
1991-2002	*1,486*	*9,650*	*388*	*435*	*1,024*	*15,053*	*6,978*	*29,199*	*48,058*	*6,938*	*27,223*	*165,478*	*238,334*
1998-2002	*1,744*	*10,254*	*553*	*507*	*1,207*	*18,777*	*9,781*	*30,644*	*54,790*	*7,674*	*15,919*	*168,965*	*232,902*

TABLE 6-2a. Total domestic shoreside landings and at-sea deliveries (round weight mt) from West Coast ocean area fisheries (0-200 miles) North and South of Cape Mendocino and by state (WA, OR and CA), 1981-2002 (includes commercial tribal fisheries, based on PacFIN data (August, 2003) and Council (1997). (Page 1 of 1)

	All Groundfish							All Species						
	At-Sea Included		Not Including At Sea					At-Sea Included		Not Including At Sea				
Year	North of Cape Mendocino	South of Cape Mendocino	WA	OR	CA	Total	Total with At-Sea	North of Cape Mendocino	South of Cape Mendocino	WA	OR	CA	Total	Total with At-Sea
1981	151,004	25,592	23,290	37,315	42,434	103,039	176,596	200,657	334,063	33,937	66,554	360,779	461,270	534,827
1982	152,292	34,007	25,200	40,999	52,635	118,834	186,299	183,276	293,142	32,915	57,250	318,838	409,003	476,468
1983	143,709	26,973	22,912	35,103	40,567	98,583	170,683	164,636	222,109	30,740	44,898	239,115	314,752	386,852
1984	141,626	26,923	20,888	28,178	40,593	89,659	168,548	158,876	187,813	26,158	36,598	205,177	267,933	346,822
1985	96,178	26,312	19,166	28,967	42,665	90,798	122,490	125,107	142,474	27,921	43,062	165,272	236,255	267,947
1986	137,395	26,692	15,939	24,883	41,625	82,448	164,087	178,713	168,874	27,489	47,623	191,090	266,202	347,841
1987	174,325	23,519	20,097	30,531	41,219	91,847	197,844	220,706	178,523	31,820	58,994	202,778	293,591	399,588
1988	208,073	19,917	20,332	32,125	39,753	92,210	227,991	266,841	197,210	39,009	62,679	226,923	328,611	464,392
1989	279,717	23,202	20,012	36,836	42,492	99,341	302,919	340,343	194,791	36,795	72,104	222,864	331,763	535,341
1990	246,481	22,210	18,329	35,509	39,168	93,006	268,691	293,533	154,619	30,679	61,455	180,603	272,737	448,422
1991	283,082	19,989	16,941	49,750	35,786	102,477	303,071	314,390	146,533	24,777	66,239	169,497	260,513	461,107
1992	260,347	20,260	15,729	81,919	34,773	132,421	280,607	320,508	108,325	29,845	114,385	136,552	280,782	428,968
1993	191,730	16,205	17,018	71,211	28,066	116,295	207,935	241,100	123,751	34,261	92,938	146,135	273,334	364,974
1994	290,828	14,483	23,558	94,096	24,733	142,388	305,311	332,743	129,364	37,800	110,440	151,021	299,262	462,186
1995	219,667	17,339	18,455	91,644	28,531	138,630	237,006	255,753	176,863	32,695	107,495	194,086	334,276	432,652
1996	254,533	17,995	25,267	95,828	28,014	149,109	272,528	305,790	189,844	43,337	118,468	210,460	372,266	495,685
1997	270,417	16,675	19,106	95,875	29,333	144,314	287,093	313,325	201,296	30,163	116,860	224,838	371,862	514,655
1998	266,072	11,775	22,094	89,899	22,816	134,809	277,847	296,576	114,582	33,611	103,710	130,739	268,060	411,294
1999	260,219	8,707	21,496	92,089	14,863	128,448	268,926	296,771	204,567	32,007	112,253	216,505	360,765	501,575
2000	235,332	6,878	19,645	85,680	16,033	121,358	242,210	288,562	237,931	35,606	118,637	251,469	405,712	526,692
2001	196,620	5,627	24,197	66,450	11,403	102,051	202,247	263,965	192,980	49,532	104,343	202,565	356,440	457,100
2002	149,348	6,118	19,300	49,861	15,220	84,381	155,646	243,531	170,027	57,899	99,966	183,794	341,659	413,791

TABLE 6-2b. Total domestic shoreside landings and at-sea deliveries (total exvessel revenue in thousands of current dollars) from West Coast ocean area fisheries (0-200 miles) North and South of Cape Mendocino and by state (WA, OR and CA), 1981-2002 (includes commercial tribal fisheries, based on PacFIN data (August, 2003) and Council (1997). (Page 1 of 1)

	All Groundfish							All Species						
	At-Sea Included		Not Including At Sea					At-Sea Included		Not Including At Sea				
Year	North of Cape Mendocino	South of Cape Mendocino	WA	OR	CA	Total	Total with At-Sea	North of Cape Mendocino	South of Cape Mendocino	WA	OR	CA	Total	Total with At-Sea
1981	43,673	14,083	9,260	14,668	21,457	45,384	57,755	124,664	261,459	28,873	56,592	288,307	373,773	386,144
1982	52,488	19,467	11,499	20,311	28,175	59,985	71,955	112,705	214,126	27,604	49,663	237,638	314,906	326,875
1983	49,245	16,228	11,354	18,481	22,758	52,593	65,473	93,782	175,823	28,109	37,254	191,506	256,868	269,748
1984	43,988	16,620	10,465	15,183	23,125	48,773	60,608	79,459	149,935	21,926	30,324	165,566	217,816	229,650
1985	42,792	18,082	12,542	17,217	26,451	56,209	60,874	93,699	105,604	27,766	42,294	125,645	195,705	200,370
1986	46,710	20,733	10,805	16,920	29,033	56,759	67,443	116,557	119,748	29,218	54,216	142,853	226,287	236,972
1987	66,641	20,029	16,711	24,330	30,879	71,920	86,669	164,019	138,934	41,100	83,247	165,416	289,762	304,512
1988	73,678	17,480	15,790	24,075	28,708	68,573	91,158	180,675	170,343	49,657	79,775	200,706	330,137	352,722
1989	78,660	20,026	13,663	25,367	30,229	69,260	98,684	165,710	133,661	42,383	72,001	156,322	270,706	300,130
1990	67,143	19,627	11,560	23,358	29,150	64,068	86,770	157,006	119,100	38,322	67,567	148,189	254,078	276,780
1991	76,062	19,007	14,159	29,957	27,363	71,479	95,068	132,078	117,744	30,437	58,415	137,650	226,500	250,089
1992	69,942	19,761	11,508	31,291	28,798	71,597	89,705	156,874	103,586	38,194	71,983	132,318	242,494	260,603
1993	54,932	16,104	10,967	29,116	23,852	63,935	71,037	133,399	101,206	41,155	58,456	128,061	227,672	234,773
1994	68,657	16,845	15,075	32,768	24,672	72,515	85,502	155,262	114,126	47,434	63,620	145,508	256,562	269,549
1995	76,306	24,055	17,816	37,895	34,419	90,131	100,361	168,664	137,737	58,833	76,310	161,129	296,272	306,501
1996	73,856	24,312	16,350	34,195	33,962	84,508	98,167	187,014	143,017	60,775	81,808	173,937	316,521	330,180
1997	78,835	22,516	16,329	33,824	31,975	82,128	101,351	159,828	144,789	44,696	67,947	172,862	285,505	304,731
1998	53,942	16,985	10,831	22,807	23,609	57,248	70,928	119,165	88,726	35,858	48,969	109,490	194,316	208,050
1999	58,418	14,747	12,379	27,559	21,094	61,033	73,165	147,541	124,473	46,496	66,844	146,589	259,929	272,062
2000	59,687	13,815	11,330	29,842	21,074	62,247	73,502	154,273	118,605	46,139	77,806	137,788	261,733	272,994
2001	50,659	11,025	10,809	23,392	16,664	50,866	61,684	138,307	91,850	48,123	66,860	104,493	219,477	230,303
2002	40,596	10,856	9,398	18,020	16,410	43,827	51,485	125,241	98,325	51,411	52,675	112,011	216,097	223,755

TABLE 6-3. Historical harvests by West Coast commercial fisheries sectors (landed roundweight in mt and exvessel revenue in thousands of current dollars). (Page 1 of 1)

	Limited Entry Trawl			Limited Entry Non-Trawl			Open Access			TOTAL		
	Groundfish	Non-Groundfish	Total	Groundfish	Non-Groundfish	Total	Groundfish	Non-Groundfish	Total	Groundfish	Non-Groundfish	Total
Landed Roundweight (mt)												
1998	271,882	4,690	276,572	4,845	4,306	9,152	1,162	130,590	131,752	277,889	139,586	417,475
1999	263,150	5,265	268,415	5,145	4,218	9,363	642	229,408	230,050	268,937	238,891	507,828
2000	237,135	4,464	241,599	4,594	4,164	8,758	455	281,349	281,804	242,183	289,978	532,161
2001	197,737	4,732	202,470	3,915	4,285	8,200	484	251,792	252,276	202,136	260,809	462,946
2002	151,646	9,587	161,232	3,233	4,914	8,146	472	254,958	255,430	155,350	269,458	424,808
Exvessel Revenue ($,000)												
1998	55,216	1,833	57,050	12,332	797	13,129	2,793	130,539	133,332	70,342	133,169	203,510
1999	54,335	1,518	55,853	15,608	1,012	16,620	2,539	189,886	192,425	72,482	192,416	264,898
2000	53,678	882	54,560	16,611	895	17,506	2,686	191,658	194,344	72,975	193,436	266,410
2001	42,001	1,149	43,150	13,335	1,328	14,663	2,555	159,985	162,541	57,892	162,462	220,354
2002	37,980	1,822	39,802	10,590	2,145	12,735	2,463	166,343	168,807	51,034	170,311	221,345

TABLE 6-4. Historical harvests of species groups by the Limited Entry Trawl commercial fishery sector North and South of Cape Mendocino (landed roundweight in mt and exvessel revenue in thousands of current dollars). (Page 1 of 2)

	Lingcod	Whiting, At Sea	Whiting, Shoreside	Flatfish	Sablefish	Rockfish	Other Groundfish	Total Groundfish	Pink Shrimp	Spot Prawn, Trawl	Spot Prawn, Pot	Ridgeback Prawn, Trawl	Pacific Halibut	California Halibut
Landed Roundweight (mt)														
North														
1,998	340	142,938	88,678	13,505	1,766	14,490	1,389	263,107	0	0	0	0	0	13
1,999	277	140,065	83,711	16,534	2,627	12,232	1,004	256,452	0	0	0	0	0	3
2,000	66	120,519	85,919	13,102	2,292	9,184	756	231,838	0	0	0	0	1	0
2,001	57	99,965	73,539	11,148	2,241	5,669	858	193,476	0	0	0	0	0	4
2,002	96	84,494	45,748	10,222	1,204	3,572	1,323	146,660	0	0	0	0	0	0
South														
1,998	40	0	2	3,182	427	4,860	263	8,774	0	0	0	0	0	303
1,999	44	0	0	3,649	559	2,332	114	6,698	0	0	0	0	0	271
2,000	11	0	1	3,201	425	1,594	64	5,296	0	0	0	0	0	138
2,001	10	0	1	2,683	373	1,119	75	4,261	0	0	0	0	0	159
2,002	16	0	0	2,841	397	1,654	79	4,986	0	0	0	0	0	176
Exvessel Revenue ($,000)														
North														
1,998	389	13,538	4,844	9,665	4,388	13,245	733	46,802	0	0	0	0	0	56
1,999	343	11,724	6,870	10,552	5,734	11,698	469	47,390	0	0	0	0	0	13
2,000	130	11,177	7,968	11,002	6,198	10,528	443	47,447	0	0	0	0	1	2
2,001	111	7,837	5,747	9,867	5,941	6,884	520	36,905	0	0	0	0	1	16
2,002	180	9,119	4,535	9,070	2,866	5,001	1,043	31,814	0	0	0	0	0	1
South														
1,998	60	0	2	2,781	882	4,597	93	8,414	0	0	0	0	0	1,463
1,999	70	0	0	3,052	1,046	2,738	38	6,945	0	0	0	0	0	1,374
2,000	23	0	0	2,913	898	2,371	25	6,231	0	0	0	0	0	787
2,001	21	0	0	2,667	794	1,586	27	5,095	0	0	0	0	0	946
2,002	30	0	0	2,651	874	2,581	31	6,166	0	0	0	0	0	1,019

TABLE 6-4. Historical harvests of species groups by the Limited Entry Trawl commercial fishery sector North and South of Cape Mendocino (landed roundweight in mt and exvessel revenue in thousands of current dollars). (Page 2 of 2)

	Salmon	Sea Cucumber	California Sheephead	Gillnet Complex	CPS Squid	CPS Wetfish	HMS	Dungeness Crab	Other Crustaceans	Other Species	Total Non-groundfish	Grand Total
Landed Roundweight (mt)												
North												
1998	0	0	0	0	27	258	0	0	18	0	2,314	265,422
1999	4	0	0	0	18	913	2	2	2	0	2,943	259,395
2000	4	0	0	0	6	283	1	0	2	0	2,298	234,136
2001	5	0	0	0	30	527	1	0	4	0	2,572	196,048
2002	2	0	0	0	14	13	0	0	1	5,337	7,370	154,029
South												
1998	0	62	0	0	4	7	1	2	0	0	2,375	11,150
1999	0	46	0	0	1	2	1	1	2	0	2,322	9,020
2000	0	27	0	0	1	1	0	0	0	0	2,167	7,463
2001	0	0	0	0	0	0	0	0	0	0	2,161	6,422
2002	0	0	0	0	1	0	1	1	3	34	2,217	7,203
Exvessel Revenue ($,000)												
North												
1998	0	0	0	0	2	38	0	0	164	0	261	47,063
1999	0	0	0	0	0	15	4	9	17	0	59	47,449
2000	4	0	0	0	4	29	2	0	11	0	52	47,498
2001	19	0	0	0	1	128	1	0	37	0	202	37,108
2002	6	0	0	0	1	2	0	0	1	738	748	32,562
South												
1998	0	87	0	0	7	3	3	10	1	0	1,573	9,986
1999	0	62	0	0	2	1	1	3	17	0	1,459	8,404
2000	0	40	0	0	1	0	1	0	1	0	831	7,062
2001	0	0	0	0	0	0	0	0	0	0	947	6,043
2002	0	0	0	0	2	0	2	3	12	36	1,074	7,240

TABLE 6-5. Historical harvests of species groups by the Limited Entry Fixed Gear commercial fishery sectors North and South of Cape Mendocino (landed roundweight in mt and exvessel revenue in thousands of current dollars). (Page 1 of 2)

	Lingcod	Whiting, At Sea	Whiting, Shoreside	Flatfish	Sablefish	Rockfish	Other Groundfish	Total Groundfish	Pink Shrimp	Spot Prawn, Trawl	Spot Prawn, Pot	Ridgeback Prawn, Trawl	Pacific Halibut	California Halibut
Landed Roundweight (mt)														
North														
1998	47	0	0	3	1,594	1,057	34	2,734	0	0	0	0	73	0
1999	60	0	0	7	2,658	808	76	3,611	0	0	0	0	144	0
2000	35	0	0	6	2,657	278	363	3,338	0	0	0	0	80	0
2001	45	0	0	6	2,149	384	265	2,848	0	0	0	0	209	0
2002	36	0	0	9	1,599	256	475	2,375	0	0	0	0	309	0
South														
1998	40	0	0	10	409	1,333	320	2,111	0	0	0	0	3	36
1999	25	0	0	18	591	651	248	1,534	0	0	0	0	2	16
2000	11	0	0	4	674	400	167	1,255	0	0	0	0	0	17
2001	13	0	0	15	584	348	107	1,067	0	0	0	0	0	14
2002	12	0	0	8	473	247	117	857	0	0	0	0	0	22
Exvessel Revenue ($,000)														
North														
1998	100	0	0	2	4,453	1,509	92	6,157	0	0	0	0	219	0
1999	141	0	0	4	8,190	1,544	146	10,025	0	0	0	0	617	0
2000	110	0	0	4	10,142	756	428	11,440	0	0	0	0	386	0
2001	118	0	0	4	7,856	1,087	359	9,424	0	0	0	0	902	0
2002	117	0	0	4	6,111	765	595	7,592	0	0	0	0	1,330	0
South														
1998	90	0	0	10	1,028	3,966	1,080	6,175	0	0	0	0	10	186
1999	73	0	0	18	1,466	3,021	1,005	5,584	0	0	0	0	7	107
2000	37	0	0	7	2,166	2,254	707	5,171	0	0	0	0	0	102
2001	47	0	0	22	1,773	1,745	324	3,911	0	0	0	0	0	95
2002	34	0	0	10	1,366	1,365	224	2,998	0	0	0	0	1	128

TABLE 6-5. Historical harvests of species groups by the Limited Entry Fixed Gear commercial fishery sectors North and South of Cape Mendocino (landed roundweight in mt and exvessel revenue in thousands of current dollars). (Page 2 of 2)

	Salmon	Sea Cucumber	California Sheephead	Gillnet Complex	CPS Squid	CPS Wetfish	HMS	Dungeness Crab	Other Crustaceans	Other Species	Total Non-groundfish	Grand Total
Landed Roundweight (mt)												
North												
1998	0	0	0	0	0	0	0	0	0	70	2,141	4,875
1999	0	0	0	0	0	0	13	0	0	0	2,157	5,767
2000	0	0	0	0	0	0	0	0	0	0	2,080	5,419
2001	0	0	0	0	0	0	0	0	0	0	2,210	5,058
2002	0	0	0	0	0	0	0	0	0	439	2,750	5,126
South												
1998	0	84	44	0	0	0	0	0	0	2	2,165	4,277
1999	0	0	27	0	0	4	10	0	0	2	2,061	3,596
2000	0	0	20	42	0	4	0	0	0	0	2,083	3,339
2001	0	0	17	27	9	6	0	0	1	0	2,075	3,141
2002	0	0	11	0	0	0	0	0	0	127	2,163	3,021
Exvessel Revenue ($,000)												
North												
1998	0	0	0	0	0	0	0	0	1	70	221	6,378
1999	0	0	0	0	0	0	48	0	0	1	668	10,693
2000	0	0	0	0	0	0	0	0	3	1	391	11,831
2001	0	0	0	0	0	0	0	0	0	0	904	10,329
2002	0	0	0	0	0	0	0	0	0	275	1,606	9,198
1998	0	125	251	0	0	0	0	0	0	2	576	6,751
1999	0	0	175	0	0	9	41	0	0	2	344	5,928
2000	0	0	145	244	1	9	0	0	0	0	504	5,675
2001	0	0	123	183	2	13	0	2	3	0	423	4,334
2002	0	0	74	0	2	0	1	0	1	330	539	3,537

TABLE 6-6. Historical harvests of species groups by the Open Access commercial fishery sectors North and South of Cape Mendocino (landed roundweight in mt and exvessel revenue in thousands of current dollars). (Page 1 of 2)

	Lingcod	Whiting, At Sea	Whiting, Shoreside	Flatfish	Sablefish	Rockfish	Other Groundfish	Total Groundfish	Pink Shrimp	Spot Prawn, Trawl	Spot Prawn, Pot	Ridgeback Prawn, Trawl	Pacific Halibut	California Halibut
Landed Roundweight (mt)														
North														
1998	19	0	0	7	14	214	7	262	4,348	1	0	0	20	0
1999	19	0	0	4	4	116	16	159	12,416	1	0	0	20	0
2000	15	0	0	1	9	91	7	122	13,562	0	0	0	16	0
2001	17	0	0	1	22	125	16	180	17,611	1	0	0	12	0
2002	28	0	0	1	13	109	46	198	25,302	0	0	0	112	3
South														
1998	20	0	0	30	5	677	169	900	0	256	116	198	0	64
1999	15	0	0	19	3	276	169	482	0	185	93	632	0	95
2000	7	0	0	17	6	160	142	333	0	106	97	706	0	99
2001	12	0	0	23	6	155	108	304	0	91	95	161	0	68
2002	17	0	0	18	28	136	75	274	0	99	79	215	0	107
Exvessel Revenue ($,000)														
North														
1998	36	0	0	7	33	299	21	395	5,054	9	2	0	69	0
1999	42	0	0	3	12	216	54	327	12,825	8	0	0	83	0
2000	28	0	0	0	29	176	32	266	11,908	0	0	0	78	0
2001	50	0	0	1	75	312	99	537	10,293	27	0	0	51	0
2002	82	0	0	1	45	321	324	772	15,358	0	1	0	487	19
South														
1998	42	0	0	49	11	1,369	927	2,398	0	3,686	1,856	762	0	403
1999	46	0	0	49	10	1,272	835	2,212	0	2,675	1,577	1,546	0	586
2000	17	0	0	54	39	1,307	1,003	2,420	0	1,922	1,900	1,794	0	674
2001	38	0	1	69	34	1,249	628	2,018	0	1,676	1,905	532	2	489
2002	63	0	0	64	132	1,033	399	1,692	0	1,755	1,589	633	0	821

TABLE 6-6. Historical harvests of species groups by the Open Access commercial fishery sectors North and South of Cape Mendocino (landed roundweight in mt and exvessel revenue in thousands of current dollars). (Page 2 of 2)

	Salmon	Sea Cucumber	California Sheephead	Gillnet Complex	CPS Squid	CPS Wetfish	HMS	Dungeness Crab	Other Crustaceans	Other Species	Total Non-groundfish	Grand Total
Landed Roundweight (mt)												
North												
1998	716	0	0	1	4	1,279	11,375	10,272	173	141	30,327	30,588
1999	615	0	0	6	0	877	4,132	14,734	122	171	35,092	35,251
2000	625	0	0	0	23	14,504	7,536	12,245	1,311	559	52,382	52,504
2001	1,717	0	0	0	0	24,052	8,744	10,386	214	675	65,412	65,593
2002	2,039	0	0	1	0	39,363	8,427	11,086	179	908	89,423	89,621
South												
1998	1,092	204	76	255	2,898	67,095	18,272	1,484	1,456	4,800	100,263	101,164
1999	2,007	227	37	389	92,186	74,364	13,553	726	1,354	6,471	194,316	194,798
2000	2,924	264	59	255	118,060	88,661	7,009	780	1,297	6,650	228,968	229,300
2001	1,485	323	51	237	85,997	81,616	6,078	842	1,336	5,999	186,380	186,683
2002	1,974	426	41	352	72,942	67,378	4,480	4,418	1,254	9,768	165,535	165,809
Exvessel Revenue ($,000)												
North												
1998	2,155	0	0	4	2	145	15,843	38,531	1,248	144	63,206	63,601
1999	2,035	0	0	13	0	154	7,619	61,545	982	207	85,472	85,798
2000	2,350	1	0	0	0	1,863	14,175	57,307	2,677	843	91,202	91,468
2001	4,734	0	0	0	0	2,910	16,428	46,280	1,859	946	83,529	84,066
2002	5,391	0	0	0	0	4,857	11,994	39,914	1,690	774	80,486	81,257
South												
1998	3,472	244	441	887	1,620	6,675	24,413	7,738	7,163	7,973	67,333	69,731
1999	7,413	356	277	1,469	33,404	7,229	25,298	3,960	5,148	13,475	104,414	106,627
2000	11,192	564	448	820	27,069	10,033	18,761	4,336	6,491	14,451	100,456	102,876
2001	5,525	579	392	912	16,862	9,271	15,064	4,953	6,524	11,771	76,456	78,474
2002	5,811	792	317	1,503	18,257	7,086	10,034	17,931	6,462	12,866	85,858	87,549

TABLE 6-7. Number of marine anglers in West Coast states, 2000. (Page 1 of 1)

	Number of Marine Anglers (Thousands)			
State	Total	Resident	Non-Resident	Percent Non-Resident
Washington	497	450	47	9%
Oregon	365	285	80	22%
N. California	439	388	51	12%
S. California	1,266	1,097	169	13%

Note: Estimates are not additive across states, since a participant may have fished in more than one state.
Source: Marine Angler Expenditures in the Pacific Coast Region, 2000 NMFS-F/SPO-49, Table 2, p. 7.

TABLE 6-8. Trends in effort for recreational ocean fisheries in thousands of angler trips. (Page 1 of 1)

	Charter							Private						
Area	1996	1997	1998	1999	2000	2001	2002	1996	1997	1998	1999	2000	2001	2002
Total Angler Trips														
Washington	51	50	44	49	49	59	201	52	55	37	52	52	88	407
Oregon	54	65	57	60	87	70	62	57	87	213	173	330	140	130
Northern CA	90	139	158	162	206	221	142	253	312	528	549	523	901	556
Southern CA	982	812	674	609	876	577	438	1,099	1,073	1,167	879	1,314	1,757	1,494
Total	1,177	1,066	933	880	1,218	927	843	1,461	1,527	1,945	1,653	2,219	2,886	2,587
Trips with Groundfish Target and Incidental														
Washington	24	19	23	21	25	12	9	24	21	54	25	30	10	10
Oregon	43	47	47	44	69	47	46	33	57	119	88	153	22	36
Northern CA	63	159	58	95	101	141	53	110	113	160	188	120	164	253
Southern CA	59	23	33	45	57	204	189	35	11	15	30	28	252	391
Total	189	248	161	205	252	404	297	202	202	348	331	331	448	690

Note: 2001 and 2002 estimates not directly comparable to previous years due to differences in estimation methodology.

TABLE 6-9. Estimated recreational groundfish effort by season and region for charter and private vessels in 2002 (in 1,000's of angler trips). (Page 1 of 1)

Region	Mode	Jan.-Feb.	March-April	May-June	July-Aug.	Sept.-Oct.	Nov.-Dec.	Total
Washington	Charter	0	0	8	1	0	0	9
	Private	0	0	8	2	0	0	10
	Total	0	0	16	3	0	0	20
Oregon	Charter	1	5	14	19	6	1	46
	Private	0	3	13	14	5	1	36
	Total	2	8	27	33	11	2	82
Oregon/California border to Cape Mendocino	Charter	0	0	1	2	0	0	3
	Private	0	0	12	16	2	0	29
	Total	0	0	13	17	2	0	32
Central California	Charter	0	0	8	26	15	1	50
	Private	38	10	42	63	60	10	224
	Total	38	10	51	89	75	10	274
Southern California	Charter	10	46	42	31	52	9	189
	Private	78	56	71	53	73	59	391
	Total	88	102	112	84	125	68	579
California Total	Charter	10	46	51	58	67	10	242
	Private	117	66	125	132	134	69	643
	Total	126	112	176	190	202	79	885
Grand Total	Charter	11	50	74	78	73	11	297
	Private	117	69	145	149	139	70	690
	Total	128	120	219	227	212	80	986

Source: Washington and Oregon estimates from state port sampling programs. California estimates from RecFIN.

TABLE 6-10. Charter vessels engaged in saltwater fishing outside of Puget Sound in 2001 by port area. (Page 1 of 1)

State	Port Area	Charter Boats
Washington	Neah Bay	1
	La Push	0
	Westport	13
	Ilwaco	6
	Unknown	86
	TOTAL	106
Oregon	Astoria	22
	Tillamook	51
	Newport	45
	Coos Bay	13
	Brookings	15
	Unknown	86
	TOTAL	232
California	Crescent City	1
	Eureka	4
	Fort Bragg	14
	San Francisco	67
	Monterey	33
	Conception (Northern portion)	129
	San Diego	95
	Unknown	72
	TOTAL	415
GRAND TOTAL		753

TABLE 6-11. Historical West Coast groundfish catch in ocean areas by tribal fleet: 1995 through 2002 (round weight-pounds). (Page 1 of 1)

Species	1995	1996	1997	1998	1999	2000	2001	2002
Arrowtooth Flounder	240	3		255	13,195	331	961	7,137
Dover Sole	1,764	2,441	1,268	4,509	11,594	2,030	4,619	35,417
English Sole		4	118	1,847	593	996	7,103	88,684
Petrale Sole		5	12	3,249	545	80	1,954	45,479
Rex Sole					26	151	1,358	6,632
Rock Sole				2,396	16		22	5,833
Unsp. Flatfish				38	775		437	8,406
Unspecified Sanddab							1,599	19,655
Sand Sole		12	40				269	2,748
Starry Flounder		22	54				3	301
Butter Sole								605
Flatfish Total	2,004	2,487	1,492	12,294	26,744	3,588	18,325	220,897
Bocaccio				2	38	145	449	
Nom. Canary Rockfish	59	171	26	609	1,033	539	4,064	13,285
Canary Rockfish				277	252	330	1,380	
Darkblotched Rockfish					36	76	226	3,074
Greenstriped Rockfish				1	51	16		
Pacific Ocean Perch					110	20	16	529
Redbanded Rockfish				1	128	492		
Redstripe Rockfish				1	63	131	1,510	
Rougheye Rockfish				1	80	76	1,529	
Rosethorn Rockfish								
Sharpchin Rockfish				1	9	10	85	
Silvergrey Rockfish					36	4	12	
Unsp. Pop Group		3			104			
Unsp. Rockfish	114,684	79,545	65,121	65,245	59,875	45,953		
Widow Rockfish				54	411	2,010	16,265	
Nom. Widow Rockfish					53	3	51	75,899
Yelloweye Rockfish					68	3	2	
Nom. Yellowtail Rockfish	519	1,297	2,471	10,448	28,671	9,585	7,598	1,037,741
Yellowtail Rockfish				3,263	6,498	68,463	210,006	
Unsp. Shelf Rockfish						3,099	20,503	19
Unsp. Near-shore Rockfish						10	58	116
Unsp. Slope Rockfish						19,891	54,920	4,121
Blackgill Rockfish							19	
Shortraker Rockfish							289	
Rockfish Total	115,262	81,016	67,618	79,903	97,516	150,856	318,982	1,140,036
Spiny Dogfish		5,521			881	6,251		2,607
Lingcod	2,873	2,732	1,648	5,247	7,051	6,817	9,429	24,854
Pacific Cod	2,814	1,540	2,166	4,873	2,677	4,573	8,712	128,530
Sablefish	1,696,098	1,881,702	1,775,108	980,719	1,566,260	1,555,808	1,451,522	959,982
Unspecified Skate	2,517	1,689	1,017	2,031	2,169	1,920	1,407	18,635
Nominal Shortspine Thornyhead	15,697	16,010	16,892	7,606	13,251	8,987	10,945	10,173
Shortspine Thornyhead				471	240		27	
Nominal Longspine Thornyhead	1,305	538	139	28				
Other Groundfish Total	1,721,304	1,909,732	1,796,970	1,000,975	1,592,529	1,584,356	1,482,042	1,145,107
Pacific Whiting		33,039,648	54,713,657	53,984,582	56,768,061	13,781,257	13,404,001	45,867,384
All Groundfish Species Total	1,838,570	35,032,883	56,579,737	55,077,754	58,484,850	15,520,057	15,223,350	47,901,855

TABLE 6-12. Historical West Coast groundfish catch in ocean areas by tribal fleet: 1995 through 2002 (exvessel revenue $). (Page 1 of 1)

Species	1995	1996	1997	1998	1999	2000	2001	2002
Arrowtooth Flounder	24	1		26	1,319	33	111	715
Dover Sole	570	768	393	1,478	3,817	663	1,498	11,335
English Sole		1	106	613	220	309	2,726	29,289
Petrale Sole		8	8	3,249	545	84	1,692	46,509
Rex Sole					8	51	471	2,316
Rock Sole				791	5		7	2,033
Unsp. Flatfish				13	271		145	2,773
Unspecified Sanddab							372	5,110
Sand Sole		9	30				204	2,084
Starry Flounder		7	16				1	98
Butter Sole								206
Flatfish Total	594	794	553	6,170	6,185	1,140	7,227	102,468
Bocaccio				1	13	64	207	0
Nom. Canary Rockfish	20	60	12	230	372	196	1,901	5,886
Canary Rockfish				97	89	145	655	0
Darkblotched Rockfish				0	12	33	104	1,139
Greenstriped Rockfish				0	18	7	0	
Pacific Ocean Perch				0	38	9	7	237
Redbanded Rockfish				0	44	216	0	
Redstripe Rockfish				0	22	58	689	
Rougheye Rockfish				0	27	33	705	
Rosethorn Rockfish				0	0		0	
Sharpchin Rockfish				0	3	4	39	
Silvergrey Rockfish				0	12	2	5	
Unsp. Pop Group		1			36			
Unsp. Rockfish	48,130	32,345	26,723	26,575	25,334	20,737		
Widow Rockfish				19	143	883	7,801	0
Nom. Widow Rockfish					19	1	16	36,431
Yelloweye Rockfish					24	2	0	2,327
Nom. Yellowtail Rockfish	189	438	864	3,542	10,256	3,429	3,379	489,530
Yellowtail Rockfish				1,142	2,275	30,124	99,901	
Unsp. Shelf Rockfish						1,758	13,068	8
Unsp. Near-shore Rockfish						4	25	14,434
Unsp. Slope Rockfish						8,238	22,558	7
Blackgill Rockfish							9	
Shortraker Rockfish							134	
Rockfish Total	61,977	48,699	42,552	39,366	49,703	73,143	159,637	549,999
Spiny Dogfish		544			177	830		405
Lingcod	1,404	1,255	731	3,007	4,169	4,065	6,075	18,176
Pacific Cod	1,086	587	818	1,924	1,096	1,987	3,792	63,961
Sablefish	3,046,910	3,003,716	3,162,376	1,280,233	2,045,434	2,544,542	2,411,517	1,512,595
Unspecified Skate	588	120	68	136	145	129	143	2,563
Nominal Shortspine Thornyhead	12,581	15,340	14,828	7,310	10,751	7,199	8,414	8,232
Shortspine Thornyhead				425	215		20	
Nominal Longspine Thornyhead	1,057	515	125	25				
Other Groundfish Total	3,049,988	3,006,222	3,163,993	1,285,300	2,051,021	2,551,553	2,421,527	1,605,932
Pacific Whiting		1,651,982	2,735,683	2,699,229	2,838,403	551,250	536,160	2,065,122
All Groundfish Species Total	3,112,559	4,707,697	5,942,781	4,030,065	4,945,312	3,177,086	3,124,551	4,323,521

TABLE 6-13. Bycatch rates of overfished species observed by sector and year in the whiting fishery, 1998-2003. (Page 1 of 2)

	1998		1999		2000		2001		2002		2003[a/]		Average 98-03	
Species	Catch	Bycatch Rate	Catch	Bycatch Rate	Catch	Bycatch Rate	Catch	Bycatch Rate	Catch	Bycatch Rate	Catch	Bycatch Rate	Catch	Bycatch Rate[b/]
Tribal														
Whiting	24,509		25,846		6,251		6,080		21,793		19,371		17,308	
Yellowtail	158.91	0.6484%	450.94	1.7447%	99.89	1.5980%	86.98	1.4306%	176.45	0.8097%	34.15	0.1763%	167.89	1.0679%
Widow	14.47	0.0590%	36.76	0.1422%	9.81	0.1569%	3.28	0.0539%	19.06	0.0875%	2.16	0.0111%	14.26	0.0851%
Canary	2.76	0.0113%	4.42	0.0171%	0.93	0.0149%	2.44	0.0401%	2.83	0.0130%	0.67	0.0035%	2.34	0.0166%
Darkblotched	0.01	0.0000%	0.00	0.0000%	0.00	0.0000%	0.00	0.0000%	0.07	0.0003%	0.02	0.0001%	0.02	0.0001%
POP	0.40	0.0016%	1.24	0.0048%	0.03	0.0005%	0.72	0.0118%	0.21	0.0010%	1.09	0.0056%	0.62	0.0042%
Lingcod	0.33	0.0013%	0.19	0.0007%	0.06	0.0010%	0.35	0.0058%	0.23	0.0011%	0.05	0.0003%	0.20	0.0017%
Motherships														
Whiting	50,087		47,580		46,840		35,823		26,593		26,021		38,824	
Yellowtail	313.26	0.6254%	253.26	0.5323%	285.54	0.6096%	91.82	0.2563%	1.42	0.0053%	0.57	0.0022%	157.65	0.3385%
Widow	171.84	0.3431%	47.70	0.1003%	150.65	0.3216%	29.19	0.0815%	20.50	0.0771%	0.69	0.0026%	70.09	0.1544%
Canary	2.46	0.0049%	0.19	0.0004%	0.56	0.0012%	0.95	0.0027%	0.81	0.0030%	0.08	0.0003%	0.84	0.0021%
Darkblotched	11.27	0.0225%	4.84	0.0102%	5.15	0.0110%	0.57	0.0016%	0.93	0.0035%	0.10	0.0004%	3.81	0.0082%
POP	6.50	0.0130%	4.44	0.0093%	3.03	0.0065%	0.05	0.0001%	2.17	0.0082%	0.10	0.0004%	2.71	0.0062%
Lingcod	0.11	0.0002%	0.39	0.0008%	0.25	0.0005%	0.48	0.0013%	0.11	0.0004%	0.09	0.0004%	0.24	0.0006%
Catcher-Processors														
Whiting	70,379		67,679		67,815		58,628		36,341		36,953		56,299	
Yellowtail	63.72	0.0905%	430.87	0.6366%	270.02	0.3982%	33.16	0.0566%	12.86	0.0354%	1.70	0.0046%	135.39	0.2037%
Widow	120.92	0.1718%	101.25	0.1496%	69.97	0.1032%	139.71	0.2383%	115.10	0.3167%	11.48	0.0311%	93.07	0.1684%
Canary	0.25	0.0004%	1.03	0.0015%	0.86	0.0013%	0.65	0.0011%	1.59	0.0044%	0.17	0.0005%	0.76	0.0015%
Darkblotched	6.94	0.0099%	6.94	0.0103%	3.81	0.0056%	11.50	0.0196%	2.19	0.0060%	4.14	0.0112%	5.92	0.0104%
POP	14.78	0.0210%	9.71	0.0143%	6.57	0.0097%	19.69	0.0336%	1.45	0.0040%	5.02	0.0136%	9.54	0.0160%
Lingcod	0.00	0.0000%	0.02	0.0000%	0.16	0.0002%	0.18	0.0003%	0.16	0.0004%	0.40	0.0011%	0.15	0.0003%

TABLE 6-13. Bycatch rates of overfished species observed by sector and year in the whiting fishery, 1998-2003. (Page 2 of 2)

	1998		1999		2000		2001		2002		2003[a/]		Average 98-03	
Species	Catch	Bycatch Rate	Catch	Bycatch Rate	Catch	Bycatch Rate	Catch	Bycatch Rate	Catch	Bycatch Rate	Catch	Bycatch Rate	Catch	Bycatch Rate [b/]
							Shoreside							
Whiting	87,626		83,272		85,652		73,326		45,276		50,965		71,019	
Yellowtail	501.06	0.5718%	481.39	0.5781%	189.81	0.2216%	95.86	0.1307%	41.37	0.0914%	48.60	0.0954%	226.35	0.2815%
Widow	366.00	0.4177%	192.00	0.2306%	76.00	0.0887%	42.00	0.0573%	5.32	0.0117%	8.97	0.0198%	115.05	0.1373%
Canary	0.38	0.0004%	0.61	0.0007%	0.52	0.0006%	0.45	0.0006%	0.21	0.0005%	0.11	0.0002%	0.38	0.0005%
Darkblotched	3.97	0.0045%	0.42	0.0005%	1.21	0.0014%	0.81	0.0011%	0.00	0.0000%	0.26	0.0005%	1.11	0.0013%
POP	27.26	0.0311%	7.47	0.0090%	0.22	0.0003%	0.04	0.0001%	0.22	0.0005%	0.30	0.0006%	5.92	0.0069%
Lingcod	0.44	0.0005%	0.61	0.0007%	0.83	0.0010%	0.76	0.0010%	0.22	0.0005%	0.40	0.0008%	0.54	0.0008%
Yelloweye	0.05	0.0001%	0.02	0.0000%	0.00	0.0000%	0.00	0.0000%	0.00	0.0000%	0.00	0.0000%	0.01	0.0000%
							Total All Sectors							
Whiting	232,601		224,377		206,558		173,857		130,004		133,310		183,451	
Yellowtail	1,036.95	0.4458%	1,616.46	0.7204%	845.26	0.4092%	307.82	0.1771%	232.10	0.1785%	85.02	0.0638%	687.27	0.3746%
Widow	673.23	0.2894%	377.71	0.1683%	306.43	0.1484%	214.18	0.1232%	159.98	0.1231%	23.30	0.0175%	292.47	0.1450%
Canary	5.85	0.0025%	6.25	0.0028%	2.87	0.0014%	4.49	0.0026%	5.44	0.0042%	1.03	0.0008%	4.32	0.0024%
Darkblotched	22.19	0.0095%	12.20	0.0054%	10.17	0.0049%	12.88	0.0074%	3.19	0.0025%	4.53	0.0034%	10.86	0.0055%
POP	48.94	0.0210%	22.86	0.0102%	9.85	0.0048%	20.50	0.0118%	4.05	0.0031%	6.51	0.0049%	18.78	0.0093%
Lingcod	0.88	0.0004%	1.21	0.0005%	1.30	0.0006%	1.77	0.0010%	0.72	0.0006%	0.95	0.0007%	1.14	0.0006%
Yelloweye	0.05	0.0000%	0.02	0.0000%	0.00	0.0000%	0.00	0.0000%	0.00	0.0000%	0.00	0.0000%	0.01	0.0000%

a/ Preliminary. Catch estimates for the at-sea sector through September 25, 2003. These data incomplete since all at-sea sectors still fishing after this date.

b/ Average bycatch rates calculated using average annual bycatch rates in 1998-2003.

TABLE 6-14. Coastwide annual and bi-monthly commercial landings of overfished species by fleet, metric tons, 1999-2001. (Page 1 of 2)

	1999	2000	2001	1999						2000						2001					
Species/Fleet	All	All	All	1.0	2.0	3.0	4.0	5.0	6.0	1.0	2.0	3.0	4.0	5.0	6.0	1.0	2.0	3.0	4.0	5.0	6.0
Bocaccio																					
LE Trawl	30.3	16.1	13.9	5.5	5.1	5.8	6.3	5.6	2.0	0.8	2.3	3.3	2.7	3.8	3.2	2.0	2.2	3.1	3.8	2.7	0.0
LE Fixed-gear	5.0	2.4	2.4	0.5	1.0	1.0	0.7	1.6	0.1	0.0	0.1	0.8	0.6	0.6	0.3	0.3	0.1	0.4	1.2	0.5	
LE Shrimp-trawl	0.3	0.1	0.0	0.3	0.0			0.0		0.0	0.1		0.0	0.0					0.0		
OA Non-shrimp	22.8	5.9	6.4	3.7	5.1	3.4	4.7	4.0	1.9	0.8	0.1	1.4	0.8	1.3	1.6	1.6	0.3	0.5	2.0	2.0	
OA Shrimp-trawl	0.2	0.0	0.1	0.0	0.0	0.1	0.1	0.0			0.0	0.0			0.0		0.0	0.1			
Total	58.5	24.6	22.8	10.0	11.2	10.2	11.8	11.4	4.0	1.6	2.6	5.4	4.1	5.8	5.2	3.9	2.7	4.1	6.9	5.2	0.0
Canary																					
LE Trawl	494.6	33.4	25.6	25.5	67.8	179.0	153.0	66.9	2.4	0.2	2.1	10.3	10.3	8.9	1.6	0.9	1.8	8.2	11.1	3.5	0.1
LE Fixed-gear	55.4	5.9	5.1	2.0	8.0	24.2	15.4	5.8	0.0	0.2	0.5	2.2	1.3	1.2	0.4	0.6	0.7	1.5	1.3	1.0	
LE Shrimp-trawl	14.2	4.3	0.7		0.9	5.3	4.8	3.3			0.0	0.9	2.7	0.7		0.0	0.0	0.5	0.2	0.0	
OA Non-shrimp	56.6	5.0	2.8	0.4	11.1	19.8	19.0	5.8	0.4	0.3	0.4	1.8	1.2	1.0	0.3	0.2	0.5	1.1	0.7	0.3	
OA Shrimp-trawl	21.3	7.2	2.0		1.2	9.2	7.0	4.0	0.0		0.0	1.6	3.9	1.6			0.1	0.8	1.0	0.0	
Total	642.2	55.8	36.2	28.0	88.9	237.5	199.2	85.8	2.8	0.6	3.0	16.9	19.5	13.5	2.3	1.7	3.1	12.2	14.3	4.8	0.1
Cowcod																					
LE Trawl	3.8	1.4	0.8	0.5	1.2	0.1	0.8	1.2	0.0	0.1	0.2	0.1	0.3	0.3	0.3	0.4	0.2	0.0	0.1	0.1	0.1
LE Fixed-gear	0.3	0.5		0.1	0.0	0.1	0.1	0.0	0.0	0.0	0.0	0.0	0.3	0.1	0.0						
LE Shrimp-trawl		0.0									0.0	0.0	0.0	0.0							
OA Non-shrimp	2.2	0.4	0.0	0.4	0.8	0.3	0.4	0.0	0.2	0.0	0.0	0.1	0.1	0.1	0.1			0.0			
OA Shrimp-trawl	0.2	0.1		0.0	0.0	0.0	0.1	0.0			0.0	0.0	0.0								
Total	6.5	2.4	0.8	1.0	2.1	0.5	1.4	1.2	0.2	0.2	0.3	0.2	0.8	0.6	0.4	0.4	0.2	0.0	0.1	0.1	0.1
Darkblotched																					
LE Trawl	280.2	216.5	141.0	34.1	56.8	96.1	64.1	26.8	2.3	28.7	25.3	52.5	42.7	41.7	25.7	22.2	24.9	33.8	31.5	26.4	2.4
LE Fixed-gear		1.7	1.8							0.0	0.7	0.3	0.4	0.3	0.0	0.0	0.1	0.0	0.6	1.0	
LE Shrimp-trawl	2.0		0.0		0.0	0.0	1.5	0.4										0.0	0.0		
OA Non-shrimp	0.1	0.5	0.2		0.0		0.0	0.1		0.0	0.1	0.1	0.2	0.0	0.0	0.0	0.1	0.0	0.0		0.1
OA Shrimp-trawl	2.0	0.0	0.0		0.0	0.3	1.3	0.4				0.0						0.0	0.0	0.0	
Total	284.3	218.8	143.1	34.1	56.8	96.5	67.0	27.6	2.3	28.7	26.2	52.9	43.3	42.0	25.8	22.2	25.1	33.8	32.1	27.4	2.4
Lingcod																					
LE Trawl	204.3	61.8	58.5	12.1	30.9	59.2	59.8	32.4	9.9	0.0	0.1	18.3	24.8	18.1	0.5	0.2	0.0	21.1	18.8	18.3	0.1
LE Fixed-gear	33.1	17.2	18.8	2.1	4.4	7.3	12.2	6.6	0.5			4.8	6.4	5.8	0.1		0.0	5.1	7.8	5.8	0.1
LE Shrimp-trawl	14.9	6.4	1.6		1.0	5.8	5.9	2.2				3.6	2.5	0.3				0.9	0.4	0.2	
OA Non-shrimp	84.7	49.0	63.5	0.6	11.7	25.3	34.0	12.7	0.4	0.1	1.1	26.9	20.2	0.6	0.1	0.0	0.0	19.3	25.0	19.0	0.1
OA Shrimp-trawl	17.5	9.1	5.5		0.5	6.1	7.2	3.8				4.8	4.4				0.0	3.2	2.2	0.0	
Total	354.5	143.5	147.8	14.9	48.5	103.6	119.1	57.7	10.8	0.1	1.2	58.3	58.4	24.8	0.7	0.2	0.1	49.6	54.2	43.5	0.2

TABLE 6-14. Coastwide annual and bi-monthly commercial landings of overfished species by fleet, metric tons, 1999-2001. (Page 2 of 2)

	1999	2000	2001	1999						2000						2001					
Species/Fleet	All	All	All	1.0	2.0	3.0	4.0	5.0	6.0	1.0	2.0	3.0	4.0	5.0	6.0	1.0	2.0	3.0	4.0	5.0	6.0
Pacific Ocean Perch																					
LE Trawl	481.4	139.7	187.5	28.3	75.9	122.6	138.6	88.0	28.0	6.9	6.5	38.8	40.1	35.5	11.9	24.3	22.7	45.5	54.5	40.6	
LE Fixed-gear	0.1	0.7	0.0			0.1						0.5	0.1	0.0				0.0	0.0	0.0	0.0
LE Shrimp-trawl	0.0	0.2	0.0			0.0	0.0	0.0				0.2	0.0	0.0				0.0			
OA Non-shrimp	0.2	0.0	0.0		0.0	0.1	0.0	0.1			0.0		0.0	0.0					0.0		0.0
OA Shrimp-trawl	0.1	0.1	0.0		0.0	0.0	0.0	0.0	0.0			0.0	0.0	0.0			0.0	0.0			
Total	481.8	140.6	187.6	28.3	75.9	122.8	138.6	88.2	28.0	6.9	6.6	39.5	40.3	35.5	11.9	24.3	22.7	45.5	54.5	40.6	0.0
Widow																					
LE Trawl	3,836.3	3,761.8	1,750.4	882.0	843.6	309.0	345.6	694.7	761.5	374.0	487.1	404.6	601.1	1,069.0	826.1	387.9	456.1	189.6	53.6	15.5	647.7
LE Fixed-gear	16.1	5.3	0.5	1.7	1.9	2.4	3.9	5.7	0.4	0.1	0.7	1.8	0.9	1.5	0.3	0.1	0.1	0.0	0.1	0.2	
LE Shrimp-trawl	5.2	1.0	0.5		0.7	1.6	2.3	0.5			0.0	0.2	0.5	0.2			0.0	0.4	0.0	0.0	
OA Non-shrimp	41.4	17.7	13.0	4.5	4.9	2.8	8.4	14.9	5.8	2.0	0.1	1.6	2.7	6.4	4.9	5.1	1.2	1.9	3.1	1.6	0.1
OA Shrimp-trawl	4.6	1.7	0.6		0.5	1.6	1.5	0.9	0.0		0.1	0.7	0.7	0.2			0.2	0.3	0.0		
Total	3,903.5	3,787.5	1,765.0	888.2	851.6	317.6	361.6	716.7	767.7	376.2	487.9	408.9	605.9	1,077.4	831.3	393.2	457.7	192.2	56.8	17.3	647.8
Yelloweye																					
LE Trawl	20.5	1.0	2.2	0.4	1.6	4.3	9.7	4.5	0.0	0.0	0.0	0.2	0.5	0.2	0.0	0.0	0.1	0.5	1.2	0.5	
LE Fixed-gear	47.7	5.0	6.9	0.5	2.5	5.1	34.5	5.1		0.0	0.4	1.3	1.5	1.6	0.1	0.7	1.0	2.0	1.7	1.4	
OA Non-shrimp	15.4	2.9	2.9	0.1	0.6	1.8	10.1	2.6	0.1	0.2	0.1	0.6	1.1	0.6	0.2	0.2	0.5	0.7	1.1	0.5	0.0
Total	83.5	8.9	12.0	1.0	4.7	11.3	54.3	12.2	0.1	0.3	0.6	2.1	3.1	2.5	0.4	0.9	1.6	3.2	4.0	2.3	0.0

TABLE 6-15. Estimated recreational catch of selected overfished groundfish species in ocean waters by subregion for charter and private boats (mt). (Page 1 of 1)

		Southern California			Northern California			Oregon			Washington			Coast Wide		
Year	Species	Charter	Private	Total	Charter	Private	Total	Charter	Private	Total	Charter	Private	Total	Charter	Private	Total
1998	Bocaccio	12.9	15.3	28.2	20.0	2.7	22.7	0.2	0.1	0.3	0.1	0.1	0.2	33.2	18.1	51.4
	Canary Rockfish	1.1	0.3	1.5	12.7	11.4	24.1	25.3	17.9	43.3	9.6	1.5	11.1	48.7	31.2	80.0
	Cowcod	0.7	2.1	2.8	-	-	-	-	-	-	-	-	-	0.7	2.1	2.8
	Widow Rockfish	0.3	0.0	0.3	32.4	3.2	35.5	15.3	0.7	16.0	-	-	-	47.9	3.9	51.8
	Yelloweye Rockfish	-	-	-	3.2	2.3	5.5	8.3	10.5	18.8	9.9	4.5	14.4	21.4	17.3	38.7
	Lingcod	7.2	9.6	16.9	32.6	165.1	197.7	17.7	51.3	69.0	20.0	7.0	27.0	77.5	233.0	310.6
1999	Bocaccio	38.7	27.9	66.6	45.8	6.4	52.2	0.2	0.2	0.4	0.2	0.2	0.4	84.9	34.7	119.6
	Canary Rockfish	1.7	0.1	1.8	47.2	15.1	62.3	15.3	13.4	28.7	4.2	0.7	4.9	68.3	29.4	97.7
	Cowcod	2.2	1.5	3.8	1.8	-	1.8	-	-	-	-	-	-	4.0	1.5	5.6
	Widow Rockfish	0.1	-	0.1	27.6	2.6	30.3	0.9	1.1	2.0	-	-	-	28.7	3.7	32.4
	Yelloweye Rockfish	1.6	-	1.6	7.3	3.7	11.0	8.9	8.4	17.3	8.0	10.4	18.5	25.8	22.5	48.4
	Lingcod	19.6	10.6	30.2	93.2	195.3	288.6	30.5	49.5	80.0	21.6	12.4	34.0	164.9	267.8	432.7
2000	Bocaccio	32.1	11.1	43.2	53.6	5.3	58.9	0.7	-	0.7	0.3	0.1	0.3	86.7	16.5	103.2
	Canary Rockfish	0.4	-	0.4	62.1	14.2	76.3	10.3	4.2	14.5	1.8	0.9	2.8	74.7	19.3	94.0
	Cowcod	0.5	3.7	4.2	-	1.7	1.7	-	-	-	-	-	-	0.5	5.4	5.9
	Widow Rockfish	0.1	-	0.1	11.5	0.2	11.6	3.0	-	3.0	-	-	-	14.5	0.2	14.7
	Yelloweye Rockfish	-	-	-	3.8	3.7	7.5	9.0	0.5	9.5	4.4	6.3	10.7	17.2	10.5	27.7
	Lingcod	3.1	2.0	5.1	56.0	107.1	163.1	22.6	27.4	50.0	17.8	10.4	28.2	99.5	146.9	246.4
2001	Bocaccio	25.9	28.4	54.3	45.9	3.0	48.8	0.5	0.2	0.7	0.7	0.2	0.9	73.0	31.8	104.8
	Canary Rockfish	-	-	-	20.5	11.8	32.3	6.1	4.7	10.9	1.2	1.2	2.4	27.9	17.7	45.6
	Cowcod	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
	Pacific Ocean Perch	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
	Widow Rockfish	-	0.3	0.3	9.1	0.1	9.2	4.1	-	4.1	-	-	-	13.2	0.4	13.6
	Yelloweye Rockfish	-	-	-	3.0	1.7	4.6	4.5	0.2	4.7	6.3	8.3	14.7	13.8	10.2	24.0
	Lingcod	3.1	19.2	22.3	39.7	76.6	116.3	28.6	31.4	60.0	17.5	14.7	32.2	88.9	141.9	230.8
2002[a/]	Bocaccio	53.4	20.0	73.3	7.7	0.5	8.2	0.4	0.4	0.8	-	-	-	61.5	20.9	82.3
	Canary Rockfish	0.0	0.2	0.2	2.5	3.2	5.7	3.8	4.6	8.4	0.1	3.5	3.6	6.4	11.5	17.9
	Cowcod	-	0.5	0.5	0.1	-	0.1	-	-	-	-	-	-	0.1	0.5	0.6
	Pacific Ocean Perch	0.0	-	0.0	0.2	0.2	0.4	-	-	-	-	-	-	0.2	0.2	0.4
	Widow Rockfish	0.7	-	0.7	0.9	0.0	0.9	1.0	-	1.0	-	-	-	2.5	0.0	2.6
	Yelloweye Rockfish	0.6	-	0.6	0.4	1.1	1.5	0.7	2.4	3.1	-	-	-	1.7	3.5	5.2
	Lingcod	28.7	35.0	63.7	187.6	216.7	404.3	10.7	64.3	75.0	4.0	23.0	27.1	231.0	339.1	570.1

a/ Preliminary estimate. Source: RecFIN (MRFSS and Oregon Recreational Ocean Boat Survey)

TABLE 6-16. Numbers of vessels most involved in West Coast fisheries and the groundfish (GF) fishery and total exvessel revenue for each group (November 2000 through October 2001). To produce this table, vessels were ranked from highest to lowest producer (by value), the first ranking (columns) was based on revenue from all species, and a second ranking (rows) was based on revenue from groundfish. (Page 1 of 1)

	Percent of Landings (All Species) by Vessels Ranked from Highest to Lowest Production (By Value)									
Percent of Groundfish Landings (All Species) by Vessels Ranked from Highest to Lowest Production (By Value)	Top 50% of Total Value	Next 20% of Total Value	Next 10% of Total Value	Next 10% of Total Value	Final 10% of Total Value	Total	Percent of All Vessels	Cumulative Percent	Percent of Groundfish Vessels	Cumulative Percent
	Number of Vessels Making The Indicated Amount of Landings									
Top 50% of GF Value	93	0	0	0	0	93	2%	2%	5%	5%
Next 20% of GF Value	50	30	0	0	0	80	2%	4%	5%	10%
Next 10% of GF Value	11	32	21	0	0	64	1%	5%	4%	14%
Next 10% of GF Value	12	16	27	64	4	123	3%	8%	7%	21%
Final 10% of GF Value	55	116	87	149	934	1,341	29%	37%	79%	100%
No Groundfish Landings	176	205	197	343	1,957	2,878	63%	100%		
Column Total	397	399	332	556	2895	4579				
Percent of All Vessels	9%	9%	7%	12%	63%					
Cumulative Percent of All Vessels	9%	17%	25%	37%	100%					
Total Groundfish Vessels in Column	221	194	135	213	938	1,701				
GF Vessels as % of Total for Col	56%	49%	41%	38%	32%					
GF Vessels in Column as % of Total Groundfish Vessels	13%	11%	8%	13%	55%					
Cumulative Total	13%	24%	32%	45%	100%					
	Exvessel Value of All Landings Made by the Vessels ($)									
Top 50% of GF Value	33,745,500	0	0	0	0	33,745,500	14%	14%	29%	29%
Next 20% of GF Value	10,988,899	4,078,778	0	0	0	15,067,678	6%	20%	13%	42%
Next 10% of GF Value	2,468,990	3,753,095	1,826,571	0	0	8,048,655	3%	23%	7%	49%
Next 10% of GF Value	2,507,196	1,756,437	1,823,832	2,800,173	124,397	9,012,036	4%	27%	8%	57%
Next 10% of GF Value	14,092,789	14,038,413	6,359,434	6,581,151	8,701,188	49,772,974	20%	47%	43%	100%
No Groundfish Landings	57,721,771	25,176,821	14,518,513	15,046,383	15,669,022	128,132,510	53%	100%		
Column Total	121,525,145	48,803,544	24,528,350	24,427,708	24,494,607	243,779,354				
Revenue of All Species Landed by Groundfish Vessels	63,803,374	23,626,723	10,009,837	9,381,325	8,825,585	115,646,844				
Revenue of Groundfish Vessels as Percent of Total for Column	53%	48%	41%	38%	36%					
Revenue of Groundfish Vessels as a Percent of Total Fishing Revenue	26%	10%	4%	4%	4%					
Cumulative Total	26%	36%	40%	44%	47%					

NOTE: Catch by catcher-processors and tribal vessels are not included in this table. Catcher vessels delivering to motherships are included, and all other landings for which landing receipts were filled out are included. Groundfish includes only the landings of groundfish species caught under the jurisdiction of the Council's groundfish FMP.

TABLE 6-17a. Number of vessels by fleet category, level of dependence and level of gross income (values for base period (November 2000 through October 2001). (Page 1 of 1)

	Category of Gross Income From West Coast Landings				
	<$5,000	$5,000-$50,000	$50,000-200,000	>$200,000	Total
Limited Entry Trawl	Number of Vessels				
>0% & <5%	0	0	4	1	5
>5% & <35%	0	0	11	6	17
>35% & <65%	0	0	18	27	45
>65% & <95%	0	4	26	40	70
>95% & <100%	2	7	53	37	99
No Groundfish Landing In Base Period	1	0	9	1	11
Total	3	11	121	112	247
Limited Entry Longline and Fishpot					
>0% & <5%	1	6	7	3	17
>5% & <35%	0	4	19	9	32
>35% & <65%	0	6	29	14	49
>65% & <95%	0	14	11	1	26
>95% & <100%	4	29	21	0	54
No Groundfish Landing In Base Period	1	10	7	1	19
Total	6	69	94	28	197
Open Access with >5% From					
>5% & <35%	52	101	44	0	197
>35% & <65%	47	50	8	0	105
>65% & <95%	63	55	6	0	124
>95% & <100%	200	138	7	0	345
Total	362	344	65	0	771
Open Access with <5% of Revenue					
>0% & <5%	45	268	169	34	516
No Groundfish Landing In Base Period	1,027	1,181	510	130	2,848
Total	1,072	1,449	679	164	3,364
Groundfish Vessel Total	416	692	449	174	1,731
Grand Total	1,443	1,873	959	304	4,579

Source: Derived from PacFIN monthly vessel summary files.

TABLE 6-17b. Exvessel revenue by fleet category, level of dependence, and level of gross income (values for base period November 2000 through October 2001). (Page 1 of 2)

	Category of Gross Income From West Coast Landings				
	<$5,000	$5,000-$50,000	$50,000-200,000	>$200,000	Total
Limited Entry Trawl		Total Exvessel Revenue ($)			
>0% & <5%	0	0	441,301	275,289	716,590
>5% & <35%	0	0	1,216,708	1,691,721	2,908,429
>35% & <65%	0	0	2,231,773	8,269,118	10,500,891
>65% & <95%	0	81,105	3,755,128	14,133,342	17,969,576
>95% & <100%	2,673	136,997	6,684,899	12,134,494	18,959,063
No Groundfish Landing In Base Period	2,273	0	756,161	210,743	969,177
Total	4,946	218,103	15,085,970	36,714,707	52,023,726
Limited Entry Longline and Fishpot					
>0% & <5%	3,311	126,194	644,914	1,163,527	1,937,946
>5% & <35%	0	110,820	1,997,638	3,286,281	5,394,739
>35% & <65%	0	196,026	3,159,960	4,498,529	7,854,515
>65% & <95%	0	407,988	1,017,071	201,429	1,626,488
>95% & <100%	9,741	797,807	1,611,208	0	2,418,756
No Groundfish Landing In Base Period	2,533	195,966	549,980	304,489	1,052,968
Total	15,585	1,834,801	8,980,771	9,454,255	20,285,412
Open Access with >5% From Groundfish					
>5% & <35%	111,738	2,148,676	3,999,350	0	6,259,764
>35% & <65%	75,358	956,712	546,317	0	1,578,387
>65% & <95%	108,372	996,853	486,934	0	1,592,159
>95% & <100%	261,318	2,589,685	508,585	0	3,359,588
Total	556,786	6,691,926	5,541,186	0	12,789,898
Open Access with <5% of Revenue from Groundfish					
>0% & <5%	112,103	6,003,259	17,085,952	9,368,639	32,569,953
No Groundfish Landing In Base Period	1,873,962	24,420,868	50,680,628	49,134,907	126,110,365
Total	1,986,065	30,424,127	67,766,580	58,503,546	158,680,318
Groundfish Vessel Total	689,420	14,748,089	46,693,879	55,537,601	117,668,989
Grand Total	2,563,382	39,168,957	97,374,507	104,672,508	243,779,354
Limited Entry Trawl			Total Groundfish Revenue ($)		
>0% & <5%	0	0	4,136	6,339	10,475
>5% & <35%	0	0	182,248	339,166	521,414
>35% & <65%	0	0	1,355,987	5,180,446	6,536,433
>65% & <95%	0	60,235	3,149,194	12,457,556	15,666,985
>95% & <100%	2,673	213,445	6,580,010	11,423,415	18,219,543
No Groundfish Landing In Base Period	0		0	0	0
Total	2,673	273,680	11,271,575	29,406,922	40,954,850
Limited Entry Longline and Fishpot					
>0% & <5%	50	1,933	7,738	20,066	29,787
>5% & <35%	0	17,374	419,268	807,674	1,244,316
>35% & <65%	0	96,624	1,631,259	2,257,878	3,985,761
>65% & <95%	0	352,893	858,841	161,731	1,373,465
>95% & <100%	9,741	789,014	1,579,821		2,378,576
No Groundfish Landing In Base Period	0	0	0	0	0
Total	9,791	1,257,838	4,496,927	3,247,349	9,011,905
Open Access with >5% From Groundfish					
>5% & <35%	16,965	358,000	423,529	0	798,494
>35% & <65%	40,741	516,414	267,690	0	824,845
>65% & <95%	91,691	851,945	407,877	0	1,351,513
>95% & <100%	259,602	2,563,176	503,827	0	3,326,605
Total	408,999	4,289,535	1,602,923	0	6,301,457

TABLE 6-17b. Exvessel revenue by fleet category, level of dependence, and level of gross income (values for base period November 2000 through October 2001). (Page 2 of 2)

	Category of Gross Income From West Coast Landings				
	<$5,000	$5,000-$50,000	$50,000-200,000	>$200,000	Total
Open Access with <5% of Revenue from Groundfish					
>0% & <5%	1,374	52,149	157,140	123,129	333,792
No Groundfish Landing In Base Period	0	0	0	0	0
Total	1,374	52,149	157,140	123,129	333,792
Groundfish Vessel Total	422,837	5,873,202	17,528,565	32,777,400	56,602,004
Grand Total	422,837	5,873,202	17,528,565	32,777,400	56,602,004

Source: Derived from PacFIN monthly vessel summary files.

TABLE 6-18a. Number of vessels by fleet category, level of dependence and vessel size category (values for base period November 2000 through October 2001). (Page 1 of 1)

	Vessel Size Category						
	<40'	40'-50'	50'-60'	60'-70'	70'-150'	Unspecified	Total
Limited Entry Trawl	Number of Vessels						
>0% & <5%	0	3	1	0	1	0	5
>5% & <35%	1	4	7	3	2	0	17
>35% & <65%	1	7	14	7	16	0	45
>65% & <95%	0	10	17	24	19	0	70
>95% & <100%	2	3	21	21	46	6	99
No Groundfish Landing In Base Period	1	4	4	2	0	0	11
Total	5	31	64	57	84	6	247
Limited Entry Longline and Fishpot							
>0% & <5%	7	8	2	0	0	0	17
>5% & <35%	8	15	5	2	2	0	32
>35% & <65%	15	19	7	7	1	0	49
>65% & <95%	14	10	2	0	0	0	26
>95% & <100%	31	14	6	1	1	1	54
No Groundfish Landing In Base Period	10	5	3	1	0	0	19
Total	85	71	25	11	4	1	197
Open Access with >5% From Groundfish							
>5% & <35%	154	32	6	4	1	0	197
>35% & <65%	96	8	1	0	0	0	105
>65% & <95%	115	5	0	0	1	3	124
>95% & <100%	310	21	5	2	0	7	345
Total	675	66	12	6	2	10	771
Open Access with <5% of Revenue from Groundfish							
>0% & <5%	324	109	29	28	25	1	516
No Groundfish Landing In Base Period	1967	432	254	80	101	14	2848
Total	2,291	541	283	108	126	15	3364
Groundfish Vessel Total	1,089	277	130	102	115	18	1,731
Grand Total	3,056	709	384	182	216	32	4,579

Source: Derived from PacFIN monthly vessel summary files.

TABLE 6-18b. Exvessel revenue by fleet category, level of dependence and vessel size category (values for base period November 2000 through October 2001). (Page 1 of 2)

	Vessel Size Category						
	<40'	40'-50'	50'-60'	60'-70'	<150'	No Length	Total
Limited Entry Trawl	Total Exvessel Revenue ($)						
>0% & <5%	0	325,964	275,289	0	115,337	0	716,590
>5% & <35%	181,153	430,674	953,215	825,043	518,344	0	2,908,429
>35% & <65%	27,962	871,383	2,490,768	1,888,811	5,221,968	0	10,500,891
>65% & <95%	0	1,165,761	3,136,028	6,765,312	6,902,474	0	17,969,576
>95% & <100%	106,771	242,804	3,151,177	4,266,877	10,613,452	577,982	18,959,063
No Groundfish Landing In Base Period	56,941	414,389	303,085	194,762	0	0	969,177
Total	372,827	3,450,975	10,309,561	13,940,805	23,371,575	577,982	52,023,726
Limited Entry Longline and Fishpot							
>0% & <5%	305,169	1,246,090	386,687	0	0	0	1,937,946
>5% & <35%	672,139	1,800,168	1,041,194	1,033,560	847,678	0	5,394,739
>35% & <65%	1,476,118	2,312,510	1,756,501	2,058,800	250,586	0	7,854,515
>65% & <95%	789,669	598,901	237,918	0	0	0	1,626,488
>95% & <100%	1,271,340	679,096	420,250	19,026	23,686	5,358	2,418,756
No Groundfish Landing In Base Period	215,379	266,313	488,684	82,592	0	0	1,052,968
Total	4,729,814	6,903,078	4,331,234	3,193,978	1,121,950	5,358	20,285,412
Open Access with >5% From Groundfish							
>5% & <35%	4,321,362	1,568,644	135,567	230,097	4,094	0	6,259,764
>35% & <65%	1,385,880	182,777	9,730	0	0	0	1,578,387
>65% & <95%	1,386,170	199,754	0	0	2,501	3,734	1,592,159
>95% & <100%	2,752,570	460,004	47,124	2,287	0	97,603	3,359,588
Total	9,845,982	2,411,179	192,421	232,384	6,595	101,337	12,789,898
Open Access with <5% of Revenue from Groundfish							
>0% & <5%	12,215,985	6,261,870	3,492,986	5,359,397	5,236,348	3,367	32,569,953
No Groundfish Landing In Base Period	38,231,406	22,436,667	26,343,670	12,444,865	26,130,590	523,167	126,110,365
Total	50,447,391	28,698,537	29,836,656	17,804,262	31,366,938	526,534	158,680,318
Groundfish Vessel Total	27,164,608	19,027,102	18,326,202	22,726,564	29,736,468	688,044	117,668,989
Grand Total	65,396,014	41,463,769	44,669,872	35,171,429	55,867,058	1,211,211	243,779,354

TABLE 6-18b. Exvessel revenue by fleet category, level of dependence and vessel size category (values for base period November 2000 through October 2001). (Page 2 of 2)

	Vessel Size Category						
	<40'	40'-50'	50'-60'	60'-70'	<150'	No Length	Total
Limited Entry Trawl	Total Groundfish Exvessel Revenue ($)						
>0% & <5%	0	2,711	6,339	0	1,425	0	10,475
>5% & <35%	19,428	43,784	157,768	253,150	47,284	0	521,414
>35% & <65%	29,954	455,343	1,150,602	728,615	2,391,219	0	4,755,733
>65% & <95%	0	977,218	3,240,980	6,428,795	6,800,692	0	17,447,685
>95% & <100%	106,787	273,082	3,097,003	4,278,678	9,886,011	577,982	18,219,543
No Groundfish Landing In Base Period	0	0	0	0	0	0	0
Total	156,169	1,752,138	7,652,692	11,689,238	19,126,631	577,982	40,954,850
Limited Entry Longline and Fishpot							
>0% & <5%	4,354	12,410	13,019	4	0	0	29,787
>5% & <35%	161,449	311,302	206,628	275,907	289,030	0	1,244,316
>35% & <65%	616,385	674,807	851,658	765,290	95,876	0	3,004,016
>65% & <95%	806,958	1,124,427	195,606	228,219	0	0	2,355,210
>95% & <100%	1,260,140	663,360	407,616	19,026	23,076	5,358	2,378,576
No Groundfish Landing In Base Period	0	0	0	0	0	0	0
Total	2,849,286	2,786,306	1,674,527	1,288,446	407,982	5,358	9,011,905
Open Access with >5% From Groundfish							
>5% & <35%	572,972	181,882	27,222	16,095	323	0	798,494
>35% & <65%	638,089	79,881	4,062	0	0	0	722,032
>65% & <95%	1,291,863	157,323	0	0	1,777	3,363	1,454,326
>95% & <100%	2,722,871	456,863	47,124	2,287	0	97,460	3,326,605
Total	5,225,795	875,949	78,408	18,382	2,100	100,823	6,301,457
Open Access with <5% of Revenue from Groundfish							
>0% & <5%	130,599	42,398	35,227	56,911	68,603	54	333,792
No Groundfish Landing In Base Period	0	0	0	0	0	0	0
Total	130,599	42,398	35,227	56,911	68,603	54	333,792
Groundfish Vessel Total	8,361,849	5,456,791	9,440,854	13,052,977	19,605,316	684,217	56,602,004
Grand Total	8,361,849	5,456,791	9,440,854	13,052,977	19,605,316	684,217	56,602

Source: Derived from PacFIN monthly vessel summary files.

TABLE 6-19. Number of vessels by length class, INPFC area, gear, and species groups for November 2000 through October 2001. (Page 1 of 3)

				Vessel Length Category				
Gear and Species	<40'	40'-50'	50'-60'	60'-70'	70'-150'	>150'	Unspecified	Total
Vancouver INPFC Area								
Limited Entry Trawl								
Whiting	0	0	1	3	13	0	0	17
Sablefish	1	10	17	22	31	0	0	81
Nearshore Species	1	6	10	9	9	0	0	35
Shelf Species	1	10	16	23	31	0	0	81
Slope Species	1	10	16	22	30	0	0	79
Limited Entry Fixed Gear								
Sablefish	9	17	6	1	3	0	0	36
Nearshore Species	1	2	1	0	0	0	0	4
Shelf Species	10	14	5	0	2	0	0	31
Slope Species	8	16	5	1	3	0	0	33
Open Access >5% Revenue from Groundfish								
Sablefish	13	3	1	0	0	0	1	18
Nearshore Species	7	0	0	0	0	0	0	7
Shelf Species	19	5	0	0	0	0	1	25
Slope Species	7	4	0	0	0	0	1	12
Open Access <5% Revenue from Groundfish								
Sablefish	0	1	2	1	1	0	0	5
Nearshore Species	2	11	3	1	1	0	0	18
Shelf Species	0	1	0	0	0	0	0	1
Slope Species	13	26	7	0	3	0	0	49
Nongroundfish Fisheries								
Shrimps and Prawns	0	0	2	3	3	0	0	8
Crabs	7	11	26	7	6	0	0	57
Salmon	13	20	2	1	4	0	0	40
HMS	2	3	2	3	5	0	0	15
CPS	0	2	6	1	15	0	0	24
Other	3	12	13	13	27	0	0	68
Columbia INPFC Area								
Limited Entry Trawl								
Whiting	-	2	1	8	35	0	6	52
Sablefish	3	10	21	38	51	0	4	127
Nearshore Species	1	10	17	19	15	0	0	62
Shelf Species	3	12	21	38	60	0	6	140
Slope Species	3	10	20	38	54	0	4	129
Limited Entry Fixed Gear								
Sablefish	12	27	14	6	2	0	1	62
Nearshore Species	3	3	2	0	0	0	0	8
Shelf Species	14	24	8	5	0	0	0	51
Slope Species	8	20	8	5	1	0	0	42
Open Access >5% Revenue from Groundfish								
Sablefish	25	12	4	2	1	0	2	46
Nearshore Species	55	5	1	0	0	0	0	61
Shelf Species	57	8	2	1	0	0	1	69
Slope Species	8	4	2	1	0	0	2	17
Open Access <5% Revenue from Groundfish								
Sablefish	19	16	10	17	17	0	0	79
Nearshore Species	35	7	2	4	3	0	0	51
Shelf Species	120	47	15	22	18	0	0	222
Slope Species	16	6	7	12	11	0	0	52
Nongroundfish Fisheries								
Halibut	104	73	24	8	12	0	1	222
Shrimps and Prawns	0	2	17	43	36	0	0	98
Crabs	167	135	90	42	32	0	0	466
Salmon	340	123	20	7	30	0	5	525
HMS	162	223	117	57	37	0	1	597
CPS	2	10	16	10	41	0	6	85
Other	51	32	40	42	58	0	7	230

TABLE 6-19. Number of vessels by length class, INPFC area, gear, and species groups for November 2000 through October 2001. (Page 2 of 3)

	Vessel Length Category							
Gear and Species	<40'	40'-50'	50'-60'	60'-70'	70'-150'	>150'	Unspecified	Total
Eureka INPFC Area								
Limited Entry Trawl								
Whiting	0	2	0	2	12	0	0	16
Sablefish	1	14	29	27	28	0	0	99
Nearshore Species	1	11	21	13	7	0	0	53
Shelf Species	2	14	29	25	30	0	0	100
Slope Species	2	14	31	28	29	0	0	104
Limited Entry Fixed Gear								
Sablefish	19	8	3	0	0	0	0	30
Nearshore Species	19	3	2	0	0	0	0	24
Shelf Species	22	6	2	0	0	0	0	30
Slope Species	20	4	1	0	0	0	0	25
Open Access >5% Revenue from Groundfish								
Sablefish	24	2	0	0	0	0	0	26
Nearshore Species	138	3	1	0	0	0	1	143
Shelf Species	133	3	1	0	0	0	0	137
Slope Species	76	1	0	0	0	0	0	77
Open Access <5% Revenue from Groundfish								
Sablefish	2	1	0	0	0	0	0	3
Nearshore Species	23	1	1	0	2	0	0	27
Shelf Species	20	4	1	5	3	0	0	33
Slope Species	5	0	0	2	1	0	0	8
Nongroundfish Fisheries								
Halibut	10	9	6	1	2	0	0	28
Shrimps and Prawns	1	6	10	12	8	0	0	37
Crabs	160	74	38	9	11	0	0	292
Salmon	74	23	1	0	3	0	0	101
HMS	39	33	27	9	7	1	0	116
CPS	1	0	1	2	11	0	0	15
Other	154	23	33	23	23	0	1	257
Monterey INPFC Area								
Limited Entry Trawl								
Whiting	0	0	0	1	1	0	0	2
Sablefish	1	5	22	17	11	0	0	56
Nearshore Species	1	7	12	8	5	0	0	33
Shelf Species	1	7	23	18	12	0	0	61
Slope Species	1	7	24	18	12	0	0	62
Limited Entry Fixed Gear								
Sablefish	15	12	3	1	0	0	0	31
Nearshore Species	12	4	1	0	0	0	0	17
Shelf Species	16	8	3	0	0	0	0	27
Slope Species	17	10	3	1	0	0	0	31
Open Access >5% Revenue from Groundfish								
Sablefish	62	20	3	0	0	0	0	85
Nearshore Species	218	12	5	1	0	0	7	243
Shelf Species	207	13	4	2	0	0	5	231
Slope Species	59	12	3	0	0	0	0	74
Open Access <5% Revenue from Groundfish								
Sablefish	8	3	0	0	0	0	1	12
Nearshore Species	31	3	0	0	0	0	0	34
Shelf Species	35	12	0	1	0	0	0	48
Slope Species	7	3	1	1	0	0	0	12
Nongroundfish Fisheries								
Halibut	152	16	11	3	3	0	0	185
Shrimps and Prawns	5	1	8	4	4	0	0	22
Crabs	138	65	22	8	4	0	0	237
Salmon	505	141	24	1	0	0	0	671
HMS	112	72	40	9	9	0	0	242
CPS	13	10	10	4	6	0	1	44
Other	361	35	22	16	11	0	4	449

TABLE 6-19. Number of vessels by length class, INPFC area, gear, and species groups for November 2000 through October 2001. (Page 3 of 3)

				Vessel Length Category				
Gear and Species	<40'	40'-50'	50'-60'	60'-70'	70'-150'	>150'	Unspecified	Total
Conception INPFC Area								
Limited Entry Trawl								
Whiting	0	0	0	0	1	0	0	1
Sablefish	0	0	5	6	2	0	0	13
Nearshore Species	0	0	4	1	0	0	0	5
Shelf Species	0	0	5	7	2	0	0	14
Slope Species	0	0	4	7	2	0	0	13
Limited Entry Fixed Gear								
Sablefish	15	4	0	0	0	0	0	19
Nearshore Species	10	3	1	0	0	0	0	14
Shelf Species	15	4	1	0	0	0	0	20
Slope Species	16	4	0	0	0	0	0	20
Open Access >5% Revenue from Groundfish								
Sablefish	6	4	0	0	0	0	0	10
Nearshore Species	208	22	1	2	0	0	1	234
Shelf Species	170	16	1	1	1	0	0	189
Slope Species	57	14	0	2	1	0	0	74
Open Access <5% Revenue from Groundfish								
Sablefish	4	2	1	0	0	0	0	7
Nearshore Species	95	26	4	0	0	0	0	125
Shelf Species	62	17	3	2	3	0	0	87
Slope Species	36	9	3	3	2	0	0	53
Halibut	157	33	5	6	0	0	0	201
Shrimps and Prawns	39	19	8	8	5	0	0	79
Crabs	238	36	7	2	1	0	0	284
HMS	221	78	34	17	50	0	0	400
CPS	69	37	41	12	20	0	0	179
Other	487	83	24	9	33	0	1	637
All Ocean Areas (Council Managed 0-200 Miles)								
Limited Entry Trawl								
Whiting	0	4	1	10	40	0	6	61
Sablefish	4	26	61	54	73	0	4	222
Nearshore Species	3	28	48	36	31	0	0	146
Shelf Species	4	30	61	54	80	0	6	235
Slope Species	4	27	60	54	76	0	4	225
Limited Entry Fixed Gear								
Sablefish	61	61	23	8	4	0	1	158
Nearshore Species	39	13	5	0	0	0	0	57
Shelf Species	65	50	16	5	2	0	0	138
Slope Species	63	48	15	7	3	0	0	136
Open Access >5% Revenue from Groundfish								
Sablefish	128	39	7	2	1	0	2	179
Nearshore Species	566	39	7	3	0	0	8	623
Shelf Species	542	41	7	4	1	0	6	601
Slope Species	207	34	5	3	1	0	2	252
Open Access <5% Revenue from Groundfish								
Sablefish	33	23	11	18	17	0	1	103
Nearshore Species	183	37	7	4	5	0	0	236
Shelf Species	234	84	20	28	22	0	0	388
Slope Species	64	19	11	17	14	0	0	125
Nongroundfish Fisheries								
Halibut	431	149	49	18	20	0	1	668
Shrimps and Prawns	44	28	38	58	45	0	0	213
Crabs	692	302	147	59	46	0	0	1,246
Salmon	855	252	43	8	31	0	5	1,194
HMS	511	324	160	75	94	1	1	1,666
CPS	85	51	60	23	63	0	7	289
Other	1,005	165	107	67	111	0	13	1,468

Source: Derived from PacFIN monthly vessel summary files.

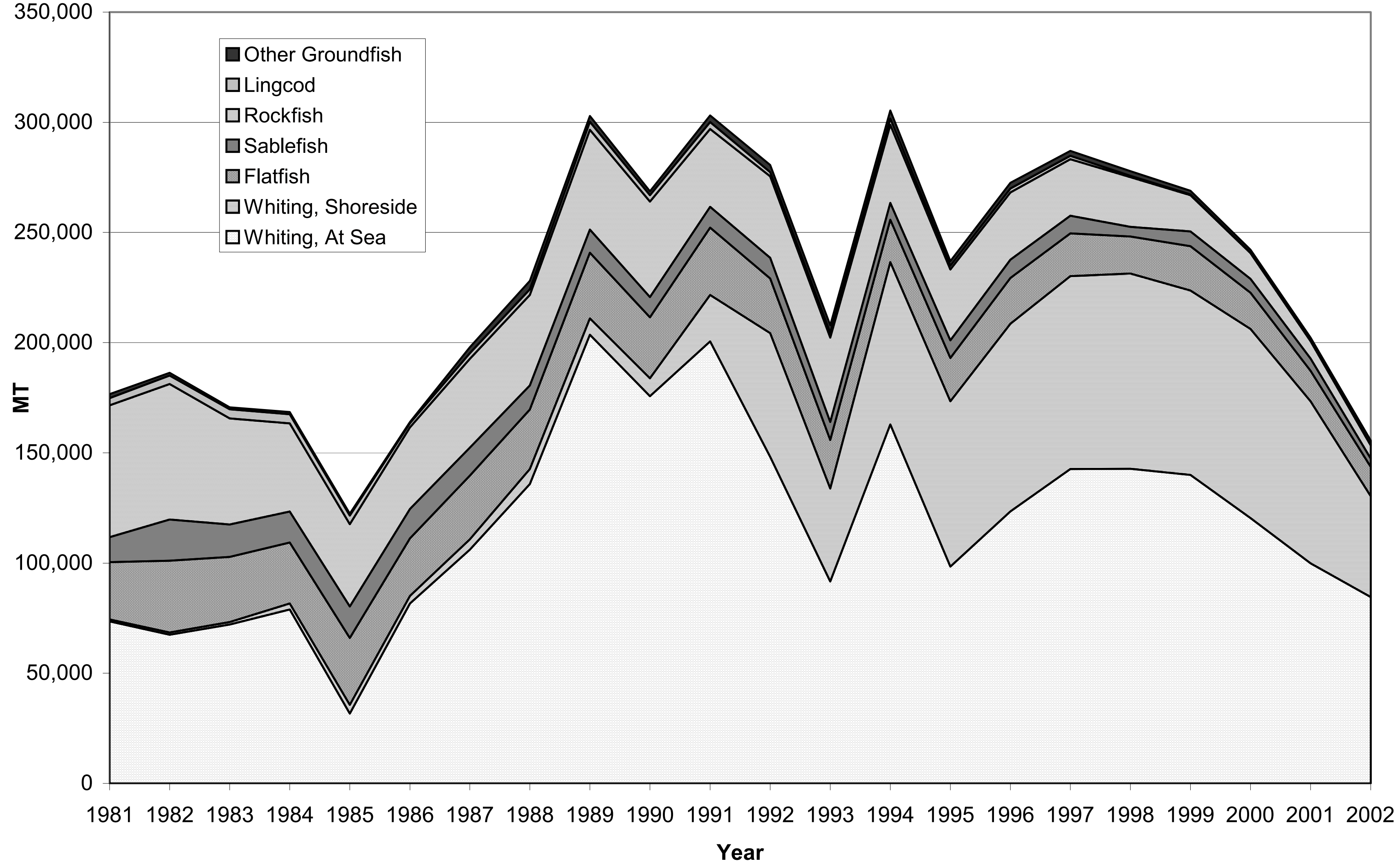

FIGURE 6-1. Groundfish landings by weight (mt), 1981-2002. (PacFIN landings data.)

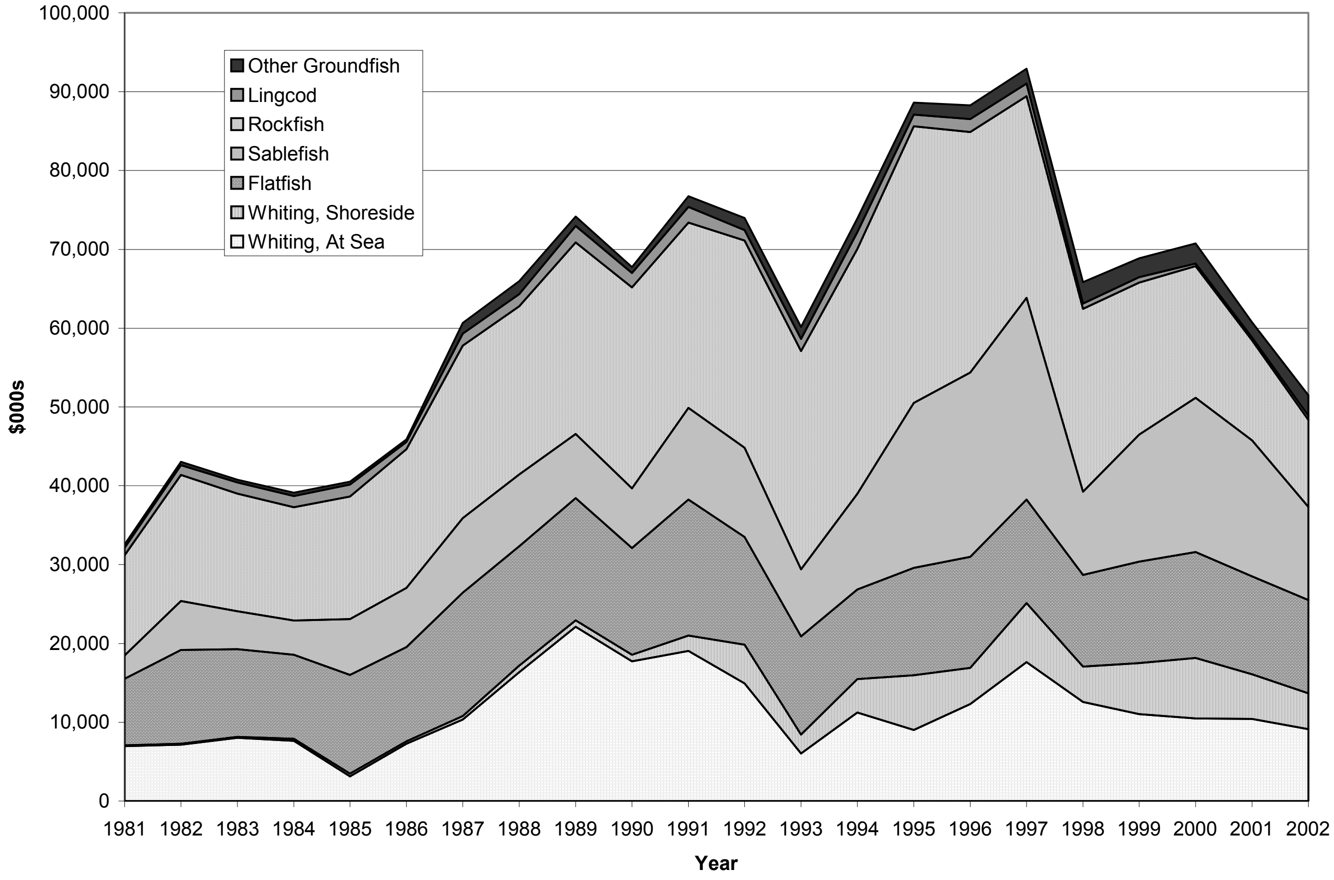

FIGURE 6-2. Groundfish landings in inflation adjusted dollars ($000), 1981-2002. (PacFIN landings data.)

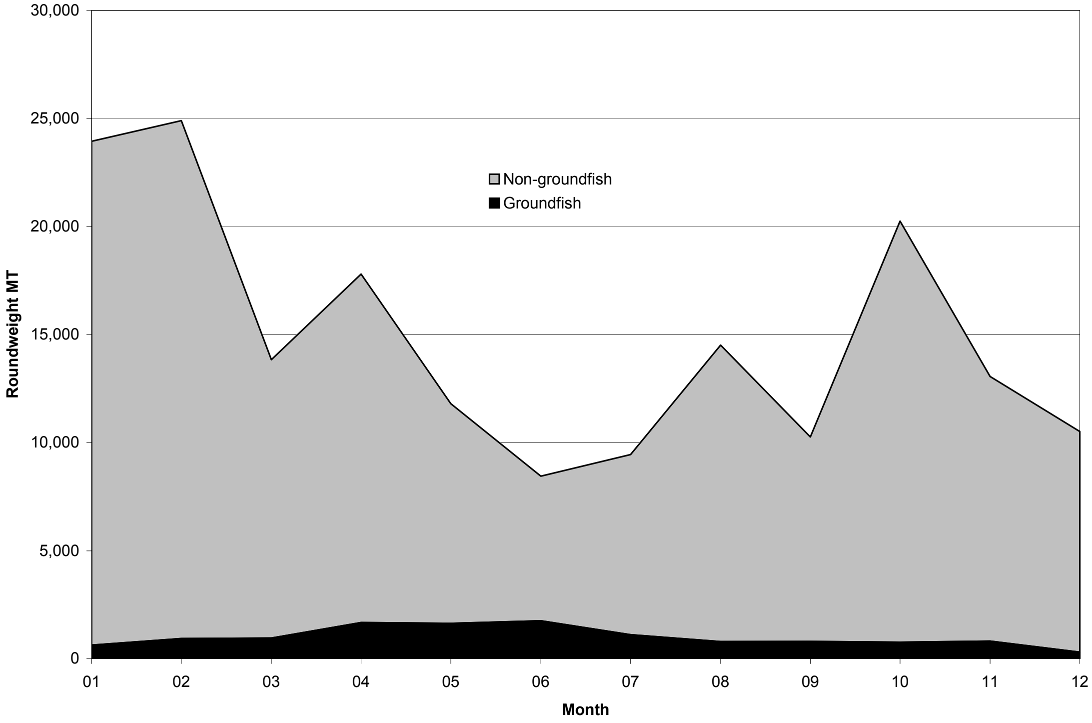

FIGURE 6-3. Total roundweight of all 2002 ocean fishery landings by month in **California**.

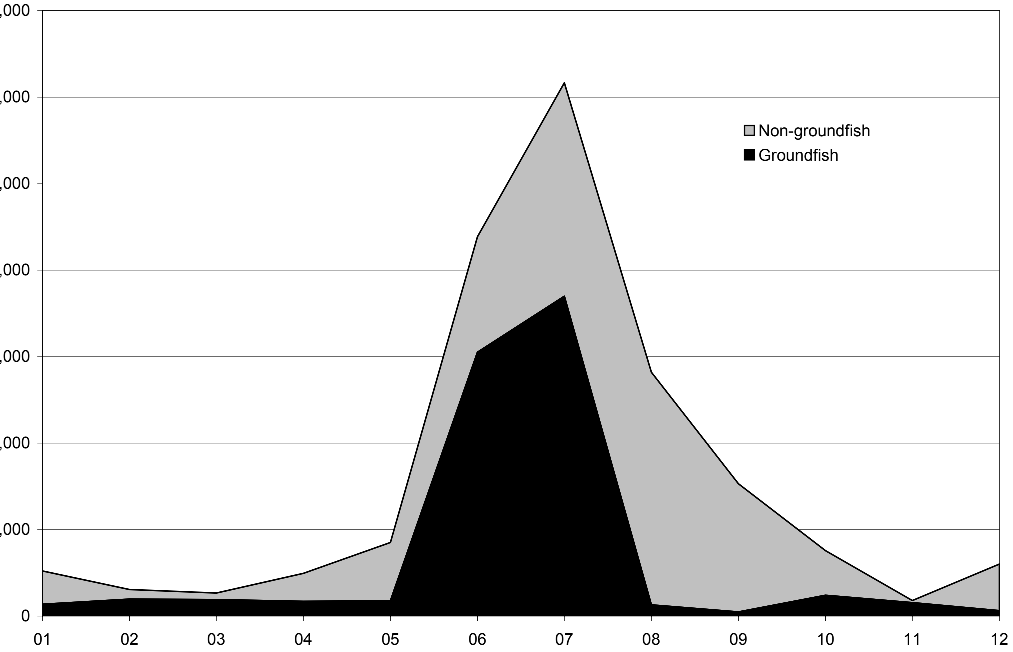

FIGURE 6-4. Total roundweight of all 2002 ocean fishery landings by month in **Oregon**.

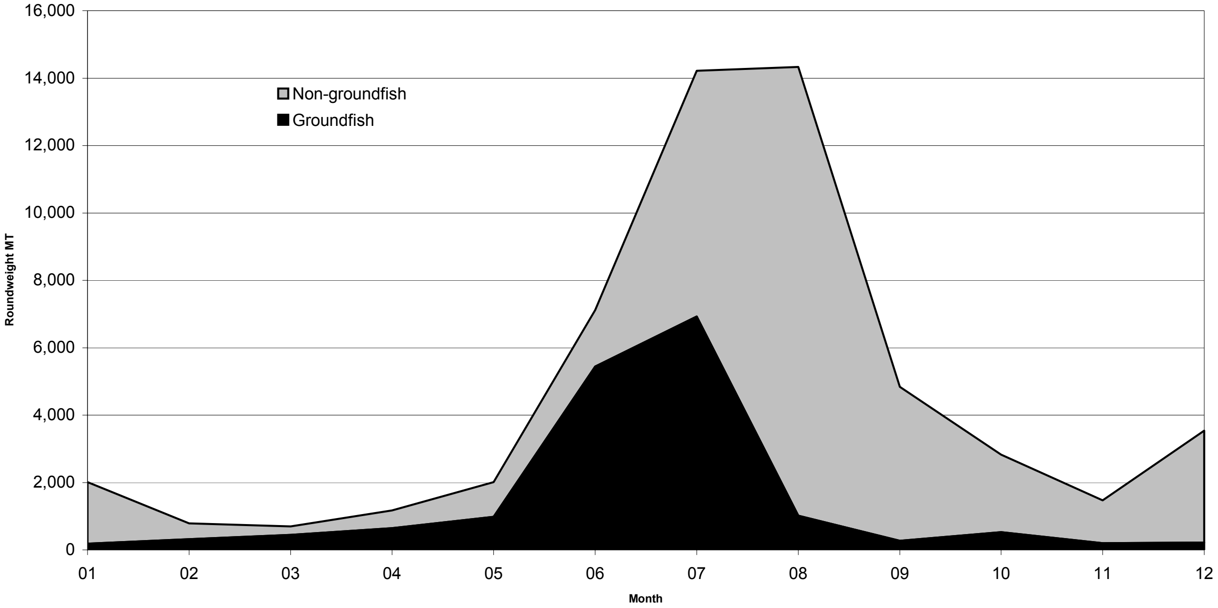

FIGURE 6-5. Total round weight of all 2002 ocean fishery landings by month in **Washington**.

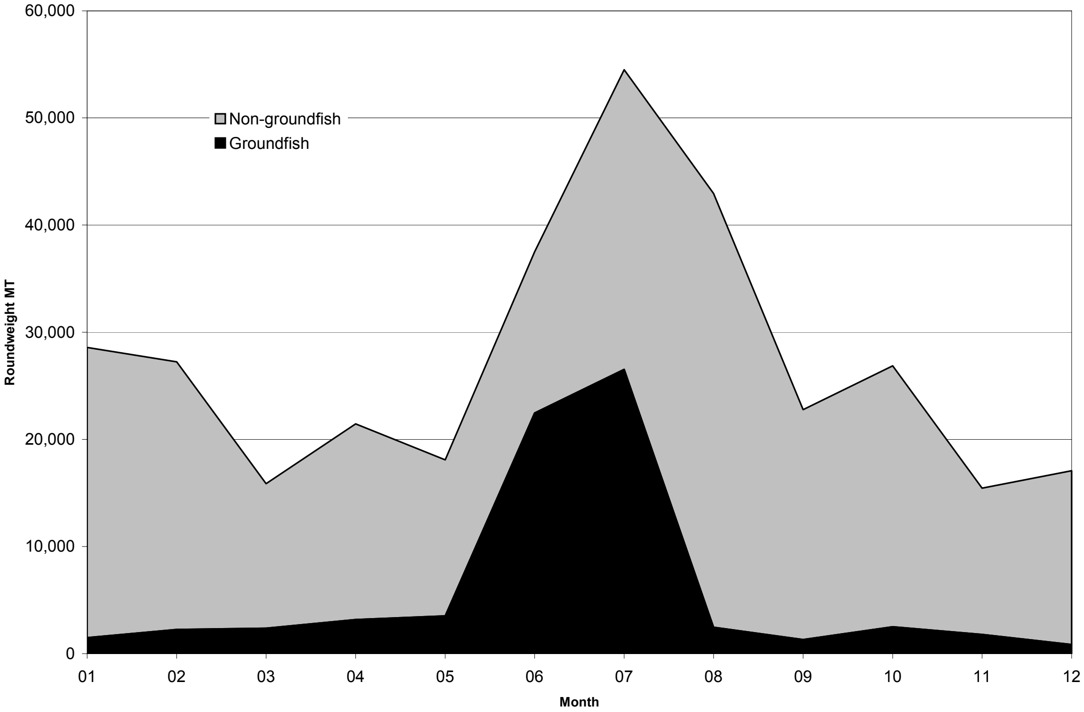

FIGURE 6-6. Total roundweight of all 2002 ocean fishery landings by month in **California, Oregon, and Washington**.

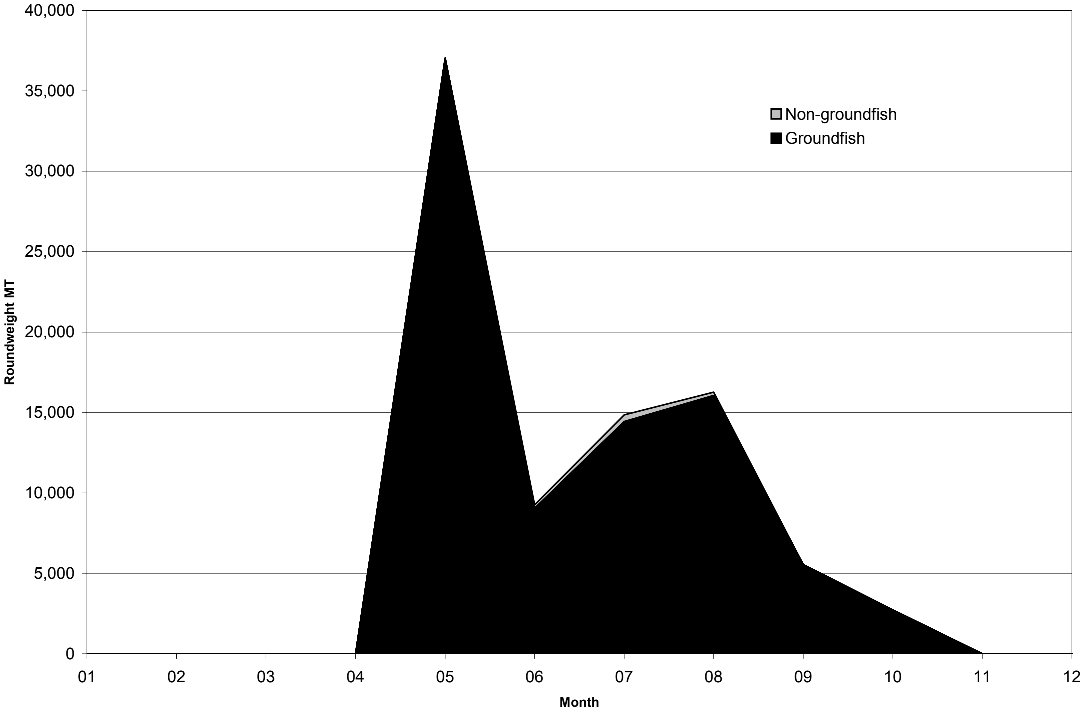

FIGURE 6-7. Total roundweight of all 2002 ocean fishery deliveries by month **At Sea**.

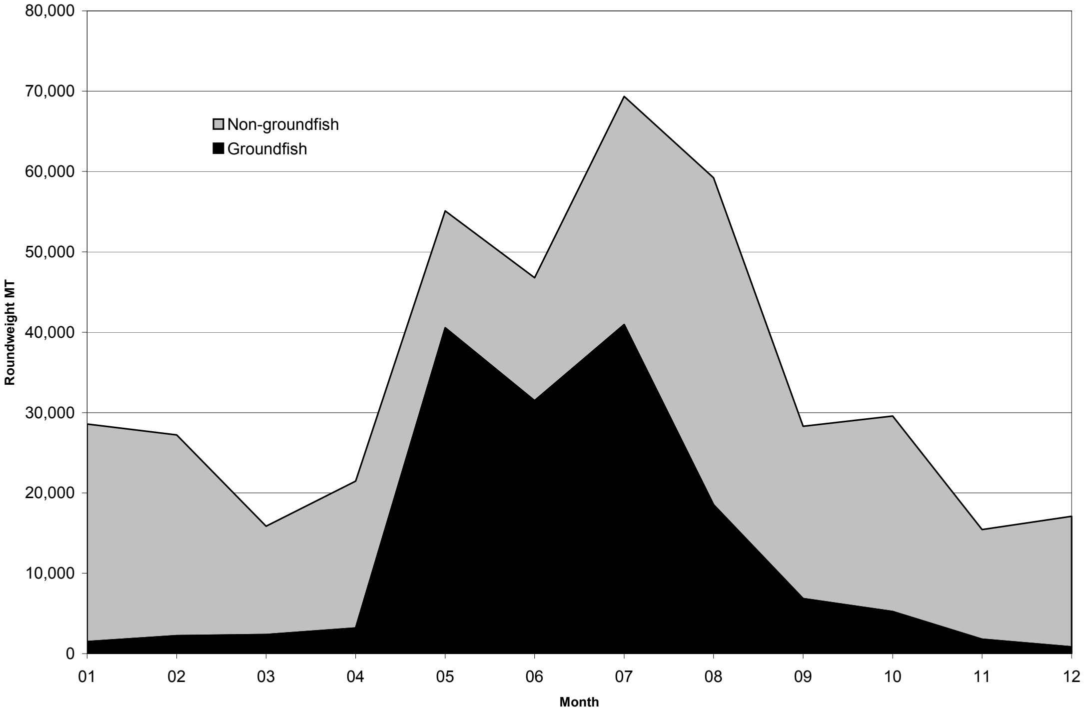

FIGURE 6-8. Total roundweight of all 2002 ocean fishery landings in **California, Oregon, and Washington** and deliveries **At Sea** by month.

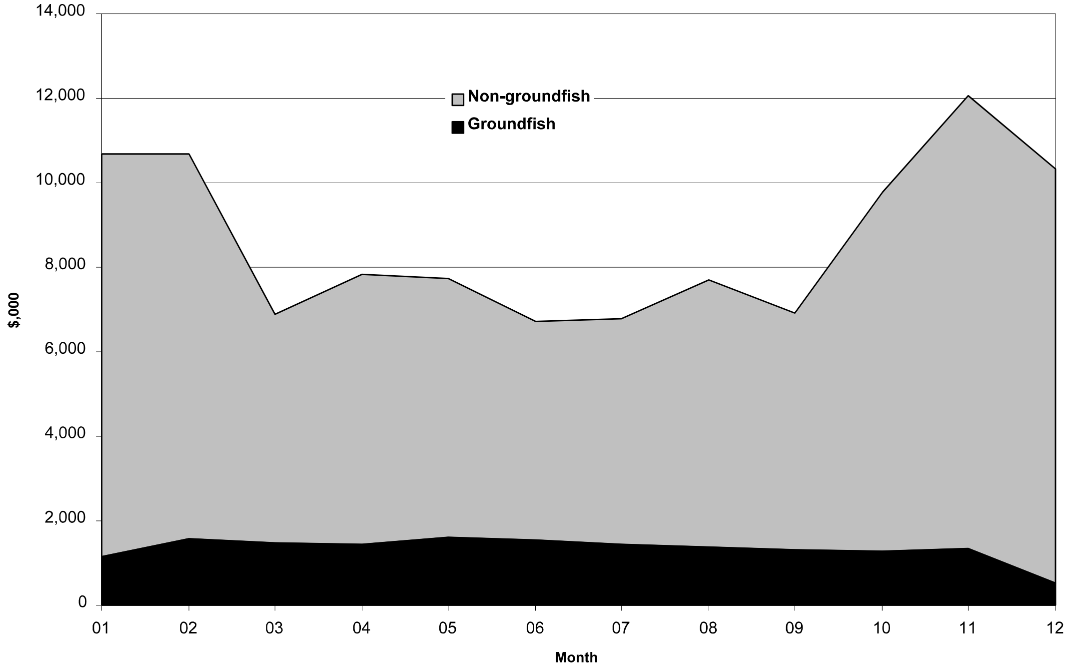

FIGURE 6-9. Exvessel value of all 2002 ocean fishery landings by month in **California**.

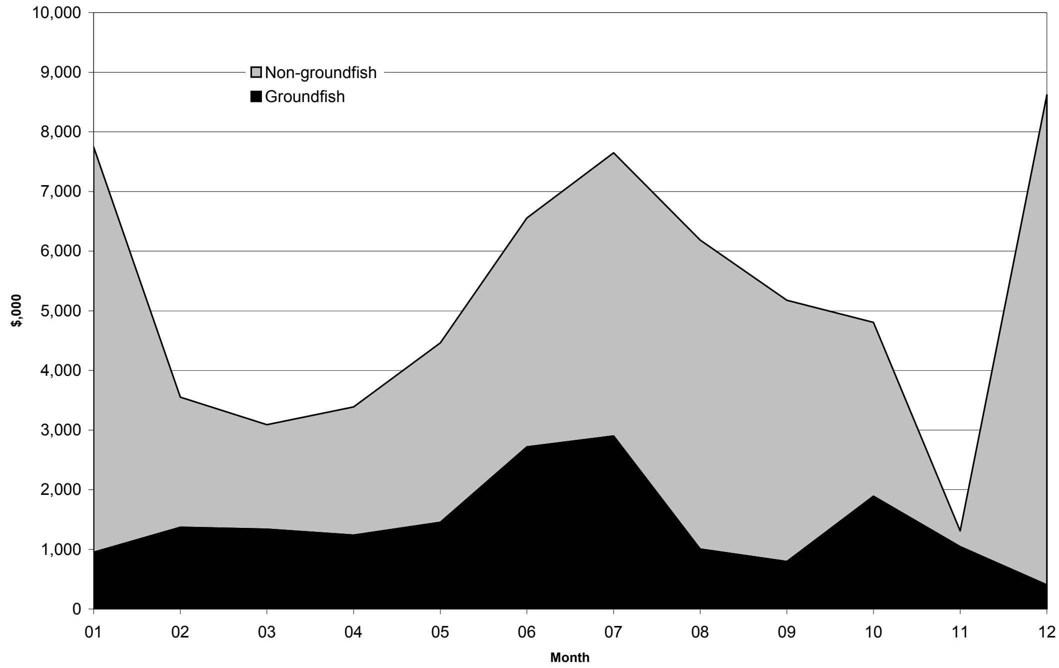

FIGURE 6-10. Exvessel value of all 2002 ocean fishery landings by month in **Oregon**.

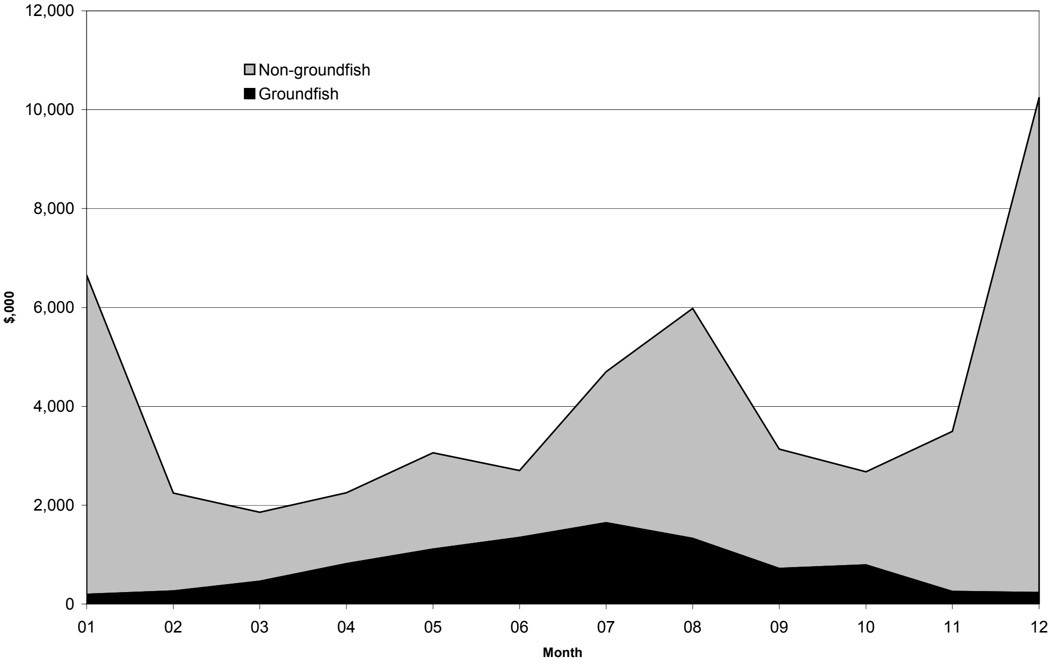

FIGURE 6-11. Exvessel value of all 2002 ocean fishery landings by month in **Washington**.

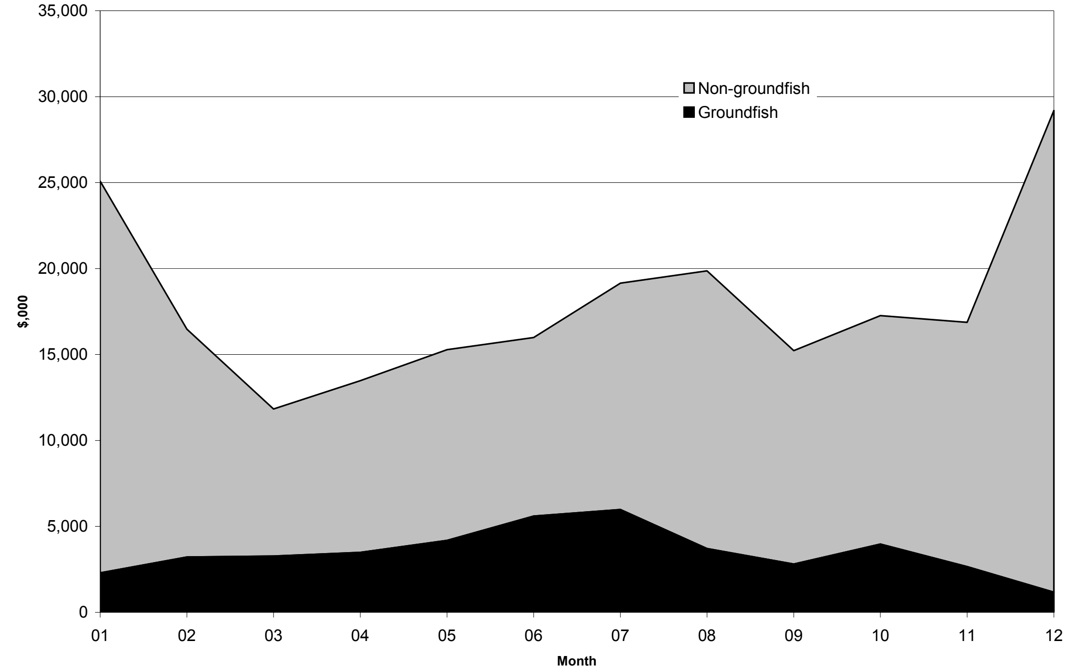

FIGURE 6-12. Exvessel value of all 2002 ocean fishery landings by month in **California, Oregon, and Washington**.

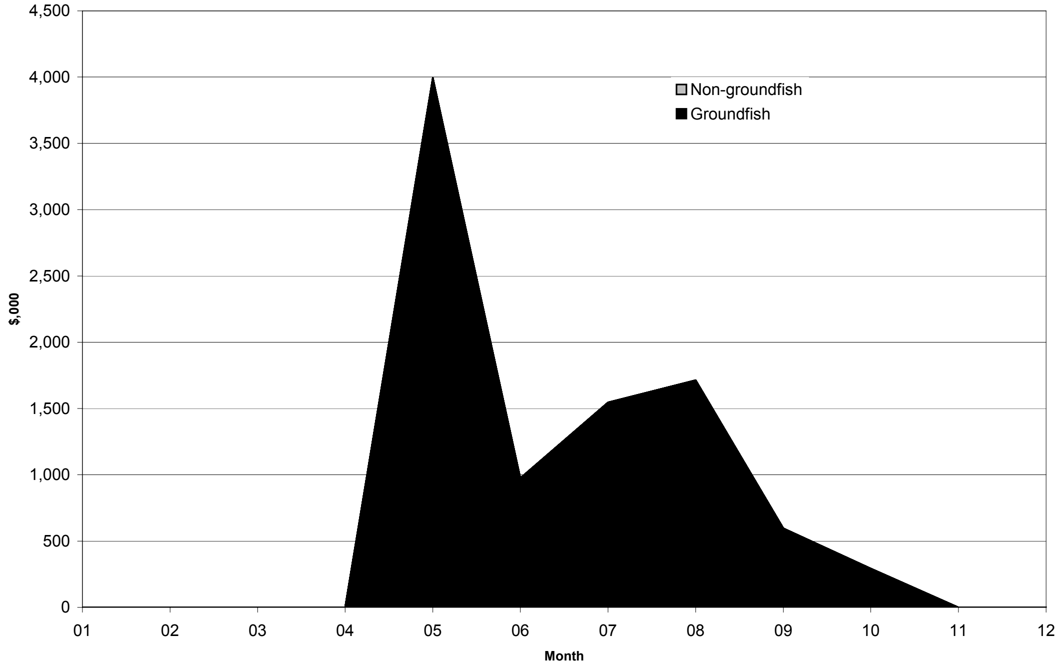

FIGURE 6-13. Exvessel value of all 2002 ocean fishery deliveries by month **At Sea**.

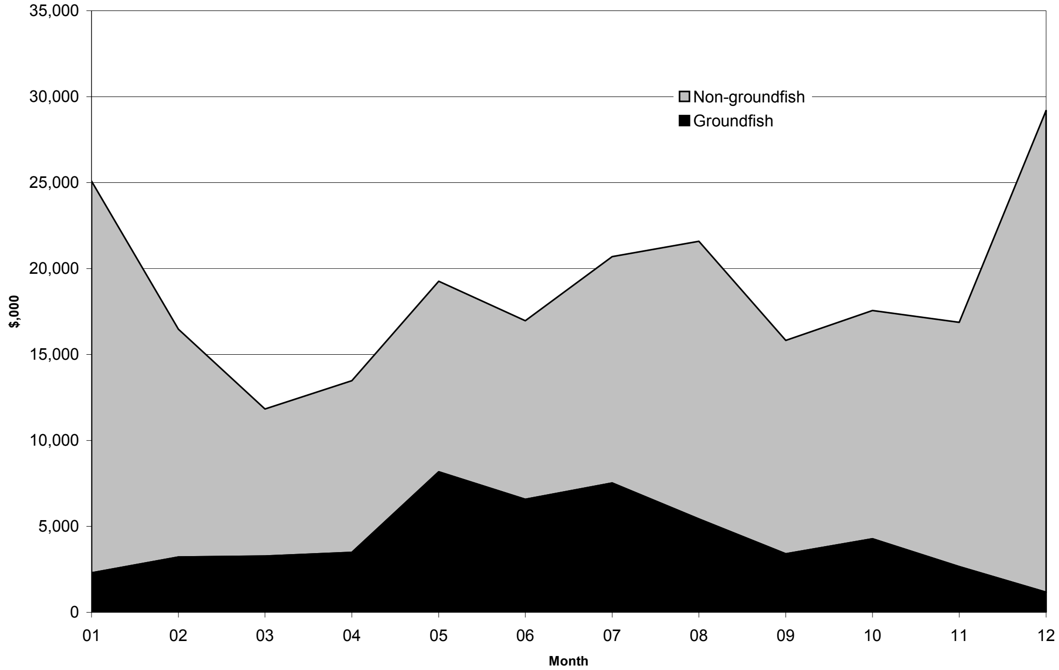

FIGURE 6-14. Exvessel value of all 2002 ocean fishery landings in **California, Oregon, and Washington** and deliveries **At Sea** by month.

7.0 Other Socioeconomic Sectors Involved in Groundfish Resources

Other sectors with a stake in the sound management of groundfish resources include secondary users, such as buyers and processors; non-consumptive users, such as tourists and wildlife watchers; and those who do not directly benefit from groundfish resources but may wish to preserve maximum flexibility for possible future uses (option value or bequethal values), or who simply value knowing that the resources exist and are well managed (existence value).

7.1 Buying, Processing, and Marketing Groundfish

The seafood distribution chain begins with deliveries by the harvesters (exvessel landings) to the shoreside networks of buyers and processors, and includes the linkage between buyers and processors and seafood markets. In addition to shoreside activities, processing of certain species (e.g. Pacific whiting and pollock) also occurs offshore on factory ships.

Several thousand entities have permits to buy fish on the West Coast. Of these 1,780 purchased fish caught in the ocean area and landed on Washington, Oregon, or California state fishtickets in the year 2000 (excluding tribal catch) and 732 purchased groundfish (Table 7-1).[18/]

Larger buyers tend to handle groundfish more than smaller buyers. Of the 546 buyers purchasing in excess of $20,000 of West Coast landings, 59% bought groundfish. These 546 buyers bought 99% of all Council-managed groundfish (Table 7-2). Of the 1,234 buyers purchasing less than $20,000 from West Coast vessels, only 33% bought groundfish.

The number of buyers handling groundfish from trawl vessels is a small proportion of all buyers handling groundfish: only 17% (125) of all groundfish buyers handled fish from trawl vessels or 7% of all buyers (Table 7-3). But buyers of trawl-caught groundfish are important to nontrawl vessels as well, handling 60% (by value) of the groundfish caught by nontrawl vessels.

The largest buyers tend to handle trawl vessels more than smaller buyers. Of the 38 largest buyers of groundfish (those with purchases in excess of $1 million), 28 (73%) bought from trawl vessels (Table 7-1). Seventy-eight percent of all groundfish purchases from trawl vessels go to these 28 buyers (Table 7-3). These 28 buyers also handle 39% of the exvessel value of the nontrawl purchases. Mid-size buyers tend to have greater importance for nontrawl vessels than for trawl vessels. Fifty percent of all nontrawl sales went to buyers with total purchases of between $20 thousand and $1 million, as compared to 22% for trawl vessels (Table 7-3).

Absent data on processor revenue and costs, gross exvessel value of purchases is used as a rough indicator of processor dependence on groundfish purchases. Large buyers of groundfish tend to have a lesser percentage of their overall purchases from groundfish than smaller buyers (Table 7-4). In the table, buyers are categorized by the proportion of purchases that are groundfish. By this measure, the distribution of large buyers has a single peak in the 5% to 35% range. The distribution of smaller buyers tends to be bimodal with peaks in the 0% to 5% range and the 95% to 100% range. For smaller buyers this may indicate that groundfish are purchased as part of the incidental catch from fisheries targeting other species (the buyers with

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[18/] A "buyer" was defined here by a unique combination of Pacific Coast Fisheries Information Network (PacFIN) port code and state buyer code on the fishticket. For California, a single company may have several buying codes that vary only by the last two digits. In PacFIN, these last two digits are truncated, and so were treated as separate buying units only if they appear for different ports.

0% to 5% of their purchases from groundfish), or that the buyers are specialty buyers or handling their own catch (the small buyers with 95% to 100% of their purchases from groundfish).

7.1.1 Live Fish Fishery

An important and growing share of groundfish harvest is delivered live. These deliveries help feed the growing trade in live seafood consumed in restaurants. Groundfish delivered live were primarily nearshore rockfish and perch, but also included thornyheads, sablefish and lingcod. About 86% of live fish landings were in California with the remainder in Oregon (PFMC 2004). There were no recorded live fish landings in Washington. Significantly higher exvessel price was paid for live product. The coastwide average price for live product was nearly four dollars per pound, compared with under one dollar for other deliveries of the same species.

7.1.2 Seasonality

Groundfish buyers (particularly larger buyers) tend to have more of a year-round presence in the fishery than nongroundfish buyers. Eighty percent of the groundfish buyers with over $1 million in purchases made purchases in every month in the year 2000, while only 31% of the nongroundfish buyers made purchases in every month (Table 7-5). For the 75 processors active 10 or 11 months of the year, the most common months to be inactive are November (22 buyers inactive), followed by February, January, March, and December (with between 10 and 14 buyers inactive in each month) (Table 7-6).

7.1.3 Processing Costs and Capacity

The main processing costs are payments for raw materials and processing labor. Information on processing costs is being collected by the Pacific States Marine Fisheries Commission Economic Fishery Information Network project. It is hoped some of this information will be available soon for economic analysis. In 2002 port biologists were asked to report their observations on the number of fillet and cutting stations in the plants from which they sampled. While the partial data collected in this initial effort is not sufficient for analysis, it does provide something of a baseline for certain areas of the coast. The survey found that in 2001 there were 44 fillet stations and two cutting tables in the Puget Sound region, 27 fillet stations (and an additional 26 in storage) on the Southern and Central Washington Coast, and 130 fillet stations between Crescent City and Fort Bragg in Northern California.

7.1.4 West Coast Groundfish and the World Market

West Coast groundfish compete in a global market, not only with similar species produced in other regions of the world, but also with other fish species such as salmon and tuna. In addition, fish compete with other sources of protein in consumers' budgets. More than 4.7 million mt of fish and other seafood were landed in the U.S. in 2000, approximately the same amount landed in each of the prior two years (DOC 2001). West Coast groundfish contributed about 0.14 million mt, 0.13 million mt, and 0.12 million mt to this total in 1998, 1999 and 2000, respectively. Pacific whiting, a relatively abundant but low-value species, comprises about two-thirds of West Coast groundfish landings by weight, but only around 10% of groundfish exvessel revenue.

Production of farm-raised fish has increased rapidly in recent years. In 2000, more than 0.4 million mt of cultured fishery products were produced in the U.S., and more than 45 million mt were raised worldwide. Salmon aquaculture demonstrates the emerging importance of farmed species. While commercial salmon harvest is still near the 1980 to 1997 annual average, world salmon supply has tripled since 1980 due to a ninefold increase in farmed salmon to 1.5 million mt in 2000.

An objective of groundfish management has been to spread harvest of the annual OY over as much of the year as possible. Consequently, groundfish harvesting occurs in every month, although in the late 1990s through 2000, it took on increased importance during the summer months when sablefish harvest peaked during the primary limited entry fixed gear fishery. (Table 7-7).

Groundfish have historically provided West Coast commercial fisheries participants with a relatively steady source of income over the year, supplementing the other more seasonal fisheries. Although groundfish contributed only about 17% of total annual exvessel revenue during 2000, seasonally groundfish played a more significant role, providing one-fifth to one-third of monthly exvessel revenue coastwide during April and the three summer months. The peak contribution by the groundfish fishery in 2000 was sablefish during August (20% of exvessel revenue). Flatfish harvest supplied between 3% and 9% of monthly exvessel revenue throughout the year, and rockfish contributed an additional 2.5% to 6.8% to monthly exvessel revenue. For northern parts of the coast, groundfish is particularly important just before the start of the December crab fishery.

7.1.4.1 Exvessel Prices

Table 7-8 shows average annual West Coast commercial exvessel prices for major species groups from 1981 to 2002. In 2002, exvessel prices for groundfish species groups were generally above their five-year (1998-2002) averages, with the exception of "other groundfish." This was due in part to the expansion of the high-value livefish fishery in recent years. Several species were substantially below their five-year averages, especially salmon and Dungeness crab. Species at or below their five year lows in 2002 included other groundfish, salmon, and Dungeness crab.

7.1.4.2 Exprocessor and Wholesale Prices

While producer prices for groundfish products have not fared quite as badly as for other frozen fish (including salmon), they still are significantly below recent highs. The trend may be flat or still lower in the future (Table7-9). Increasing production of farmed salmon is partly responsible for a continuing slump in salmon commodity prices. Producer prices for meat products in general have been relatively weak, thereby helping to hold down prices for competitive fish protein. Preliminary 2003 estimates of producer price indices for fish and meat products were higher than seen in recent years, possibly due to the continuing improvement in the world economic outlook.

7.1.4.3 Trade

In 2000 the U.S. imported 1.8 million mt of edible fishery products (17% from Canada and 14% from Thailand), and exported about one million mt of edible fishery products, one third of this to Japan (DOC 2001). Japan is the world's largest importer of fish, and Japanese demand drives much of the trade in world markets (Wessells 1992). Altogether Japan imported more than $14 billion of fishery products from the rest of the world in 1999. The U.S. was the second largest importer of fishery products in 1999 at $9.4 billion. While the current dollar value of U.S. edible fishery product exports remained fairly flat from 1995 to 1999 at approximately $3 billion, the current dollar cost of imports increased by one third over the same period to $9 billion. In 1999 the U.S. was the fourth largest exporter by value of fishery products after Thailand, Norway, and China (DOC 2001).

Imports

Most West Coast groundfish compete in the fresh and frozen fish product markets. In 2000 the U.S. imported 1.5 million mt of edible fresh and frozen fish products (DOC 2001). One hundred seventy one thousand mt

(11%) consisted of flatfish and groundfish. An additional 283 thousand mt of canned and cured edible fishery products were also imported. Fresh and frozen shrimp were by far the largest edible fishery import item in 2000, both in terms of tonnage (343 thousand mt) and value ($3.7 billion). Thailand supplied one half of this tonnage, earning $1.5 billion. In terms of value, U.S. imports of non-edible fishery products are almost as important as edible products. In 2000, nearly $9 billion of non-edible fishery products were imported along with $10 billion in edible products.

Exports

In 2000 the U.S. exported 190,000 mt of edible, fresh or frozen flatfish and groundfish products, about 22% of total edible fresh or frozen fishery exports by weight, or 19% by value (DOC 2001). Surimi was the single largest component of total fresh and frozen imports by weight, accounting for another 150 thousand mt. However, salmon was the most valuable export, generating $353 million on the 100 thousand mt of fresh and frozen product shipped, and another $146 million from exports of canned product. Asia was the largest export region, absorbing 61% of U.S. fishery exports by volume. Japan alone bought 34% of total fishery exports, and South Korea and China took 11% and 10%, respectively.

Domestic Demand

From 1910 through the early 1970s, annual per-capita fish consumption in the U.S. generally ran between 10 pounds and 12 pounds edible weight (DOC 2001). Beginning in the early 1970s, per-capita consumption increased to between 12 pounds and 13 pounds. In the mid 1980s, it began shifting upward again to the 15-pound to 16-pound range where it has generally remained since 1985. In 2000 annual per-capita U.S. fish consumption was estimated to be 15.6 pounds. Internationally the U.S. ranks just above average in terms of per-capita fish consumption along with countries like the United Kingdom, Italy, Russia, and Canada, and not far below China, but less than half the level of Japan and South Korea.

7.2 Market and Nonmarket Benefits

7.2.1 Market Consumer Goods

For goods sold in markets where a consumer price can be determined, for example the market for seafood, price and quantity information can be used to estimate the maximum benefits consumers derive from consumption activities. A given regulatory action may have little or no impact on consumers if changes in the quantity of fish available are not expected to change prices. This would be especially the case if imports or other protein substitutes are readily available. In the market for recreational experiences, individuals pay fees to participate in recreational fishing trips on charterboats. Price and quantity information from these trips might allow estimation of the maximum benefits participants derive from this type recreational fishing. However, charter trips may often be purchased as part of a bundle of goods and services that include nonfishing recreational activities. Therefore, the estimation of benefits from recreational charter activities is less straightforward than for marketed consumer goods.

7.2.2 Non-Market Consumer Goods

For other consumer goods, especially bundles of goods and services like a recreational fishing trip taken on a private vessel, the prices and quantities associated with each transaction are much more difficult to determine. For the private recreationalist, the amount spent on fishing gear, licenses, and other goods necessary to carry out a particular fishing trip is difficult to isolate. The term "private" is used here to designate a recreational fisher fishing from a private vessel, the shore, bank or a public pier, as opposed to fishing on a charter vessel. Depending on the value a particular individual places on alternatives to fishing, the maximum benefit associated with a fishing trip may far exceed actual trip expenditures.

7.3 Non-consumptive Activities

This section discusses nonmarket values, other than the recreational fishing experience, that members of the general public may have. The sectors benefitting from a resource can generally be placed into one of three groups: consumptive users (e.g., recreational fishers, commercial harvesters, and processors), nonconsumptive users (e.g., wildlife viewers), and nonconsumptive nonusers (e.g., members of the general public who derive value from knowing that fish species are being maintained at healthy biomass levels). The following table displays the general relationship between use/non-use and consumptive/nonconsumptive types of activities.

Relationship between Use/Non-use and Consumptive/Non-consumptive Activities

	Consumptive	Non-Consumptive
Use	Commercial and Recreational Fishing, Processing.	Wildlife Viewing
Non-use	N/A	Existence Value, Options Value, Bequethal Value

In economic terms, renewable resource management entails a fundamental tradeoff between current and future costs and benefits. When management needs call for a substantial reduction in allowable harvests, from the perspective of consumptive users of the resource, additional costs are born by the direct consumptive users, who may be left with much smaller harvests than they have been accustomed to. While this near-term sacrifice may create much greater harvest opportunities in the future once the stock has been replenished—depending on the duration of the rebuilding period—many fishers and processors may be unable to weather a long down period, opting instead to go out of business. Therefore, many of the consumptive users using the resource after a stock has been rebuilt may be different from those who left the fishery during the rebuilding period.

For a nonconsumptive user, benefit may derive from maximizing the unexploited biomass, so the faster a stock is rebuilt the better.

7.3.1 Non-consumptive Use

Nonconsumptive users may benefit from the use and non-use values provided by the resource. Wildlife viewing or the derivation of secondary benefits from ecosystem services are examples of non-consumptive use values. One or more of the following non-use benefits may accrue from the preservation of fish stocks at higher levels of abundance: (1) existence value derived from knowing a fish population or ecosystem is protected without intent to harvest the resource; (2) option value placed on knowing a fish population, habitat, or ecosystem has been protected and is available for use, regardless of whether the resources are actually used; and (3) bequethal value placed on knowing a fish population, habitat, or ecosystem is protected for the benefit of future generations. These values may be closely related and overlap with values the general public places on wildlife and natural parks. Offsite nonconsumptive uses of resources are public in nature in that no one is excluded from deriving the identified benefits, and one person's enjoyment does not affect another's potential benefit.

The existence of coastal fishing communities in themselves may have intrinsic social value. For example, the Newport Beach dory fishing fleet, founded in 1891, is a historical landmark designated by the Newport Beach

Historical Society. The city grants the dory fleet use of the public beach in return for the business and tourism this unique fishery generates.

Value may also be placed on biological diversity. The value of biological diversity may be part of the total value placed on a site by nonconsumptive users (onsite or offsite). Three levels of biological diversity have been identified, (1) genetic diversity within a species, (2) species diversity (richness, abundance, and taxonomic diversity), and (3) ecosystem diversity. Ecosystem diversity encompasses the variety of habitats, biotic communities, and ecological processes (Caribbean Fishery Management Council 1998).

The total societal value placed on offsite nonconsumptive use of a stock or component of the ecosystem will also depend on: (1) the size of the human population, (2) the level of income, (3) education levels, and (4) environmental perceptions and preferences. (After Spurgeon, 1992, as cited in Caribbean Fishery Management Council, 1998).

The above relationships imply that as human populations and the affluence of those populations increase, and as fish stocks and their ecosystems are depleted, nonconsumptive values associated with maintaining ocean resources are likely to increase. Another implication of these relationships is that once the basic integrity of ecosystem processes and marine fisheries components are preserved, the likely additional benefit from incremental increases biomass will decrease.

TABLE 7-1. Number of buyers on the West Coast in the year 2000 (excluding at-sea whiting deliveries). (Page 1 of 1)

Buyers' Total Expenditures on West Coast Harvest (Groundfish and Nongroundfish)	All Buyers	Nongroundfish Buyers	Groundfish Buyers	Groundfish Buyers as % of Category	Trawl-Caught Groundfish Buyers	Nontrawl-Only Groundfish Buyers
>$2 Million	21	2	19	90%	17	2
$1-$2 Million	33	14	19	58%	11	8
$300 Thousand - $1 Million	98	36	62	63%	33	29
$100-$300 Thousand	121	49	72	60%	23	49
$20-$100 Thousand	273	123	150	55%	19	131
$5 Thousand-$20 Thousand	372	224	148	40%	11	137
<$5 Thousand	862	600	262	30%	11	251
Total	1,780	1,048	732	41%	125	607

Source: Data for West Coast ocean area landings made to West Coast ports derived from PacFIN monthly vessel summary files.

TABLE 7-2. Value of purchases ($1,000) by West Coast buyers (groundfish and nongroundfish) in the year 2000. (Page 1 of 1)

	All Buyers	Groundfish Buyers					
		All Species (All West Coast Purchases by All Groundfish Buyers)			Groundfish (All West Coast Purchases)		
	Total Purchases	Total Purchases	As % of All West Coast Purchases	Cumulative Percent of All West Coast Purchases	Groundfish Purchases	Percent of Total Groundfish	Cumulative Percent of Total Groundfish
>$2 Million	95,742	90,762	38%	38%	28,680	53%	53%
$1-$2 Million	45,343	25,851	11%	49%	8,585	16%	68%
$300 Thousand-$1 Million	56,115	36,527	15%	65%	11,278	21%	89%
$100-$300 Thousand	21,427	12,543	5%	70%	3,269	6%	95%
$20-$100 Thousand	12,881	7,297	3%	73%	2,023	4%	99%
$5 Thousand-$ 20 Thousand	3,989	1,519	1%	74%	501	1%	100%
<$5 Thousand	1,278	426	0%	74%	218	0%	100%
Total	236,775	174,926			54,554		

Source: Derived from PacFIN monthly vessel summary files.

TABLE 7-3. Groundfish buyers' expenditures on all species and groundfish in the year 2000 (excludes at-sea whiting). (Page 1 of 1)

	Buying Groundfish from Limited Entry Trawl Vessels						Buying Groundfish from Nontrawl Only				All Buyers
			Trawl Expenditure		Nontrawl Expenditures						
	Number	Total Expenditures All Species ($,000)	($,000)	As a % of Grand Total Trawl Expenditures	($,000)	As a % of Grand Total Nontrawl Expenditures	Number	Total Expenditures ($,000)	Nontrawl Expenditures ($,000)	As a % of Grand Total Nontrawl Expenditures	Grand Total Nontrawl Expenditures ($,000)
>$2 Million	17	80,726	22,904	60%	5,773	35%	2	10,036	3	0%	5,776
$1-2 Million	11	15,874	6,898	18%	699	4%	8	9,976	988	6%	1,686
$300 Thousand-$1 Million	33	20,226	6,419	17%	2,957	18%	29	16,301	1,902	12%	4,859
$100-$300 Thousand	23	3,765	1,515	4%	235	1%	49	8,778	1,519	9%	1,754
$20-$100 Thousand	19	990	234	1%	249	2%	131	6,307	1,540	9%	1,789
$5 Thousand-$20 Thousand	11	132	80	0%	16	0%	137	1,386	405	2%	421
<$5 Thousand	11	24	20	0%	0	0%	251	402	197	1%	197
Total	125	121,739	38,071	100%	9,929	60%	607	53,187	6,554	40%	16,483

Source: Derived from PacFIN monthly vessel summary files.

TABLE 7-4. Number of buyers by amount and proportion of total purchases that are groundfish from trawl vessels and nontrawl vessels in the year 2000 (excludes at-sea whiting). (Page 1 of 1)

Buyers Total Expenditures on West Coast Harvest (Groundfish and Nongroundfish)	Number of		Percent of Purchases That Are:																	
			Groundfish						Groundfish Caught with LE Trawl Gear						Groundfish Caught With Other Gear					
	All Buyers	Groundfish Buyers	None	<5%	5%-35%	35%-65%	65%-95%	>95%	None	<5%	5%-35%	35%-65%	65%-95%	>95%	None	<5%	5%-35%	35%-65%	65%-95%	>95%
Number of Buyers (All)																				
>$2 Million	21	19	2	4	8	5	2	0	Same as below						2	9	10	0	0	0
$1-$2 Million	33	19	14	4	9	3	3	0							15	12	5	1	0	0
$300 Thousand-$1 Million	98	62	36	26	15	6	10	5							44	34	12	3	3	2
$100-$300 Thousand	121	72	49	37	12	10	6	7							56	41	12	6	3	3
$33-$100 Thousand	183	100	83	56	19	5	5	15							86	56	19	4	4	14
$5-$33 Thousand	462	198	264	80	43	16	21	38							274	81	43	16	18	30
<$5 Thousand	862	262	600	50	42	29	24	117							610	51	42	26	24	109
Total	1,780	732	1,048	257	148	74	71	182							1,087	284	143	56	52	158
Buyers Buying from Trawl Vessels																				
>$2 Million	17	17	0	2	8	5	2	0	-	3	10	4	0	0	0	7	10	0	0	0
$1-$2 Million	11	11	0	0	6	2	3	0	-	1	5	2	3	0	1	8	2	0	0	0
$300 Thousand-$1 Million	33	33	0	6	9	5	10	3	-	11	9	5	7	1	8	14	6	2	3	0
$100-$300 Thousand	23	23	0	6	4	5	4	4	-	10	2	4	3	4	7	10	4	1	1	0
$33-$100 Thousand	13	13	0	2	4	2	3	2	-	6	5	0	1	1	3	2	4	1	2	1
$5-$33 Thousand	17	17	0	1	4	1	3	8	-	2	4	1	4	6	10	2	4	1	0	0
<$5 Thousand	11	11	0	0	0	3	0	8	-	0	0	3	0	8	10	1	0	0	0	0
Buyers NOT Buying from Trawl Vessels																				
>$2 Million	4	2	2	2	0	0	0	0	4	-	-	-	-	-	Same as to far left					
$1-$2 Million	22	8	14	4	3	1	0	0	22	-	-	-	-	-						
$300 Thousand-$1 Million	65	29	36	20	6	1	0	2	65	-	-	-	-	-						
$100-$300 Thousand	98	49	49	31	8	5	2	3	98	-	-	-	-	-						
$33-$100 Thousand	170	87	83	54	15	3	2	13	170	-	-	-	-	-						
$5-$33 Thousand	445	181	264	79	39	15	18	30	445	-	-	-	-	-						
<$5 Thousand	851	251	600	50	42	26	24	109	851	-	-	-	-	-						

Note: Each unique combination of buyer license and PacFIN port is counted as a separate buyer. In some cases, a particular buyer may have a presence in a port (be buying through a port), but have no facilities at that port. Source: Derived from PacFIN monthly vessel summary files.

TABLE 7-5. Number of buyers (groundfish and nongroundfish) by number of months buying and exvessel value of purchases in the year 2000 (excluding at-sea whiting). (Page 1 of 1)

	Number of Months During Which Purchases Were Made												
	1	2	3	4	5	6	7	8	9	10	11	12	Total
	Number of Buyers **NOT Buying Groundfish**												
>$2 Million	0	0	0	0	0	0	0	0	0	0	0	2	2
$1-$2 Million	0	0	0	0	0	0	1	0	1	3	6	3	14
$300 Thousand-$1 Million	0	0	3	3	2	3	3	4	3	3	5	7	36
$100-$300 Thousand	1	4	6	4	3	4	2	4	7	4	4	6	49
$20-$100 Thousand	15	23	21	10	11	14	3	2	7	8	4	5	123
$5 Thousand-$20 Thousand	54	45	36	25	19	11	5	7	7	5	4	6	224
<$5 Thousand	388	113	59	16	9	7	2	2	0	1	1	2	600
Total	458	185	125	58	44	39	16	19	25	24	24	31	1,048
	Groundfish Buyers that Buy from Groundfish Limited Entry Trawl Vessels												
>$2 Million	0	0	0	0	0	0	0	0	0	0	1	16	17
$1-$2 Million	0	0	0	0	0	0	0	0	0	1	2	8	11
$300 Thousand-$1 Million	0	0	0	2	0	3	1	4	1	0	7	15	33
$100-$300 Thousand	0	0	1	6	2	1	0	5	0	1	5	2	23
$20-$100 Thousand	0	4	4	2	0	1	0	1	0	1	2	4	19
$5 Thousand-$20 Thousand	2	3	0	1	1	2	0	0	0	0	0	2	11
<$5 Thousand	7	2	2	0	0	0	0	0	0	0	0	0	11
Total	9	9	7	11	3	7	1	10	1	3	17	47	125
	Groundfish Buyers that Do Not Buy from Groundfish Limited Entry Trawl Vessels												
>$2 Million	0	0	0	0	0	0	0	0	0	0	0	2	2
$1-$2 Million	0	0	0	0	0	0	0	0	0	2	2	4	8
$300 Thousand-$1 Million	0	2	0	0	2	0	3	1	2	1	5	13	29
$100-$300 Thousand	0	0	0	0	1	3	4	0	6	5	7	23	49
$20-$100 Thousand	3	6	10	7	9	18	12	9	10	7	12	28	131
$5 Thousand-$20 Thousand	8	21	22	14	13	11	15	12	6	4	8	3	137
<$5 Thousand	118	54	28	17	10	8	8	6	0	1	1	0	251
Total	129	83	60	38	35	40	42	28	24	20	35	73	607
Grand Total	596	277	192	107	82	86	59	57	50	47	76	151	1,780

Note: Each unique combination of buyer license and PacFIN port is counted as a separate buyer. In some cases, a particular buyer may have a presence in a port (be buying through a port), but have no facilities at that port. Source: Derived from PacFIN monthly vessel summary files.

TABLE 7-6. Number of groundfish buyers by seasonality of activity and amounts of purchases (exvessel value) for the year 2000 (excludes at-sea deliveries). (Page 1 of 2)

	Groundfish Buyers Total Expenditures on West Coast Landings							
Month During Which Any Species Was Purchased (Groundfish and Nongroundfish)	>$2 Million	$1-$2 Million	$300 Thousand - $1 Million	$100-$300 Thousand	$33-$100 Thousand	$5-$33 Thousand	<$5 Thousand	Totals
				Number of Processors				
Year Round	18	12	28	25	32	5	0	120
11 Month	1	4	12	12	14	8	1	52
10 Month	-	3	1	6	8	4	1	23
9 Month	-	-	3	6	10	6	0	25
7-8 Month	-	-	9	9	22	27	14	81
4-6 Month	-	-	7	13	37	42	35	134
1-3 Month	-	-	2	1	27	56	211	297
Total	19	19	62	72	150	148	262	732
Percent processing 10 or	100%	100%	66%	60%	36%	11%	1%	27%
				Number of 11 Month Buyers by Month Not Buying				
January			1	2	2			5
February				3	2	3		8
March		1		1	2			4
April			3	1				4
May								0
June						1		1
July				1	1			2
August						1		1
September			2		1	1		4
October		1			1	2		4
November	1	2	6	1	4			14
December				3	1		1	5
				Number of 10 Month Buyers by Months Not Buying				
January-February				1	1			2
January, March					2	1		3
January, November					1			1
January, July							1	1
January, October						1		1
February-March		1			1			2
February, December		1						1
February, September						1		1
March-April					1			1
March, May					1			1
August-September				1				1
October-November		1	1	1	1			4
November-December				3		1		4

TABLE 7-6. Number of groundfish buyers by seasonality of activity and amounts of purchases (exvessel value) for the year 2000 (excludes at-sea deliveries). (Page 2 of 2)

	Groundfish Buyers Total Expenditures on West Coast Landings							
Month During Which Any Species Was Purchased (Groundfish and Nongroundfish)	>$2 Million	$1-$2 Million	$300 Thousand - $1 Million	$100-$300 Thousand	$33-$100 Thousand	$5-$33 Thousand	<$5 Thousand	Totals
	Number of 10 and 11 Month Buyers Not Buying in Each Month							
January			1	3	6	2	1	13
February		2		4	4	4		14
March		2		1	7	2		12
April			3	1	1			5
May					1			1
June						1		1
July				1	1		1	3
August				1		1		2
September			2	1	1	2		6
October		2	1	1	2	3		9
November	1	3	7	5	6	1		22
December		1		6	1	1	1	10

Note: Each unique combination of buyer license and PacFIN port is counted as a separate buyer. In some cases, a particular buyer may have a presence in a port (be buying through a port), but have no facilities at that port. Source: Derived from PacFIN monthly vessel summary files.

TABLE 7-7 Percent of monthly exvessel value of all 2000 West Coast commercial fishery landings by month. (Page 1 of 1)

Species Group	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	Total
Sablefish	0.8	1.3	3.6	6.0	3.7	3.4	6.3	20.3	5.7	4.4	4.3	2.2	5.8
Whiting	0.0	0.0	0.0	0.2	1.9	3.5	7.6	6.7	4.4	0.0	0.0	0.0	2.3
Flatfish	8.9	5.5	5.4	7.1	4.1	3.2	3.2	2.7	2.7	3.0	3.2	3.0	4.2
Rockfish	2.5	3.3	5.6	6.5	5.6	4.7	5.6	3.3	5.9	5.0	6.8	3.2	4.6
Other GF	0.2	0.7	0.3	0.7	1.1	1.4	1.3	0.8	0.8	0.5	0.4	0.3	0.7
Shrimp/Prawns	1.6	2.7	3.8	6.8	7.1	16.2	14.3	8.2	8.3	5.0	1.6	1.3	6.2
Crab/Lobster	51.0	41.6	29.6	19.6	15.9	13.0	7.2	4.3	8.3	18.3	18.4	50.3	23.5
Salmon	0.2	0.3	0.2	0.7	17.1	13.7	10.0	13.6	13.3	8.2	2.0	0.4	6.9
HMS	1.2	6.5	2.6	4.7	1.1	1.4	7.3	16.3	19.8	19.6	8.6	6.7	8.9
CPS	13.5	13.3	11.3	10.6	8.1	6.1	7.8	4.9	6.5	11.6	25.0	15.4	11.0
Other	20.2	24.9	37.5	37.2	34.3	33.4	29.3	18.9	24.2	24.4	29.7	17.3	25.9
GF Total	12.3	10.9	14.9	20.4	16.5	16.1	24.0	33.8	19.5	12.8	14.7	8.7	17.5
Non GF Total	87.7	89.1	85.1	79.6	83.5	83.9	76.0	66.2	80.5	87.2	85.3	91.3	82.5
Region Total	100	100	100	100	100	100	100	100	100	100	100	100	100

Source: PacFIN

TABLE 7-8. Average coastwide exvessel prices for deliveries of West Coast species groups ($ per lb). (Page 1 of 2)

Year	Lingcod	Whiting, At Sea	Whiting, Shoreside	Flatfish	Sablefish	Rockfish	Other Groundfish	Total Groundfish	Total Groundfish - Less Whiting	Total Groundfish - Less At Sea Whiting	Pink Shrimp	Spot Prawn, Trawl	Spot Prawn, Pot	Ridgeback Prawn, Trawl	Pacific Halibut
1981	0.23	0.08	0.08	0.26	0.21	0.17	0.20	0.15	0.20	0.20	0.50	2.03	4.29	0.86	1.17
1982	0.25	0.08	0.08	0.27	0.25	0.20	0.25	0.17	0.23	0.23	0.51	2.27	4.96	1.17	1.20
1983	0.25	0.08	0.08	0.27	0.24	0.22	0.27	0.17	0.24	0.24	0.73	2.89	6.03	0.91	1.13
1984	0.24	0.07	0.07	0.27	0.22	0.25	0.27	0.16	0.25	0.24	0.46	3.40	0.00	0.57	0.84
1985	0.26	0.07	0.07	0.28	0.34	0.28	0.27	0.22	0.29	0.28	0.35	4.27	5.30	0.61	1.04
1986	0.32	0.06	0.06	0.30	0.38	0.31	0.33	0.19	0.32	0.31	0.53	4.47	4.10	0.82	1.51
1987	0.38	0.06	0.06	0.35	0.48	0.35	0.33	0.20	0.37	0.35	0.68	4.39	5.72	1.12	1.85
1988	0.37	0.08	0.08	0.35	0.52	0.32	0.27	0.18	0.36	0.34	0.41	4.74	4.92	1.27	1.93
1989	0.35	0.07	0.07	0.31	0.47	0.32	0.26	0.15	0.33	0.31	0.37	3.26	4.76	1.31	1.85
1990	0.35	0.06	0.06	0.28	0.48	0.34	0.25	0.15	0.34	0.31	0.49	3.79	4.95	1.36	2.68
1991	0.35	0.05	0.05	0.32	0.69	0.37	0.25	0.14	0.38	0.31	0.56	4.80	5.24	1.29	2.89
1992	0.39	0.06	0.05	0.30	0.66	0.39	0.26	0.14	0.39	0.24	0.35	5.61	6.13	2.20	2.17
1993	0.38	0.04	0.03	0.30	0.56	0.39	0.23	0.15	0.37	0.25	0.33	5.43	6.68	1.93	1.75
1994	0.39	0.04	0.03	0.31	0.83	0.46	0.25	0.13	0.44	0.23	0.59	5.85	6.88	1.35	2.30
1995	0.45	0.05	0.05	0.35	1.35	0.56	0.37	0.19	0.58	0.29	0.72	6.34	7.24	1.16	2.16
1996	0.46	0.05	0.03	0.34	1.41	0.50	0.34	0.16	0.56	0.26	0.60	6.57	7.09	1.34	2.31
1997	0.48	0.06	0.04	0.33	1.59	0.49	0.41	0.16	0.59	0.26	0.40	6.42	7.10	1.77	2.01
1998	0.64	0.04	0.02	0.34	1.17	0.50	0.61	0.12	0.51	0.19	0.53	6.53	7.21	1.76	1.62
1999	0.74	0.04	0.04	0.31	1.17	0.57	0.71	0.12	0.55	0.22	0.47	6.58	7.70	1.11	1.99
2000	1.08	0.04	0.04	0.39	1.47	0.68	0.80	0.14	0.69	0.23	0.40	8.19	9.16	1.15	2.46
2001	1.13	0.05	0.04	0.41	1.41	0.75	0.62	0.14	0.71	0.23	0.27	8.40	9.10	1.50	2.02
2002	1.12	0.05	0.05	0.41	1.40	0.84	0.56	0.15	0.68	0.27	0.28	8.03	9.15	1.34	1.96
1981-2001	0.34	0.06	0.04	0.31	0.64	0.35	0.35	0.15	0.38	0.26	0.46	5.67	6.91	1.16	1.70
1991-2002	0.44	0.05	0.04	0.34	1.10	0.48	0.40	0.14	0.50	0.25	0.42	6.70	7.39	1.31	2.09
1998-2002	0.83	0.04	0.04	0.37	1.32	0.61	0.65	0.13	0.61	0.22	0.35	7.24	8.37	1.25	2.00

NOTE: For 1981-1990, at-sea whiting catch estimates are from Council 1997.

TABLE 7-8. Average coastwide ex-vessel prices for deliveries of West Coast species groups ($ per lb). (Page 2 of 2)

Year	California Halibut	Salmon	Sea Cucumber	California Sheephead	Gillnet Complex	CPS Squid	CPS Wetfish	HMS	Dungeness Crab	Other Crus-taceans	Other Species	Total Non-groundfish	Total
1981	1.35	1.81	0.00	0.00	0.75	0.10	0.06	0.59	0.92	1.04	0.34	0.41	0.32
1982	1.39	1.92	0.18	0.00	0.73	0.10	0.06	0.53	1.08	1.45	0.27	0.40	0.31
1983	1.46	1.41	0.16	0.00	0.78	0.19	0.08	0.47	1.48	1.24	0.27	0.43	0.31
1984	1.70	2.24	0.19	0.00	0.77	0.23	0.08	0.51	1.59	1.65	0.21	0.43	0.30
1985	1.80	1.88	0.00	0.00	0.62	0.17	0.08	0.56	1.45	1.08	0.24	0.43	0.34
1986	1.99	1.55	0.21	0.00	0.63	0.10	0.08	0.55	1.39	1.54	0.21	0.42	0.31
1987	2.16	2.22	0.22	0.00	0.76	0.09	0.07	0.62	1.38	1.62	0.23	0.49	0.34
1988	2.27	2.47	0.20	0.00	0.81	0.10	0.08	0.73	1.18	1.83	0.26	0.50	0.34
1989	2.23	1.77	0.00	0.00	1.00	0.08	0.08	0.66	1.13	1.59	0.28	0.39	0.25
1990	2.35	2.13	0.25	0.00	0.97	0.08	0.06	0.70	1.53	1.47	0.44	0.48	0.28
1991	2.41	1.73	0.32	0.00	0.94	0.07	0.07	0.70	1.57	1.53	0.74	0.44	0.24
1992	2.41	2.05	0.00	0.00	1.13	0.09	0.07	0.86	1.17	1.90	0.81	0.52	0.27
1993	2.39	1.83	0.54	0.00	1.33	0.11	0.06	0.82	1.11	1.53	0.85	0.47	0.29
1994	2.70	1.83	0.65	2.88	1.18	0.12	0.07	0.84	1.35	2.13	0.94	0.53	0.26
1995	2.71	1.47	0.70	2.77	1.31	0.14	0.05	0.66	1.70	2.35	0.99	0.48	0.32
1996	2.58	1.28	0.65	2.74	1.29	0.12	0.05	0.70	1.37	2.45	0.94	0.47	0.30
1997	2.38	1.24	0.50	2.77	1.76	0.13	0.05	0.70	1.91	2.38	0.70	0.41	0.27
1998	2.31	1.40	0.59	2.64	1.59	0.25	0.05	0.62	1.79	2.29	0.49	0.47	0.23
1999	2.45	1.62	0.70	3.26	1.71	0.16	0.04	0.85	1.93	1.89	0.68	0.39	0.25
2000	2.81	1.71	0.94	3.41	1.75	0.10	0.05	1.03	2.15	2.30	0.68	0.32	0.24
2001	2.86	1.43	0.82	3.44	1.88	0.09	0.05	0.97	2.07	2.35	0.65	0.30	0.23
2002	2.92	1.27	0.84	3.40	1.94	0.11	0.05	0.77	1.69	2.56	0.41	0.30	0.25
1981-2001	2.29	1.83	0.63	2.95	0.93	0.11	0.06	0.61	1.49	1.82	0.42	0.42	0.28
1991-2002	2.55	1.53	0.67	2.95	1.42	0.12	0.05	0.77	1.61	2.12	0.76	0.41	0.26
1998-2002	2.62	1.48	0.78	3.15	1.78	0.12	0.05	0.81	1.92	2.28	0.57	0.34	0.24

NOTE: For 1981-1990, at-sea whiting catch estimates are from Council 1997.

TABLE 7-9. Producer Price Indices: Groundfish vs. Substitutes. (Page 1 of 1)

Year	Groundfish, fillets and steaks	Groundfish (cod, cusk, haddock, hake, perch, pollock, whiting)	Other frozen fish (salmon, flounder, halibut, etc.)	Meat products
1992	166.5	127.5	96.4	110.0
1993	161.3	122.9	94.2	113.6
1994	157.0	121.4	97.0	110.7
1995	164.8	126.1	95.3	109.3
1996	164.0	126.5	92.6	114.6
1997	177.8	131.2	96.6	116.1
1998	190.1	137.4	98.8	109.2
1999	216.7	153.0	99.3	108.9
2000	205.1	153.4	101.9	115.0
2001	190.5	145.5	94.9	120.3
2002	195.9	145.9	88.3	114.0
2003 (preliminary)	197.6	149.5	90.7	125.9

Source: U.S. Department of Labor, Bureau of Labor Statistics website (http://146.142.4.24/cgi-bin/srgate)

8.0 Fishing Communities

Fishing communities, as defined in the Magnuson-Stevens Act, include not only the people who actually catch the fish, but also those who share a common dependency on directly related fisheries-dependent services and industries. In commercial fishing this may include boatyards, fish handlers, processors, and ice suppliers. Similarly, entities that depend on recreational fishing may include tackle shops, small marinas, lodging facilities catering to out-of-town anglers, and tourism bureaus advertising charter fishing opportunities. People employed in fishery management and enforcement make up another component of fishing communities.

Fishing communities on the West Coast depend on commercial and/or recreational fisheries for many species. Participants in these fisheries employ a variety of fishing gears and combinations of gears. Naturally, community patterns of fishery participation vary coastwide and seasonally, based on species availability, the regulatory environment, and oceanographic and weather conditions. Communities are characterized by the mix of fishery operations, fishing areas, habitat types, seasonal patterns, and target species. While each community is unique, there are many similarities. For example, all face danger, safety issues, dwindling resources, and a multitude of state and federal regulations.

Individuals make up unique communities with differing cultural heritages and economic characteristics. Examples include a Vietnamese fishing community of San Francisco Bay and an Italian fishing community in Southern California. Native American communities with an interest in the groundfish fisheries are also considered. In most areas, fishers with a variety of ethnic backgrounds come together to form the fishing communities within local areas, drawn together by their common interests in economic and physical survival in an uncertain and changing ocean and regulatory environment.

This section provides an overview of West Coast fishing communities organized around regions comprising port groups and ports consistent with the organization of fish landings data in the PacFIN database. Ports are coded in PacFIN using a two- or three-letter code, or PCID; landings data from several sites may be combined under one of these ports.[19/] The ports have been further aggregated into 18 port groups. These port groups are designed to reduce issues surrounding the disclosure of confidential information (which could be a problem with very disaggregated data). Because ports and port groups are also units of analysis when evaluating socioeconomic and demographic characteristics, their boundaries are consistent with major civil boundaries, such as county and state lines. Figure 8-1 maps the ports and port groups (although the port group boundaries in this map are illustrative only). Table 8-1 lists the ports by state, port group, and county, and gives the PCID for each port.

The discussion here further aggregates these geographic entities into seven larger regions, each comprising one or more port groups: Puget Sound, the Washington coast, the northern Oregon coast, the southern Oregon coast, Northern California, Central California, and Southern California. Each subsection first describes the constituent port groups and ports and associated fleet characteristics. Socioeconomic and demographic characteristics are then summarized. The following tables provide the detailed source information for the description of fleet characteristics:

Table 8-2a: Landings at each port by species group in 1998.
Table 8-2b:Landings at each port by species group in 2002.
Table 8-3a: Exvessel revenue at each port by species group in 1998.
Table 8-3b: Exvessel revenue at each port by species group in 2002.
Table 8-4: Number of vessels by primary port and species group in 2001.

19/ Additional codes account for fish landed in unspecified locations.

Table 8-5: Number of vessels by primary port and vessel length class in 2001.
Table 8-6: Number of processors/buyers by primary port in 2001.
Table 8-7: Number of processors/buyers by purchase value of raw product by port group.

The socioeconomic and demographic descriptions are drawn from the following detailed tables:

Table 8-8: Income and employment from commercial fishing activities in 2001.
Table 8-9: Effort, personal income, and jobs related to recreational fishing on the West Coast in 2001.
Table 8-10: Urban and rural population at state, regional, and port levels in 2000.
Table 8-11: Racial composition at state, regional, and port levels in 2000.
Table 8-12: Hispanic population at state, regional, and port levels in 2000.
Table 8-13: Age distribution of the population at state, regional, and port levels in 2000.
Table 8-14: Educational attainment of the population at state, regional, and port levels in 2000.
Table 8-15: Unemployment and employment in natural-resource-related resource occupations at state, regional, and port levels in 2000.
Table 8-16: Median income, average income and poverty rate at state, regional, and port levels in 2000
Table 8-17a: and 8-17b: County-level economic profile.
Table 8-18: County unemployment rates, 2002.

Table 8-10 through 8-16 are derived from 2000 U.S. census data. This series of tables shows demographic characteristics at the state, port group, county, and port levels. Port- and port group-level data are derived in two ways. First, census places are used. The U.S. Census Bureau defines these entities as census designated places (CDPs), consolidated cities, and incorporated places.[20/] However, the following ports are not identified as census places: La Push, Grays Harbor, and Willapa Bay in Washington; Salmon River in Oregon; and Albion, Princeton, Avila Beach, Ventura, San Pedro, Wilmington, and Terminal Island in California. Furthermore, in rural areas population may be more dispersed so that the census places are less representative of population involved in the local economy. For these two reasons, ports have also been characterized by deriving data at the census block group level. Census block groups comprise several census blocks and contains between 600 and 3,000 people, with an optimum of 1,500.[21/] Block groups never cross county or state lines. A geographic information system (GIS) was used to select block groups covering an area coincident with the corresponding census place in urban areas and a somewhat larger area in rural areas.[22/] For the ports without corresponding census places, Zip Code Tabulation Areas were used in all cases except Salmon River, Oregon, were a point designating the location of a boat landing was used. Demographic data are only reported for the "block group equivalent area" in these cases. The block groups comprising the block group equivalent areas were further filtered by choosing only those within 10 miles of the coast. Block group equivalent areas have a larger population for ports in rural areas. In urban areas there is typically little or no population difference between the block group area and the census place. In a few cases, such as San Diego, the population of the block group equivalent area may actually be smaller because part of the census place lies further than 10 miles from the coast. Figures 8-2 through 8-5 show the

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20/ In some cases more than one census place corresponds to a port. These are: Port Angeles and Port Angeles East; Crescent City, Bertsch Oceanview, and Crescent City North; and Newport Beach and Newport Coast CDP. Demographics are reported separately for these places in the tables.

21/ Because block groups are delineated to limit the variation in population size between block groups, the geographic size of block groups can vary substantially. In urban areas, with high population density, block groups are smaller than in rural areas where population density is lower. This explains why block groups representing ports in rural areas cover large geographic areas in comparison to the census place.

22/ The basic query rule for selecting block groups in rural areas was to choose block groups whose boundaries fell within a half-mile of the boundary of the census place.

correspondence between census places and the block group equivalents for West Coast ports. (In the figures darker shading indicates census places, lighter shading block group equivalents.)

8.1 Washington State

8.1.1 Puget Sound

8.1.1.1 Port Infrastructure and Fleet Characteristics

Puget Sound is dominated by the Seattle metropolitan area; the city is a regional population center and economically important regionally and nationally. Seattle has traditionally been an important entrepôt for Alaska, and many of the large catcher-processors participating in Alaskan fisheries are based there. Blaine and Bellingham, both north of Seattle, are important ports for groundfish vessels.

In 2002, 3,794 mt of groundfish were landed in the Puget Sound port group (Table 8-2b), a smaller amount than most other port groups in Washington and Oregon. Exvessel revenue from Puget Sound landings in 2002 was relatively high at $3.3 million, comparable to other port groups in Washington (Table 8-3b). This is partly explained by the large amounts of high-value sablefish landed in this region; flatfish are also a large component of landings than in other port groups.

As shown in Table 8-4, about one-third of the port group's fishing vessels home port in Bellingham in 2001.[23/] As described in Section 1.2.4, a vessel buyback program permanently retired 91 groundfish limited entry trawl vessels and associated permits. Thus the current number of limited entry trawl vessels is less than what is reported in Table 8-4. A recent report (NMFS 2004a) provides information on the home ports of retired vessels. Where appropriate, changes in vessel numbers are noted. Bellingham and Blaine—on Puget Sound near the Canadian border—hosted all nine of the region's groundfish limited entry trawl vessels and almost all the limited entry fixed gear vessels. However, the aforementioned report shows that four vessels were retired in Bellingham and one in Blaine. Seattle is a distant second in terms of the number of vessels participating in West Coast fisheries, with 93, and only two limited entry fixed gear vessels port there. But many of the vessels listed as at-sea only—which participate in the Pacific whiting fishery—are likely part of the fleet based in Seattle and also fishing in Alaska. Otherwise, Puget Sound is less important as a center for West Coast groundfish vessels; with 36 vessels listed under this total in Table 8-4 it ranks near the bottom among the port groups. In terms of the distribution of different sized vessels, Puget Sound is consistent with the West Coast as a whole, with about two-thirds of the vessels under 40 feet; one of the two vessels over 150 feet participating in West Coast fisheries is based in Seattle, however (Table 8-5).

[23/] Table 8-4 actually counts vessels based on fish landings. In some cases, a vessel's primary port for landings may not be its home port. To simplify the description, however, these primary ports are also referred to as the home port.

8.1.1.2 Community Demographics

Puget Sound demographics at a glance:

	Value	Rank
Total population:	749,916	3
Urban population	97.2%	5
Non-white population:	25%	5
Hispanic population:	5.5%	11
Working age population (17-64):	69.4%	4
High school graduate and higher*:	88.1%	4
Natural resource-related employment**:	0.4%	15
Average household income:	$58,327	7
Poverty rate:	11.6%	12

(Values from Tables 8-10 through 8-16 for block group equivalent areas. Census data, 2000. *Some college, bachelor and graduate degrees. **Population employed in private sector natural resource-related occupation.)

As noted above, the Puget Sound is a major population center on the West Coast and is largely urban. Washington and Oregon, and the more rural coastal areas in particular, are less racially and ethnically diverse than coastal California, especially Southern California. The Puget Sound region has the fifth-largest percent non-white population of the port groups, or about a quarter of the population. All the other port groups with larger percent non-white populations are in Central and Southern California. Hawaiian and Pacific Islanders represent largest non-white racial group with 10% of the population for the port group and 13% of Seattle's population. (As might be expected, Seattle and Tacoma are the most ethnically diverse census places in this port group.) Puget Sound ranks eleventh among the port groups for the percentage of the population that is Hispanic (Table 8-12), fourteenth if looking at census places, suggesting that the Hispanic population is more rural. Comparing communities within the Puget Sound port group, Skagit County, and the La Conner environs in particular, and also Shelton have a proportionately large Hispanic population, although the absolute numbers in these more rural communities are small.

Employment- and income-related statistics reflect the area's urbanism and economic activity. A large proportion of the population is of working age (defined as between 17 to 64 year olds) and incomes are relatively high, although these data, from the 2000 census and representing income in 1999, do not reflect the subsequent economic down-turn. As has been widely reported, Washington and Oregon unemployment rates were the highest in the nation in subsequent years; employment in Oregon especially has been slow to rebound. Median income values, which are reported in the census, cannot be aggregated and are thus not available for the port area, although Table 8-16 shows this statistic for states, counties and census places. (Median income is a better measure of economic well being of the population at large since it is not skewed by a relative few "outlier" high income earners.) Of census places, Seattle has the highest median income in this port group, $45,736, which is very close to the value for Washington state as a whole. The counties impinging on the port areas (which, as defined by census place or block group equivalent generally exclude inland areas of counties) generally show higher median and average incomes, probably reflecting greater wealth in surrounding suburbs.

Table 8-8 shows economic modeling estimates of income and employment derived from fisheries (for November 2002 to October 2001.)[24/] Puget Sound ranks at the bottom in terms of the share of personal

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[24/] Table 8-8 displays estimated income and employment resulting from all commercial fishing activities for each port area group. (Note that the time period differs from that for the data in Tables 8-2 and 8-3, showing landings by weight and revenue.) Indices were calculated as the percentage of total area personal income or total employment that is generated by commercial fishing and processing activities via local economic linkages. Note that income and employment rankings for all commercial fishery (continued...)

income and employment derived from all commercial fishing activities. The relative unimportance of fisheries as a share of total income and employment in the region reflects its economic dynamism, with many industries—notably computer software and commercial aircraft manufacture—providing substantial income and employment. However, looking at fishery-related income alone, at 61%, more of it is derived from groundfish-fishery-related activities than in any of the other port areas. Thus, groundfish fisheries play an important role in what is a relatively small sector of the total regional economy.

8.1.2 Washington Coast (North Washington Coast and Central and South Washington Coast)

8.1.2.1 Port Infrastructure and Fleet Characteristics

Ports in the Straits of Juan de Fuca, along the north coast of the Olympic Peninsula, and Pacific coast of the peninsula are part of the North Washington Coast port group. The Central and South Washington Coast port group continues south to the Columbia River border with Oregon. The South and Central Washington Coast shows the largest groundfish landings of the three Washington port groups in 2002, with 13,247 mt (Table 8-2b). However, most of this is relatively low-value Pacific whiting delivered to shore-based processing plants. As a result, the North Washington Coast, with greater landings of higher value species such as sablefish shows more ex-vessel revenue in 2002—$3.4 million versus $2.6 million (Table 8-3b). It is important to note, however, that the treaty Indian tribes participating in West Coast groundfish fisheries are located in these two port groups and landings from their fisheries are not reflected in Tables 8-2 and 8-3. Because of the Pacific whiting landings, the Central and South Washington Coast ranks third among the port groups for total groundfish landings in 2002. In terms of landings value, however, these two port areas are similar to other port groups in southern Oregon and Washington—northern Oregon ports have notably higher exvessel revenue while Southern California ports have significantly less. The South Washington Coast is also a major center for several nongroundfish fisheries, and measured by its $34.4 million in exvessel revenue from all fisheries in 2002, is the largest port area on the West Coast. High-value Dungeness crab is the big contributor to this total.

The South Coast has almost twice as many vessels involved in the groundfish fishery as the North Coast port group—97 versus and 52. (Note that in Table 8-4 Central and South Washington are listed separately.) Port Angeles, Neah Bay, and La Push are the only ports in the North Coast region hosting groundfish vessels, with no limited entry trawl vessels listed for La Push. Neah Bay is home to the Makah Tribe, while La Push is near the Quileute Indian reservation and it is likely that some of the five vessels ported there are involved in the tribal fishery sector. However, Port Angeles is the delivery port for the bulk of limited entry fixed gear and open access groundfish vessels in the North Coast region. Westport and Ilwaco are the dominant ports for groundfish in the Central and South Coast port group. Ilwaco has relatively few groundfish limited entry vessels, but comparable numbers of groundfish open access vessels, so that its total of 42 groundfish vessels is only nine less than the 51 in Westport. According to Table 8-5, most of the larger vessels, in excess of 60 feet, are ported in Westport and Ilwaco. Some of these are likely participants in groundfish fisheries, particularly the industrial fishery for Pacific whiting.

24/ (...continued)
activity are broadly consistent, but show slight discrepancies due to differing shares of wage and non-wage income in each area's total personal income. Also displayed in the table are estimated income and employment derived from the groundfish fishery, split between limited entry trawl and other groundfish gear.

8.1.2.2 Community Demographics

Washington Coast demographics at a glance:

	North Coast		Central/South Coast	
	Value	Rank	Value	Rank
Total population:	58,855	7	39,574	11
Urban population	63.1%	12	60.5%	13
Non-white population:	9.8%	13	9.6%	14
Hispanic population:	2.3%	18	5.0%	14
Working age population (17-64):	58.1%	16	58.5	15
High school graduate and higher*:	87.7%	5	78.8%	15
Natural resource-related employment**:	1.92%	13	3.72%	3
Average household income:	$45,252	11	$40,188	15
Poverty rate:	12.6%	7	15.0%	4

(Values from Tables 8-10 through 8-16 for block group equivalent areas. Census data, 2000. *Some college, bachelor and graduate degrees. **Population employed in private sector natural resource-related occupation.)

These two port groups are sparsely populated, more rural areas. Both are less ethnically diverse than most of the other port groups; lower ranked port groups for this statistic are on the Oregon coast. However, these regions have large Native American populations, at least proportionately, and rank third and seventh for this statistic (Table 8-11). Both port groups also have a comparatively lower proportion of working age population. The North Coast port group includes some communities with a large number of retirees. Forty-six percent of the population in Sequim, for example, is 65 and older. The Central and South Coast port group is noticeably worse off in terms of other socioeconomic indicators of education and income. But Neah Bay, in the North Coast group, has the lowest median income, at $21,635 in 1999, of any of the ports that are also census places.

Earnings from and employment in fishing-related activities is important in the Washington Coast port groups. The South Coast ranked first for the proportion of total personal income that is derived from fishing activities at 4.8%, with the Central and North Coast regions ranking fifth and ninth (Table 8-8) in 2001. This is consistent with the employment-related census data discussed above. Groundfish-related revenues are a less important component of fisheries-related income and employment on the South Coast, however, in comparison to the Central and North Coast regions. Fifty-nine percent of fisheries income was derived from groundfish-related activities on the North Coast, for example, as compared to only 7.4% on the South Coast in 2001. (Note that the Central and South Coasts are split out in Table 8-8.)

8.2 Oregon

8.2.1 North Oregon Coast (Astoria, Tillamook, and Newport)

8.2.1.1 Port Infrastructure and Fleet Characteristics

The north Oregon coast is the most important groundfish region on the West Coast in terms of total groundfish landings and revenue. These port groups accounted for $12.3 million in exvessel groundfish revenue in 2002, almost a quarter of the $51.5 million coastwide total, including at-sea deliveries (Table 8-3b). (Note that the bulk of the at-sea deliveries—which are Pacific whiting delivered to floating processors—are attributable to these port groups.) Astoria-Tillamook, grouped as one port area in the fishery-related tables (but split out in the demographic tables), and Newport are at or near the top of all the groundfish species categories shown in Tables 8-2 and 8-3, indicating that although the high-volume whiting fishery is centered in this region, other groundfish are equally important, surpassing whiting in terms of exvessel revenue. For example, these two port areas rank second and third behind the North Washington Coast for sablefish landings.

Table 8-4 shows that Astoria and Newport are home to a large fraction of the limited entry groundfish trawl fleet with 57 of the 243 total vessels in the fleet in 2002. The vessel buyback program retired 13 limited entry trawl vessels in Astoria and six trawlers in Newport in 2003 (NMFS 2004a). Table 8-5 shows that these port areas have a relatively large number of vessels in the 60 foot and above length classes, also reflecting the larger limited entry trawlers fishing out of these ports.

8.2.1.2 Community Demographics

North Oregon coast demographics at a glance:

	Astoria		Tillamook		Newport	
	Value	Rank	Value	Rank	Value	Rank
Total population:	39,957	12	19,876	17	24,335	14
Urban population	71.51%	11	28.51%	18	61.21%	13
Non-white population:	7.4%	16	5.47%	18	10.4	11
Hispanic population:	5.1%	13	5.1%	12	4.8%	15
Working age population (17-64):	62.9%	11	59.8%	14	60.87	13
High school graduate and higher*:	85.0%	7	85.0%	8	85.3%	6
Natural resource-related employment**:	2.07%	11	7.31%	1	2.5%	9
Average household income:	$45,399	10	$42,730	13	$44,715	12
Poverty rate:	12.3%	10	11.4%	13	10.9%	14

(Values from Tables 8-10 through 8-16 for block group equivalent areas. Census data, 2000. *Some college, bachelor and graduate degrees. **Population employed in private sector natural resource-related occupation.)

These port groups are demographically quite similar. Tillamook is much more rural, ranking lowest for urban population of all the port groups. (Even looking at the value for census places, Tillamook ranks fourteenth in terms of urban population, with 70%.) It is also the least racially diverse port group and has the highest proportion of the population involved in natural resource-related occupations (farming, forestry, fishing, and hunting). Of these three areas, Newport has the highest percent nonwhite population, and Native Americans represent the largest share of this population with 3.2% of the total population. These port groups rank in the middle in terms of educational attainment. Although average income is comparatively modest, poverty rates also rank lower, which could suggest less wealth disparity in these areas. However, looking at rates for individual census places suggests pockets of poverty in some areas. The rate for Astoria is 15.2% while Siletz Bay in the Newport port group has a 15.7% poverty rate. Siletz Bay also has a large percentage of Native Americans: they make up 19.3% of the population. Median incomes range from a low of $31,074 for Seaside in the Astoria port group to a high of $40,250 in Nehalem Bay in the Tillamook port group, which has the lowest average income of the three.

Fishery-related income and employment are important in these port groups as evidenced by Table 8-8. Newport ranked second while Astoria-Tillamook ranked fourth in terms of contribution fisheries activities made to these economic indicators in 2001. About half of all fisheries income in these port groups was derived from groundfish-fishery-related activities in that year, reflecting the significance of these ports to the West Coast groundfish fishery, discussed above.

8.2.2 South Oregon Coast (Coos Bay and Brookings)

8.2.2.1 Port Infrastructure and Fleet Characteristics

The Pacific whiting fishery diminishes in importance, measured by landings and exvessel revenue in southern Oregon. Although still a component of the Coos Bay port group landings, no whiting landings are shown in the Brookings region. Table 8-2b shows that groundfish landings in the Brooking port group for 2002, at 881 mt, were less than any other port group north of San Francisco. However, with $2.3 million in exvessel revenue from groundfish in 2002, the Brookings port group is not substantially smaller than most of the other port groups. The rockfish category contributes most to revenues in Brookings. Because many of these are sold as live fish, which command higher prices, Brookings ports earned more revenue from fewer landed fish in comparison to the neighboring Coos Bay port group. As noted in Section 6.1.3, live fish deliveries are an important component of California groundfish fisheries, and increasingly in southern Oregon as well. Also, as a proportion of revenue from all fisheries, groundfish are especially important in the Brooking region: the $2.3 million value amounts to just over half the $4.3 million in landings from all fisheries shown in Table 8-3b for 2002.

Looking at Table 8-4, there are some notable differences in fleet characteristics between these two port groups. Coos Bay had 29 limited entry groundfish trawlers in 2001 versus only four in Brookings. The vessel buyback program retired eight limited entry trawl vessels in Coos Bay. Five retired vessels are reported for Brookings out of a total of nine (NMFS 2004a), more than the 2001 count shown in Table 8-4. This discrepancy is likely due to differences in the way vessel home ports are determined. Port Orford in the Brookings port group had a fleet of limited entry fixed vessels numbering 14 in 2001. The table also shows a large number of vessels in the open access category of more than 5% of revenue from groundfish in the Brookings port group. Some of these vessels are likely participating in the live fish fishery and contributing to high-value rockfish landings.

8.2.2.2 Community Demographics

South Oregon coast demographics at a glance:

	Coos Bay		Brookings	
	Value	Rank	Value	Rank
Total population:	59,901	8	20,137	16
Urban population	80.44%	9	49.2%	15
Non-white population:	7.8%	15	6.7%	17
Hispanic population:	3.1%	17	3.4%	16
Working age population (17-64):	57.6%	17	55.5%	18
High school graduate and higher*:	83.0%	11	81.3%	13
Natural resource-related employment**:	2.52%	8	3.0%	5
Average household income:	$39,553	18	$39,563	17
Poverty rate:	14.8%	5	13.3%	6

(Values from Tables 8-10 through 8-16 for block group equivalent areas. Census data, 2000. *Some college, bachelor and graduate degrees. **Population employed in private sector natural resource-related occupation.)

These two fairly rural port groups are generally similar to northern Oregon ports in terms of race and ethnicity, or the comparatively small percentage of the population that is non-white and Hispanic. Native Americans are the largest minority group at a little over two percent in both port groups. These two port groups rank at the bottom for the percent of the population between 17 and 64; Coos Bay ranks first for population 65 years old and up, Brookings third. This reflects the popularity of this part of the Oregon coast as a retirement destination. They also rank at the bottom in terms of average household income and have fairly high poverty rates. Median incomes in constituent census places, however, are higher than in some Northern California communities (see below), ranging from $31,656 in Brookings to $29,492 in Bandon. These values are about two-thirds the statewide value of $40,916. Table 8-8 shows that fisheries made a modest contribution to income and employment in 2001, with Brookings ranking somewhat higher than Coos Bay for the percent share coming from fisheries.

8.3 California

8.3.1 Northern California (Crescent City, Eureka, and Fort Bragg)

8.3.1.1 Port Infrastructure and Fleet Characteristics

Groundfish are an important component of landings, measured by value, in Northern California even if the total amount of groundfish landed in these three port groups is less than for most port groups in Washington and Oregon. Referring to Table 8-3b, in 2002 groundfish landings accounted for 29% of total exvessel revenues in these three port groups compared to 34% in Oregon and 18% in Washington. During this year these port groups also accounted for a little over half of the value of all groundfish landed in California but only about a quarter of all fishery landings in California (Table 8-3b). Yet the amount of groundfish landed in these three port groups, 8,303 mt in 2002, is less than that landed in any one of three port groups in Washington and Oregon (South and Central Washington, Astoria-Tillamook, and Newport) and less than the sum of any three port groups in those two states. As in southern Oregon, rockfish and lingcod are an important component of landings, measured by exvessel revenue. In Fort Bragg rockfish were the largest component of groundfish landings, as shown in Table 8-3b. As mentioned above, this likely reflects the importance of high-value live fish deliveries. Eureka represents the southern terminus of the Pacific whiting fishery in terms of landings ports with 2,775 mt landed there in 2002, a small amount in comparison to landings in southern Washington and northern Oregon.

The total number of groundfish vessels in each of these three port groups is less than in Oregon port groups, although greater than port groups in Washington (Table 8-4). However, the largest number of limited entry trawl vessels were retired by the vessel buyback program in this region. According to the report (NMFS 2004a), 14 vessels each were retired in Crescent City and Eureka. Another four vessels in Fort Bragg were retired. The open access sector also plays a larger role in these ports. In Eureka, for example, of the 98 vessels making groundfish landings in 2001, 68 were in the open access sector with groundfish accounting for more than 5% of their revenue for the year. Smaller vessels are more prevalent in the fishing fleets in these port groups; only 7% of the vessels are in the 60 feet and above size groups, half or less of the comparable percentage in Oregon port groups such as Astoria-Tillamook and Newport.

8.3.1.2 Community Demographics

Northern California coast demographics at a glance:

	Crescent City		Eureka		Fort Bragg	
	Value	Rank	Value	Rank	Value	Rank
Total population:	24,472	13	52,460	9	21,237	15
Urban population	76.3%	10	82.5%	8	43.9%	17
Non-white population:	20.9	6	14.5	9	14.7	8
Hispanic population:	13.0%	7	6.2%	9	14.1%	6
Working age population (17-64):	64.8%	6	64.6%	7	73.9%	8
High school graduate and higher*:	71.4%	18	84.8	9	84.0	10
Natural resource-related employment**:	2.6%	12	2.0%	12	5.1%	2
Average household income:	$39,654	16	$41,482	14	$49,781	9
Poverty rate:	18.5%	1	17.3%	2	12.5%	8

(Values from Tables 8-10 through 8-16 for block group equivalent areas. Census data, 2000. *Some college, bachelor and graduate degrees. **Population employed in private sector natural resource-related occupation.)

Hispanics are the largest minority group in these three port groups, although their share of the population is less than in most of the other port groups in California. The next largest minority groups after Hispanics is Native Americans, which make up 5.4% of the population in the Crescent City area, 4.0% in Eureka, and 2.9% in Fort Bragg, ranking them first, third, and fifth among the port groups, respectively, for this statistic.

Crescent City and Eureka rank low in terms of average household income and have the highest poverty rates among all the port groups. Median incomes in constituent census places are also comparatively low; in fact the median income for Crescent City—$20,133—is less than half the value for California as a whole. Fort Bragg is notable in terms of the comparatively high percentage of the population employed in natural resource related jobs. As shown in Table 8-8, estimated employment in fisheries in 2001 was relatively high in Crescent City but more modest in the other two port groups. Groundfish fisheries played a more prominent role in Eureka than the other two port groups in this region, likely because of the shore-based processing of Pacific whiting at this port.

8.3.2 Central California (Bodega Bay, San Francisco, Monterey, and Morro Bay)

8.3.2.1 Port Infrastructure and Fleet Characteristics

In Central California, and Southern California especially (see below), groundfish diminish as a significant component of commercial landings. In 2002 San Francisco ranked below Eureka and Fort Bragg port groups in terms of the amount of groundfish landings, but second only to Eureka in California measured by exvessel value. (Note that in the fishery-related tables, as opposed to the demographic tables, Bodega Bay ports are included in the San Francisco port group.) Rockfish were an important component of landings in all three port groups in 2002, but in Morro Bay especially they provided a large portion of exvessel revenue. As noted above, this reflects the importance of the live fish fishery. Flatfish are also an important contributor to landings in all three port groups, while sablefish are significant in the Monterey port group.

As in Northern California, open access vessels were an important part of the fleet in these port groups, based on landings at member ports, as shown in Table 8-4. The limited entry trawl vessel buyback program retired 11 vessels in this region (NMFS 2004a), further reducing the importance of that sector. Taking the three port groups together, 86% of vessels making groundfish landings were in the open access sector, and the great majority of these likely targeted groundfish on some trips, given the number for which groundfish account for more than 5% of total landings value. In Morro Bay almost all of these vessels made landings of nearshore species, again suggesting the importance of the live fish fishery—which targets fish in relatively shallow water—in this port group. Table 8-5 shows that these port groups have more smaller vessels—97.5% are less than 60 feet in comparison to the coastwide value of 92%.

8.3.2.2 Community Demographics

Central California coast demographics at a glance:

	Bodega Bay		San Francisco		Monterey		Morro Bay	
	Value	Rank	Value	Rank	Value	Rank	Value	Rank
Total population:	15,592	18	1,484,046	1	112,344	6	40,812	10
Urban population	49.1%	16	99.7%	2	92.5%	6	87.7%	7
Non-white population:	11.0%	10	55.0%	1	20.1%	7	10.3%	12
Hispanic population:	9.2%	9	16.7%	4	16.0%	5	10.9%	8
Working age population (17-64):	73.9%	1	70.0%	3	72.2%	2	61.6%	12
High school graduate and higher*:	93.9%	1	80.1%	14	89.3%	3	91.2%	2
Natural resource-related employment**:	2.8%	6	0.1%	18	1.0%	14	2.4%	10
Average household income:	$108,183	1	$72,203	2	$67,623	3	$56,804	8
Poverty rate:	6.3%	18	12.3%	9	10.3%	15	9.9%	17

(Values from Tables 8-10 through 8-16 for block group equivalent areas. Census data, 2000. *Some college, bachelor and graduate degrees. **Population employed in private sector natural resource-related occupation.)

This region is more ethnically diverse, better educated and wealthier than port groups to the north. Like Seattle in Puget Sound, San Francisco and the Bay Area conurbation dominate this region in terms of population and economic activity. The sparsely populated Bodega Bay port group includes affluent Sausalito, just across the Golden Gate Bridge from San Francisco. Its median income of $87,469 places it above all other communities except for the Newport Coast CDP in Southern California. Yet all of these port groups compare positively in terms of the statistics measuring income and education, with Morro Bay somewhat of a laggard in comparison to the other three port groups. As might be expected, natural resource related employment is insignificant in the San Francisco port group and modest in the other three. Table 8-8 further underscores the relatively unimportant role that fisheries play in large regional economy of Central California. These ports rank near the bottom of the West Coast port groups in estimates of 2001 income and employment from fisheries. Groundfish-related activities were also a less important share of fisheries income and employment in the Central California port groups, outranking only Southern California.

8.3.3 Southern California (Santa Barbara, Los Angeles, and San Diego)

8.3.3.1 Port Infrastructure and Fleet Characteristics

Commercial groundfish fisheries are relatively unimportant in Southern California; these port groups show groundfish exvessel revenue in 2002 somewhat greater than a half a million dollars in each group (Table 8-3b). Half of that revenue, or better, came from rockfish. In contrast, Los Angeles ranked second (behind the South Washington Coast) for exvessel revenue from all fisheries on the West Coast, and Santa Barbara ranked fourth in 2002. Table 8-9 shows the importance of recreational fisheries for groundfish in this region: an estimated $37.2 million in income was generated in 2001. (This statistic cannot be directly compared to the exvessel revenue figures in Tables 8-3a and 8-3b because income includes a wider range of economic activity than what is reflected in exvessel revenue. Nonetheless, it suggests that recreational groundfish fisheries play a greater role in the regional economy than commercial groundfish fisheries.)

Table 8-4 shows that this region is dominated by open access groundfish fisheries. No groundfish limited entry trawlers operate out of these ports and only a modest number of limited entry fixed gear vessels do. Of the 258 vessels making groundfish landings at these ports in 2001, 236 were in the open access sector.

8.3.3.2 Community Demographics

Southern California coast demographics at a glance:

	Santa Barbara		Los Angeles		San Diego	
	Value	Rank	Value	Rank	Value	Rank
Total population:	400,353	5	703,511	4	1,336,350	2
Urban population	99.2%	3	100.0%	1	99.6%	3
Non-white population:	39.2%	3	46.9%	2	38.8%	4
Hispanic population:	45.8%	1	35.8%	2	26.0%	3
Working age population (17-64):	63.8%	10	63.8%	9	66.2%	5
High school graduate and higher*:	73.8%	17	75.1%	16	82.5%	12
Natural resource-related employment**:	3.4%	4	0.1%	17	0.2%	16
Average household income:	$63,423	5	$64,901	4	$61,947	6
Poverty rate:	9.9%	16	15.6%	3	11.9%	11

(Values from Tables 8-10 through 8-16 for block group equivalent areas. Census data, 2000. *Some college, bachelor and graduate degrees. **Population employed in private sector natural resource-related occupation.)

Coastal Southern California is overwhelmingly urban and the most racially and ethnically diverse region on the West Coast. Los Angeles is the preeminent urban center on the West Coast. As might be expected, these port groups rank at the top for the percent of the population that is Hispanic. The population value for the Los Angeles port group is somewhat misleading because it includes a small subset of the cities and communities in the Los Angeles area. In comparison, the combined population of Los Angeles and Orange counties is 7.7 million. The Los Angeles ports in particular show significant disparities in economic well-being. The Newport Coast CDP, for example, has the highest median income of the West Coast port areas—$164,653—and an average income of $264,648. This is more than four times the average income for the port group as a whole. To a lesser degree, there are these types of disparities in the Santa Barbara port group. Santa Barbara itself is a quite affluent city while the coastal areas in Ventura county to the south, also part of the port group, have fewer wealthy residents. Comparison of the median and average income values for Santa Barbara and the other ports in the port group reflect the differences in income distribution. There is a much greater difference between median income and average income in Santa Barbara compared to the other ports. For example, median household income in Santa Barbara is less than in Oxnard while average household income is greater.

The estimates of income and employment derived from fisheries are comparatively small for these port groups; Santa Barbara ranks higher than the other two but still in the bottom half of all West Coast port groups. These port groups rank at the bottom of the port roups in terms of the share groundfish contributes to fishery-related income.

8.4 Coastwide Summary

8.4.1 Dependence on and Engagement in Fishing and Fishing-related Activities

By examining the rankings in the first block of Table 8-8 we get an idea of how engaged each port area is in commercial fishing relative to other opportunities in the regional economy. Both the income and employment measures show that the south Washington coast is the area most heavily invested in commercial fishing relative to its economy. Newport and Astoria-Tillamook in Oregon, and Crescent City, California, are the next most engaged. Brookings and Central Washington coast alternate for fifth and sixth place, depending on whether the income or employment measure is used. By this measure the least engaged port areas are the large, relatively urbanized centers of Puget Sound, San Diego, San Francisco, and Los Angeles. While these areas certainly include local pockets that are heavily engaged in fishing activities, the size and diversity of the surrounding economies tend to mask the significance of locally important factors.

The second block on the first page of Table 8-8 shows how much of the total fishery-related income and employment in each region is generated by groundfish activity. This measure shows Puget Sound, North Washington Coast, Astoria-Tillamook, and Eureka all depend on groundfish for at least 50% of fishery-related income and employment. All but four of the port groups generate at least 14% of fishery-related income from groundfish.

The second page of Table 8-8 splits the groundfish totals into limited entry trawl and other gear components. From this information we see that of the regions highly involved in groundfish, Astoria-Tillamook, Puget Sound, Newport, and Eureka-derive more than 40% of groundfish income from the limited entry trawl fishery. Only the North Washington coast derives more than one-third of groundfish income from nontrawl sources.

Table 8-9 shows estimated personal income generated in 2001 by the West Coast ocean recreational fishery. These estimates were also generated using the Fisheries Economic Assessment Model (or FEAM, see Jensen 1996). The ocean recreational fishery accounted for $254 million in personal income and almost 10,000 jobs in 2001. Of this, groundfish trips accounted for $71 million and 2,800 jobs, respectively, or about 28% of the total. The proportion of income associated with groundfish trips ranged from 17% in Washington to 45% in Oregon. The ratio of charter angler trips to private vessel participation was much greater in Northern and Southern California than in Washington and Oregon, probably reflecting differences in species opportunities, season length and weather along the coast.

8.4.2 County Economic Indicators

Tables 8-17a and 8-17b display the most recent (2001) information on the components of total personal income in counties along the West Coast, Puget Sound, and Lower Columbia River by county. The counties are ranked on the basis of several different average or per capita income measures. In terms of total per capita personal income, the urban Northern California counties are on top, with Marin county ranked number one, followed by two other Bay Area counties: San Mateo and San Francisco. San Mateo and San Francisco also rank first and second in terms of average annual wage, a measure of the strength of these economies as centers of high wage employment, with King county Washington at number three. Marin, San Mateo, and San Francisco counties are ranked first, second, and third in terms of per capita non-labor income (dividends, interest and rent). The status of Marin county as a top bedroom community for San Francisco-bound commuters is betrayed by its ranking as number one in terms of residence adjustment, a net measure of income brought home by resident commuters minus the income carried out by non-residents. The number two and three spots in this category are held by Contra Costa, California, and Columbia County, Oregon, respectively. The four poorest counties in the region, measured by per capita income, are Del Norte County in California, and Klickitat, Pacific, and Grays Harbor counties in Washington.

Transfer payments include welfare and Social Security benefits received from federal, state, and local governments. As such, it can be both a measure of how dependent an area is on public assistance or an indicator of how attractive an area is as a retirement destination. By this measure, Pacific County, Washington, is number one, followed by Curry County, Oregon and Clallam County in Washington. Looking at dividends, interest, and rent (a measure of wealth) expands this picture. By this measure, Curry and Clallam counties rank relatively high (7th and 11th respectively), but Pacific County is well down the list at thirty-third, indicating that Pacific is probably the poorer of the three counties.

Table 8-18 shows 2002 unemployment rates in coastal counties, the latest available county-level data. Counties with relatively high unemployment rates are arrayed along the lower Washington coast, Columbia River, and southern Oregon coast. Monterey and Del Norte were the only counties in California with unemployment rates among the highest ten. Three of the four counties with highest unemployment rates in 2002 were located in southwestern Washington.

Table 8-18 also displays the national average unemployment rate and the state averages for the three coastal states. Unemployment rates for all three states were significantly above the national average in 2002. In Washington, 11 of the 15 counties displayed had higher unemployment rates than the state average. In Oregon, 7 of 11 counties displayed had higher than state-average unemployment. In California, 7 of 19 counties displayed had unemployment rates higher than the state average.

8.4.3 Social Structure: Networks, Values, Identity

The fishing community on the West Coast is composed of many separate communities based on fishery, gear type, targeted species, geography and, to some degree, cultural background and ethnicity. For example, Astoria, Oregon, has Finnish roots that are celebrated in community festivals, and Native American communities have ties to the fishery that date back thousands of years.

Commercial fishing enterprises in Washington, Oregon, and California are socially and culturally diverse. However, most tend to be family-run businesses. While most fishers are male, women are often involved in the shoreside aspects of the fishing business and provide an important support and communications network for the fishing community. Few fishing families own multiple boats, and few boats are owned by large corporations. In many communities, families can trace several generations of involvement in the fishing industry.

Recreational fishing is also an important part of many communities' identities. The recreational fishing industry includes charter boats, guides, marinas; and gear, bait, and other suppliers. Many of these businesses are also family-owned and operated. In addition to their direct impact on the local community, the recreational fishing industry supports a broad-based community of thousands of individual boat owners and shore fishers participating in ocean and inland recreational fisheries.

The commercial fishing industry generally places a high value on independence. Fishing necessarily occurs at sea, and frequently attracts people who enjoy solitude and self-direction. This sense of independence and self-reliance contrasts sharply with the increasingly stringent controls being placed on the industry.

Fishing is also known for its high level of danger; it is consistently rated among the most dangerous professions in the United States. Despite this danger, there are few safety nets for people in the industry. Crew members are not technically "employees" and are not eligible for unemployment insurance, workers' compensation, and other benefits normally associated with workers in other demanding and dangerous occupations. Vagaries of weather, market conditions and regulations demand high levels of flexibility. Many crew members are itinerant, moving from port to port and job to job (Gilden 1999).

The challenges of pursuing and maintaining fishing-based livelihoods have caused fishers to form organizations to represent common interests. Examples include the Coos Bay Trawlers Association, the Newport Fishermen's Wives Association, the Pacific City Dorymen's Association, the Fishermen's Marketing Association, the Pacific Marine Conservation Council, the West Coast Fishermen's Alliance, the Western Fishboat Owner's Association, and the Women's Coalition for Pacific Fisheries (Gilden 1999). These organizations help the multiple facets of the fishing community represent their interests to policy makers and the general public.

8.4.4 Impact on the Built Environment in Fishing Communities

While few coastal communities depend exclusively on fishing; harvesting, processing and related support industries (fuel, docks, ice, gear repair, etc.) are part of a complex web of interaction with other economic activities such as sport fishing, whale watching, tourism, and other recreational activities. Commercial and recreational fishers coexist, and both contribute financially to the businesses and infrastructure that serve and support them. Communities such as Newport, Oregon, celebrate their fishing industry, having turned the port waterfront into a major tourist attraction. This is also true for many other historic ports in Washington, Oregon, and California. Maintenance of port facilities for the fishing fleet provides access for other user groups, such as recreational fishers and boaters, and draws tourists who are attracted to the sights and smells of a working fishing port.

The presence of a viable commercial fleet helps provide the funding and incentive to dredge harbor entrances and to maintain jetties and port facilities. These in turn assist the recreational industry and private users to operate safely and efficiently from coastal ports. Seafood processors and shoreside support businesses pay property taxes and license fees to the port cities and surrounding jurisdictions, thereby contributing to the maintenance of the local infrastructure for all area residents.

The following are examples of fishery-related effects on port infrastructure. In ports such as Brookings and Garibaldi in Oregon, reduction in fishing fleets has coincided with the silting of harbor entrances due to reduced dredging. This has restricted access for larger vessels, including trawlers, and made it more difficult for a fleet to become established in the future (Gilden 1999). In another example, the Port of Astoria recently added a new breakwater to provide additional moorage for larger vessels involved in the new sardine fishery (Oregon Coastal Zone Management Association 2002).

8.5 Identification of Minority and Low Income Communities and Addressing Environmental Justice

Executive Order 12898, *Federal Actions to Address Environmental Justice in Minority Populations and Low-Income Populations*, requires federal agencies to identify and address "disproportionately high adverse human health or environmental effects of its programs, policies, and activities on minority and low-income populations in the United States." Fishery management actions promulgated by the Pacific Council and implemented by NMFS can have environmental and socioeconomic impacts over a very wide area; the affected area of many actions covers all West Coast waters and adjacent coastal communities involved in fishing. This makes it difficult to identify minority and low-income populations that may be disproportionately affected.

The same population units described above and used to characterize the demographics of ports and port groups were used to evaluate what ports might qualify as low income and minority. These are census places and block group equivalent areas. Five criteria were used from SF3 population tables: percent non-white population, percent Native American population, percent Hispanic population, average income, and poverty rate.[25/] Statistics for the ports need to be compared to a reference community in order to determine if they are sufficiently different from a more general, but comparable, population to be considered a minority or low-income community. Three reference communities were identified: north, central, and south. (A single coastwide reference community was not used because of the substantial variation in population characteristics along the coast.) To begin developing the reference communities census block groups within 10 miles of the coast were selected and coded using GIS. (Some manual editing was necessary to include smaller census blocks, which, although more than 10 miles from the coast, were surrounded by large block groups that qualified. This is because the selection rule was based on the boundary of the block group, not its centroid. A small number of block groups qualifying, but not in coastal counties, were also manually excluded.) The three regions are based on port groups; "coastal" block groups were further coded according to these regions. The northern region includes port groups in Washington, Oregon, and the Crescent City, Eureka, and Fort Bragg port groups in California. The central region includes the Bodega Bay, San Francisco, Monterey, and Morro Bay port groups. The southern region includes the Santa Barbara, Los Angeles, and San Diego port groups. (See Figure 8-1 for a map of ports and port groups.)

Once reference communities were identified, a threshold value for each of the five statistics used in the evaluation was determined. The block groups in each reference community were ranked and the value constituting the minimum of the highest quintile (twentieth percentile) was identified for percent nonwhite, percent Native American, percent Hispanic, and percent households below the poverty line, and the value constituting the maximum of the bottom quintile for average household income. Table 8-19 shows the number of block groups, total population, and threshold values for these five statistics for each of the three reference communties.

Using the quintile value, the ports were evaluated to see if they met the threshold for each of these statistics. Table 8-20 summarizes the results; for each port the appropriate cell is shaded if that statistic is above (or below for average household income) the quintile threshold for the block group equivalent (the column headed "B") or census place (the column headed "P"). Providing results for both block group equivalents and census places allows comparison to note how they differ.

25/ Percent nonwhite was calculated from Table P6 by subtracting the white population from the total population. Sources for the other statistics are given in the notes for Table 8-10 to 8-16.

TABLE 8-1. Location and composition of port groups. (Page 1 of 2)

State	Port Group Area	County	PCID	Name
Washington	Puget Sound	Whatcom	BLN	Blaine
		Whatcom	BLL	Bellingham Bay
		San Juan	FRI	Friday Harbor
		Skagit	ANA	Anacortes
		Skagit	LAC	La Conner
		Snohomish	ONP	Other North Puget Sound Ports
		Snohomish	EVR	Everett
		King	SEA	Seattle
		Pierce	TAC	Tacoma
		Thurston	OLY	Olympia
		Mason	SHL	Shelton
		Unknown	OSP	Other South Puget Sound Ports
	North Washington Coast	Jefferson	TNS	Port Townsend
		Clallam	SEQ	Sequim
		Clallam	PAG	Port Angeles
		Clallam	NEA	Neah Bay
		Clallam	LAP	La Push
	South & Central WA Coast	Grays Harbor	CPL	Copalis Beach
		Grays Harbor	GRH	Grays Harbor
		Grays Harbor	WPT	Westport
		Pacific	WLB	Willapa Bay
		Pacific	LWC	Ilwaco/chinook
		Klickitat	OCR	Other Columbia River Ports
	Unidentified WA	Pacific	OWC	Other Washington Coastal Ports
		Unknown	OWA	Unknown WA Ports
Oregon	Astoria	Multnomah	CRV	Psuedo Port Code for Columbia R.
		Clatsop	AST	Astoria
		Clatsop	GSS	Gearhart - Seaside
		Clatsop	CNB	Cannon Beach
		Unknown	WAL	Landed in WA; Transp. to OR
	Tillamook	Tillamook	NHL	Nehalem Bay
		Tillamook	TLL	Tillamook / Garibaldi
		Tillamook	NTR	Netarts Bay
		Tillamook	PCC	Pacific City
	Newport	Lincoln	SRV	Salmon River
		Lincoln	SLZ	Siletz Bay
		Lincoln	DPO	Depoe Bay
		Lincoln	NEW	Newport
		Lincoln	WLD	Waldport
		Lincoln	YAC	Yachats
	Coos Bay	Lane	FLR	Florence
		Douglas	WIN	Winchester Bay
		Coos	COS	Coos Bay
		Coos	BDN	Bandon
	Brookings	Curry	ORF	Port Orford
		Curry	GLD	Gold Beach
		Curry	BRK	Brookings
California	Crescent City	Del Norte	CRS	Crescent City
		Del Norte	ODN	Other Del Norte County Ports
	Eureka	Humboldt	ERK	Eureka (Includes Fields Landing)
		Humboldt	FLN	Fields Landing
		Humboldt	TRN	Trinidad
		Humboldt	OHB	Other Humboldt County Ports
	Fort Bragg	Mendocino	BRG	Fort Bragg
		Mendocino	ALB	Albion
		Mendocino	ARE	Arena
		Mendocino	OMD	Other Mendocino County Ports
	Bodega Bay	Sonoma	BDG	Bodega Bay
		Marin	TML	Tomales Bay
		Marin	RYS	Point Reyes
		Marin	OSM	Other Son. and Mar. Co. Outer Coast Ports
		Marin	SLT	Sausalito
	San Francisco	Alameda	OAK	Oakland
		Alameda	ALM	Alameda
		Alameda	BKL	Berkely
		Contra Costa	RCH	Richmond

TABLE 8-1. Location and composition of port groups. (Page 2 of 2)

State	Port Group Area	County	PCID	Name
		San Francisco	SF	San Francisco
		San Mateo	PRN	Princeton
		San Francisco	SFA	San Francisco Ara
		San Francisco	OSF	Other S.F. Bay and S.M. Co. Ports
	Monterey	Santa Cruz	CRZ	Santa Cruz
		Monterey	MOS	Moss Landing
		Monterey	MNT	Monterey
		Monterey	OCM	Other S.C. and Mon. Co. Ports
	Morro Bay	San Luis Obispo	MRO	Morro Bay
		San Luis Obispo	AVL	Avila
		San Luis Obispo	OSL	Other S.L..O. Co. Ports
	Santa Barbara	Santa Barbara	SB	Santa Barbara
		Santa Barbara	SBA	Santa Barbara Area
		Ventura	HNM	Port Hueneme
		Ventura	OXN	Oxnard
		Ventura	VEN	Ventura
		Ventura	OBV	Other S.B. and Ven. Co. Ports
	Los Angeles	Los Angeles	TRM	Terminal Island
		Los Angeles	SPA	San Pedro Area
		Los Angeles	SP	San Pedro
		Los Angeles	WLM	Willmington
		Los Angeles	LGB	Longbeach
		Orange	NWB	Newport Beach
		Orange	DNA	Dana Point
		Orange	OLA	Other LA and Orange Co. Ports
	San Diego	San Diego	SD	San Diego
		San Diego	OCN	Oceanside
		San Diego	SDA	San Diego Area
		San Diego	OSD	Other S.D. Co. Ports
	Unidentified CA	Unknown	OCA	Unknown CA Ports

TABLE 8-2a. Total Commercial Deliveries (including Tribal fisheries) of Council-Managed Species to West Coast Port Areas in 1998 (mt). (Page 1 of 2)

	Washington					Oregon				
Species Group	Puget Sound	North WA Coast	South and Central WA Coast	Unsp. WA	WA TOTAL	Astoria-Tillamook	Newport	Coos Bay	Brookings	OR TOTAL
Lingcod	156	21	14	0	191	64	49	54	85	252
Whiting (at sea)	0	0	0	0	0	816	1,055	0	0	1,872
Whiting (shoreside)	34	0	662	0	696	1,608	2,144	4	0	3,756
Flatfish	1,216	420	591	0	2,227	2,136	838	2,018	416	5,407
Sablefish	931	1,239	698	516	3,384	1,483	1,427	1,153	538	4,602
Rockfish	2,314	392	1,114	8	3,829	3,607	1,937	1,866	1,211	8,621
Other Groundfish	248	201	57	0	507	117	10	67	71	265
Total Groundfish	4,899	2,274	3,136	524	10,833	9,832	7,461	5,162	2,320	24,775
Pink Shrimp Trawl	0	5	875	0	880	1,020	1,210	586	373	3,189
Spot Prawn Trawl	0	0	0	0	0	0	0	0	0	0
Spot Prawn Pot	0	0	0	0	0	0	0	0	0	0
Ridgeback Prawn Trawl	0	0	0	0	0	0	0	0	0	0
Pacific Halibut	1	444	33	53	530	73	107	68	4	253
California Halibut[a/]	0	0	0	0	0	0	0	0	0	0
Salmon	1	137	212	7	356	1,778	24	23	1	1,825
Sea Cucumber	0	0	0	0	0	0	0	0	0	0
California Sheephead	0	0	0	0	0	0	0	0	0	0
Gillnet Complex[b/]	0	0	0	0	0	0	0	0	0	0
Squid	0	0	0	0	0	0	2	1	1	4
Other CPS	0	0	64	0	64	12	58	4	0	74
HMS	484	1	8,291	22	8,798	4,467	1,385	851	119	6,823
Dungeness Crab	1,250	1,148	10,875	555	13,828	3,664	3,604	2,176	3,076	12,519
Other Crustaceans	1	7	388	98	494	521	76	40	9	646
Other Species	0	0	7	0	7	51	18	21	116	207
Total Council-Managed	6,636	4,015	23,881	1,258	35,791	21,418	13,944	8,933	6,020	50,314

TABLE 8-2a. Total Commercial Deliveries (including Tribal fisheries) of Council-Managed Species to West Coast Port Areas in 1998 (mt). (Page 2 of 2)

	California												
Species Group	Crescent City	Eureka	Fort Bragg	San Francisco	Monterey	Morro Bay	Santa Barbara	Los Angeles	San Diego	Unsp. CA	CA TOTAL	At Sea TOTAL	Grand TOTAL
Lingcod	50	36	47	77	23	26	12	4	0	0	275	0	718
Whiting (at sea)	155	0	0	0	0	0	0	0	0	0	155	11,512	13,538
Whiting (shoreside)	341	50	0	0	0	0	1	1	0	0	394	0	4,846
Flatfish	885	1,171	637	801	730	599	19	37	1	0	4,879	0	12,514
Sablefish	539	930	542	323	508	203	74	148	112	0	3,380	14	11,380
Rockfish	1,050	1,608	1,639	2,572	1,853	2,210	740	614	229	0	12,515	32	24,996
Other Groundfish	46	25	246	174	281	1,182	175	25	20	0	2,174	0	2,946
Total Groundfish	3,066	3,821	3,111	3,946	3,396	4,220	1,020	829	363	0	23,771	11,558	70,937
Pink Shrimp Trawl	985	0	0	0	0	0	0	0	0	0	985	0	5,054
Spot Prawn Trawl	8	1	10	730	302	1,385	1,246	13	0	3	3,697	0	3,697
Spot Prawn Pot	0	2	0	2	544	13	389	738	170	0	1,858	0	1,858
Ridgeback Prawn Trawl	0	0	0	0	0	3	747	12	0	0	762	0	762
Pacific Halibut	0	0	10	0	0	0	0	0	0	0	11	0	794
California Halibut a/	31	25	0	1,228	60	248	238	267	11	0	2,108	0	2,108
Salmon	0	58	62	2,355	0	1,056	0	0	0	0	3,530	0	5,712
Sea Cucumber	0	0	0	0	0	0	309	141	6	0	456	0	456
California Sheephead	0	0	0	0	0	6	349	221	116	0	692	0	692
Gillnet Complex b/	0	0	0	5	127	18	384	280	76	0	891	0	891
Squid	0	0	0	15	0	0	1,476	133	3	0	1,626	0	1,630
Other CPS	8	5	0	35	833	0	239	5,519	51	0	6,690	33	6,861
HMS	531	233	55	1,187	1,311	463	723	16,763	3,386	0	24,653	0	40,274
Dungeness Crab	6,550	5,634	1,100	6,451	135	60	1	1	0	2	19,935	0	46,282
Other Crustaceans	258	15	0	956	26	248	2,557	2,199	1,177	79	7,516	0	8,655
Other Species	1	0	1,784	350	0	1	4,648	806	385	0	7,975	0	8,188
Total Council-Managed	11,439	9,795	6,131	17,261	6,734	7,721	14,323	27,924	5,743	85	107,156	11,591	204,852

a/ Excluding California halibut caught in Gillet Complex.

b/ Includes California halibut, white sea bass, sharks and white croaker.

TABLE 8-2b. Total exvessel revenue from commercial deliveries (including tribal fisheries) of Council-managed species to West Coast port areas in 2002 ($,000). (Page 1 of 2)

	Washington					Oregon					
Species Group	Puget Sound	North WA Coast	South and Central WA Coast	Unsp. WA	WA TOTAL	Astoria-Tillamook	Newport	Coos Bay	Brookings	Unsp. OR	OR TOTAL
Lingcod	14	41	11	0	65	52	37	27	93	0	209
Whiting (at sea)	0	0	211	0	211	226	699	0	0	0	925
Whiting (shoreside)	6	0	1,055	0	1,060	1,208	1,841	157	0	0	3,205
Flatfish	1,150	575	264	0	1,989	2,425	1,015	1,399	316	0	5,155
Sablefish	1,231	1,736	574	417	3,958	1,425	1,374	1,081	449	0	4,330
Rockfish	343	501	123	3	969	1,277	650	748	759	0	3,435
Other Groundfish	589	535	21	0	1,144	84	12	20	646	0	761
Total Groundfish	3,332	3,387	2,259	420	9,398	6,697	5,627	3,432	2,264	0	18,020
Pink Shrimp Trawl	0	0	2,737	0	2,737	3,953	3,089	3,631	667	0	11,340
Spot Prawn Trawl	0	0	0	0	0	0	0	0	0	0	0
Spot Prawn Pot	0	0	0	0	0	0	0	0	0	0	0
Ridgeback Prawn Trawl	0	0	0	0	0	0	0	0	0	0	0
Pacific Halibut	122	821	63	203	1,209	63	424	79	36	6	608
California Halibut[a/]	0	0	0	0	0	0	0	0	0	0	0
Salmon	472	2,428	552	8	3,460	2,757	90	635	0	2	3,484
Sea Cucumber	0	0	0	0	0	0	0	0	0	0	0
California Sheephead	0	0	0	0	0	0	0	0	0	0	0
Gillnet Complex[b/]	0	0	0	0	0	0	0	0	0	0	0
Squid	0	0	0	0	0	0	0	1	0	0	1
Other CPS	0	0	2,009	0	2,009	2,846	1	1	0	0	2,849
HMS	770	23	6,429	196	7,419	979	1,282	652	37	0	2,950
Dungeness Crab	1,145	470	19,030	3,090	23,735	1,276	5,682	3,902	998	0	11,858
Other Crustaceans	79	1	673	0	753	589	27	7	36	0	659
Other Species	21	47	623	0	691	264	175	171	297	0	907
Total Council-Managed	5,941	7,177	34,375	3,918	51,411	19,423	16,398	12,512	4,336	8	52,675

TABLE 8-2b. Total Commercial Deliveries (including Tribal fisheries) of Council-Managed Species to West Coast Port Areas in 2002 (mt). (Page 2 of 2)

	California												
Species Group	Crescent City	Eureka	Fort Bragg	San Francisco	Monterey	Morro Bay	Santa Barbara	Los Angeles	San Diego	Unsp. CA	CA TOTAL	At Sea TOTAL	Grand TOTAL
Lingcod	22.6	14.5	13.8	10.2	9.5	8.4	1.4	0.3	0.3	0.0	80.9	0.1	205.2
Whiting (at sea)	0.0	0.0	0.0	3,016.2	0.0	0.0	0.0	0.0	0.0	0.0	3,016.2	70,952.7	84,494.3
Whiting (shoreside)	0.0	2,775.3	0.0	0.1	0.0	0.0	0.0	0.3	0.0	0.0	2,775.8	0.0	45,807.5
Flatfish	907.1	1,202.2	1,110.6	835.8	569.9	326.9	11.3	11.0	0.2	0.0	4,975.0	4.4	13,220.1
Sablefish	162.3	259.4	319.8	149.8	238.8	56.1	15.6	45.0	72.8	0.0	1,319.5	18.7	3,829.8
Rockfish	285.4	424.2	713.7	322.0	320.7	488.4	56.6	63.1	64.9	0.0	2,738.9	287.0	5,974.1
Other Groundfish	7.7	35.6	49.4	20.3	126.7	30.6	20.2	15.8	7.7	0.0	313.9	1.2	2,114.5
Total Groundfish	1,385.0	4,711.1	2,207.3	4,354.4	1,265.6	910.4	105.1	135.4	145.9	0.0	15,220.3	71,264.1	155,645.5
Pink Shrimp Trawl	1,869.5	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	1,869.5	0.0	25,302.4
Spot Prawn Trawl	0.0	0.0	2.8	23.6	11.4	39.9	21.4	0.2	0.0	0.0	99.2	0.0	99.2
Spot Prawn Pot	0.0	0.2	0.0	0.1	26.1	4.6	14.9	18.8	14.3	0.1	79.0	0.0	79.0
Ridgeback Prawn Trawl	0.0	0.0	0.0	0.0	0.0	0.8	212.6	1.7	0.0	0.0	215.2	0.0	215.2
Pacific Halibut	0.0	0.0	0.1	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.1	0.0	421.6
California Halibut[a/]	0.1	3.5	0.0	157.1	32.6	6.9	86.5	21.1	1.4	0.0	309.1	0.0	309.1
Salmon	0.0	76.4	0.0	1,891.5	0.0	81.9	0.0	0.0	0.0	0.0	2,049.8	0.0	4,660.4
Sea Cucumber	0.0	0.0	0.2	0.4	0.0	0.5	350.8	67.9	5.9	0.1	425.7	0.0	425.7
California Sheephead	0.0	0.0	0.0	0.3	0.0	0.3	23.0	17.0	11.7	0.0	52.2	0.0	52.2
Gillnet Complex[b/]	0.0	0.0	0.0	0.0	6.8	10.5	148.8	170.5	15.2	0.0	352.0	0.0	352.5
Squid	0.0	0.0	3.9	866.2	25,089.6	356.5	18,441.4	28,185.6	1.0	0.0	72,944.2	10.4	72,957.7
Other CPS	0.0	0.1	0.0	189.2	16,313.1	102.0	5,811.1	44,866.9	95.8	0.0	67,378.2	5.8	106,754.3
HMS	136.3	1,121.5	21.2	72.8	420.1	290.3	293.6	2,589.5	638.5	0.0	5,583.8	0.0	12,908.5
Dungeness Crab	742.3	537.7	2,496.0	1,859.2	48.8	14.5	0.1	0.0	0.0	0.0	5,698.6	0.0	15,504.6
Other Crustaceans	36.0	6.3	0.8	377.1	0.5	54.1	506.7	153.2	164.4	4.4	1,303.5	0.0	1,464.9
Other Species	51.8	207.6	1,962.0	3,839.7	85.4	19.9	2,145.2	1,366.9	509.8	25.6	10,213.8	851.9	16,638.6
Total Council-Managed	4,221.0	6,664.4	6,694.4	13,631.5	43,299.9	1,893.0	28,161.2	77,594.8	1,603.8	30.2	183,794.1	72,132.2	413,791.4

a/ Excluding California halibut caught in Gillet Complex.

b/ Includes California halibut, white sea bass, sharks, and white croaker.

TABLE 8-3a. Total exvessel revenue from commercial deliveries (including Tribal fisheries) of Council-managed species to West Coast port areas in 1998 ($,000). (Page 1 of 2)

	Washington					Oregon				
Species Group	Puget Sound	North WA Coast	South and Central WA Coast	Unsp. WA	WA TOTAL	Astoria-Tillamook	Newport	Coos Bay	Brookings	OR TOTAL
Lingcod	156	21	14	0	191	64	49	54	85	252
Whiting (at sea)	0	0	0	0	0	816	1,055	0	0	1,872
Whiting (shoreside)	34	0	662	0	696	1,608	2,144	4	0	3,756
Flatfish	1,216	420	591	0	2,227	2,136	838	2,018	416	5,407
Sablefish	931	1,239	698	516	3,384	1,483	1,427	1,153	538	4,602
Rockfish	2,314	392	1,114	8	3,829	3,607	1,937	1,866	1,211	8,621
Other Groundfish	248	201	57	0	507	117	10	67	71	265
Total Groundfish	4,899	2,274	3,136	524	10,833	9,832	7,461	5,162	2,320	24,775
Pink Shrimp Trawl	0	5	875	0	880	1,020	1,210	586	373	3,189
Spot Prawn Trawl	0	0	0	0	0	0	0	0	0	0
Spot Prawn Pot	0	0	0	0	0	0	0	0	0	0
Ridgeback Prawn Trawl	0	0	0	0	0	0	0	0	0	0
Pacific Halibut	1	444	33	53	530	73	107	68	4	253
California Halibut[a/]	0	0	0	0	0	0	0	0	0	0
Salmon	1	137	212	7	356	1,778	24	23	1	1,825
Sea Cucumber	0	0	0	0	0	0	0	0	0	0
California Sheephead	0	0	0	0	0	0	0	0	0	0
Gillnet Complex[b/]	0	0	0	0	0	0	0	0	0	0
Squid	0	0	0	0	0	0	2	1	1	4
Other CPS	0	0	64	0	64	12	58	4	0	74
HMS	484	1	8,291	22	8,798	4,467	1,385	851	119	6,823
Dungeness Crab	1,250	1,148	10,875	555	13,828	3,664	3,604	2,176	3,076	12,519
Other Crustaceans	1	7	388	98	494	521	76	40	9	646
Other Species	0	0	7	0	7	51	18	21	116	207
Total Council-Managed	6,636	4,015	23,881	1,258	35,791	21,418	13,944	8,933	6,020	50,314

TABLE 8-3a. Total exvessel revenue from commercial deliveries (including tribal fisheries) of Council-managed species to West Coast port areas in 1998 ($,000). (Page 2 of 2)

	California												
Species Group	Crescent City	Eureka	Fort Bragg	San Francisco	Monterey	Morro Bay	Santa Barbara	Los Angeles	San Diego	Unsp. CA	CA TOTAL	At Sea TOTAL	Grand TOTAL
Lingcod	50	36	47	77	23	26	12	4	0	0	275	0	718
Whiting (at sea)	155	0	0	0	0	0	0	0	0	0	155	11,512	13,538
Whiting (shoreside)	341	50	0	0	0	0	1	1	0	0	394	0	4,846
Flatfish	885	1,171	637	801	730	599	19	37	1	0	4,879	0	12,514
Sablefish	539	930	542	323	508	203	74	148	112	0	3,380	14	11,380
Rockfish	1,050	1,608	1,639	2,572	1,853	2,210	740	614	229	0	12,515	32	24,996
Other Groundfish	46	25	246	174	281	1,182	175	25	20	0	2,174	0	2,946
Total Groundfish	3,066	3,821	3,111	3,946	3,396	4,220	1,020	829	363	0	23,771	11,558	70,937
Pink Shrimp Trawl	985	0	0	0	0	0	0	0	0	0	985	0	5,054
Spot Prawn Trawl	8	1	10	730	302	1,385	1,246	13	0	3	3,697	0	3,697
Spot Prawn Pot	0	2	0	2	544	13	389	738	170	0	1,858	0	1,858
Ridgeback Prawn Trawl	0	0	0	0	0	3	747	12	0	0	762	0	762
Pacific Halibut	0	0	10	0	0	0	0	0	0	0	11	0	794
California Halibut[a/]	31	25	0	1,228	60	248	238	267	11	0	2,108	0	2,108
Salmon	0	58	62	2,355	0	1,056	0	0	0	0	3,530	0	5,712
Sea Cucumber	0	0	0	0	0	0	309	141	6	0	456	0	456
California Sheephead	0	0	0	0	0	6	349	221	116	0	692	0	692
Gillnet Complex[b/]	0	0	0	5	127	18	384	280	76	0	891	0	891
Squid	0	0	0	15	0	0	1,476	133	3	0	1,626	0	1,630
Other CPS	8	5	0	35	833	0	239	5,519	51	0	6,690	33	6,861
HMS	531	233	55	1,187	1,311	463	723	16,763	3,386	0	24,653	0	40,274
Dungeness Crab	6,550	5,634	1,100	6,451	135	60	1	1	0	2	19,935	0	46,282
Other Crustaceans	258	15	0	956	26	248	2,557	2,199	1,177	79	7,516	0	8,655
Other Species	1	0	1,784	350	0	1	4,648	806	385	0	7,975	0	8,188
Total Council-Managed	11,439	9,795	6,131	17,261	6,734	7,721	14,323	27,924	5,743	85	107,156	11,591	204,852

a/ Excluding California halibut caught in Gillet Complex.

b/ Includes California halibut, white sea bass, sharks, and white croaker.

TABLE 8-3b. Total exvessel revenue from commercial deliveries (including tribal fisheries) of Council-managed species to West Coast port areas in 2002 ($,000). (Page 1 of 2)

	Washington					Oregon					
Species Group	Puget Sound	North WA Coast	South and Central WA Coast	Unsp. WA	WA TOTAL	Astoria-Tillamook	Newport	Coos Bay	Brookings	Unsp. OR	OR TOTAL
Lingcod	14	41	11	0	65	52	37	27	93	0	209
Whiting (at sea)	0	0	211	0	211	226	699	0	0	0	925
Whiting (shoreside)	6	0	1,055	0	1,060	1,208	1,841	157	0	0	3,205
Flatfish	1,150	575	264	0	1,989	2,425	1,015	1,399	316	0	5,155
Sablefish	1,231	1,736	574	417	3,958	1,425	1,374	1,081	449	0	4,330
Rockfish	343	501	123	3	969	1,277	650	748	759	0	3,435
Other Groundfish	589	535	21	0	1,144	84	12	20	646	0	761
Total Groundfish	3,332	3,387	2,259	420	9,398	6,697	5,627	3,432	2,264	0	18,020
Pink Shrimp Trawl	0	0	2,737	0	2,737	3,953	3,089	3,631	667	0	11,340
Spot Prawn Trawl	0	0	0	0	0	0	0	0	0	0	0
Spot Prawn Pot	0	0	0	0	0	0	0	0	0	0	0
Ridgeback Prawn Trawl	0	0	0	0	0	0	0	0	0	0	0
Pacific Halibut	122	821	63	203	1,209	63	424	79	36	6	608
California Halibut[a/]	0	0	0	0	0	0	0	0	0	0	0
Salmon	472	2,428	552	8	3,460	2,757	90	635	0	2	3,484
Sea Cucumber	0	0	0	0	0	0	0	0	0	0	0
California Sheephead	0	0	0	0	0	0	0	0	0	0	0
Gillnet Complex[b/]	0	0	0	0	0	0	0	0	0	0	0
Squid	0	0	0	0	0	0	0	1	0	0	1
Other CPS	0	0	2,009	0	2,009	2,846	1	1	0	0	2,849
HMS	770	23	6,429	196	7,419	979	1,282	652	37	0	2,950
Dungeness Crab	1,145	470	19,030	3,090	23,735	1,276	5,682	3,902	998	0	11,858
Other Crustaceans	79	1	673	0	753	589	27	7	36	0	659
Other Species	21	47	623	0	691	264	175	171	297	0	907
Total Council-Managed	5,941	7,177	34,375	3,918	51,411	19,423	16,398	12,512	4,336	8	52,675

TABLE 8-3b. Total exvessel revenue from commercial deliveries (including tribal fisheries) of Council-managed species to West Coast port areas in 2002 ($,000). (Page 2 of 2)

	California												
Species Group	Crescent City	Eureka	Fort Bragg	San Francisco	Monterey	Morro Bay	Santa Barbara	Los Angeles	San Diego	Unsp. CA	CA TOTAL	At Sea TOTAL	Grand TOTAL
Lingcod	71	39	31	32	18	30	8	2	2	0	232	0	506
Whiting (at sea)	0	0	0	326	0	0	0	0	0	0	326	7,658	9,119
Whiting (shoreside)	0	275	0	0	0	0	0	0	0	0	275	0	4,540
Flatfish	828	1,131	1,017	860	473	306	15	53	0	0	4,683	0	11,828
Sablefish	410	741	802	351	601	127	43	156	291	0	3,522	0	11,810
Rockfish	739	985	1,236	623	834	1,216	355	330	343	0	6,662	0	11,066
Other Groundfish	31	30	106	26	105	290	90	19	12	0	710	0	2,615
Total Groundfish	2,080	3,201	3,192	2,218	2,031	1,969	511	560	648	0	16,410	7,658	51,485
Pink Shrimp Trawl	1,281	0	0	0	0	0	0	0	0	0	1,281	0	15,358
Spot Prawn Trawl	0	0	52	397	198	725	381	3	0	0	1,755	0	1,755
Spot Prawn Pot	0	1	0	1	571	97	307	361	251	2	1,592	0	1,592
Ridgeback Prawn Trawl	0	0	0	0	0	3	625	6	0	0	633	0	633
Pacific Halibut	0	0	1	0	0	0	0	0	0	0	1	0	1,818
California Halibut[a/]	0	20	0	873	171	41	659	216	8	0	1,988	0	1,988
Salmon	0	261	0	5,492	0	318	0	0	0	0	6,071	0	13,015
Sea Cucumber	0	0	1	1	0	1	618	156	16	0	792	0	792
California Sheephead	0	0	0	2	0	2	152	137	98	0	391	0	391
Gillnet Complex[b/]	0	0	0	0	40	49	636	695	84	0	1,503	0	1,504
Squid	0	0	1	215	6,793	76	4,742	6,432	1	0	18,260	0	18,261
Other CPS	0	0	0	41	1,553	7	806	4,615	63	0	7,086	0	11,944
HMS	233	1,612	50	180	622	578	644	6,005	1,739	0	11,663	0	22,032
Dungeness Crab	2,467	1,854	9,257	8,285	262	131	0	0	0	0	22,255	0	57,848
Other Crustaceans	284	22	4	317	1	150	3,042	1,533	1,427	63	6,845	0	8,257
Other Species	33	157	2,774	3,187	119	45	3,710	2,353	1,045	62	13,484	0	15,082
Total Council-Managed	6,378	7,129	15,330	21,210	12,361	4,193	16,832	23,071	5,380	127	112,011	7,658	223,755

a/ Excluding California halibut caught in Gillet Complex.

b/ Includes California halibut, white sea bass, sharks, and white croaker.

TABLE 8-4. Number of vessels by vessel primary port and species group in 2001.[a/] (Page 1 of 4)

	Vessels with Limited Entry Trawl Permits						Vessels with Fixed Gear Limited Entry Permits (No Trawl Permit)					Open Access Vessels with More than 5% Revenue from Groundfish					Open Access Vessels with Less than 5% Revenue from Groundfish					Vessels Participating in Other Fisheries								
	Whiting	Sablefish	Nearshore spp	Shelf spp	Slope spp	Total	Sablefish	Nearshore spp	Shelf spp	Slope spp	Total	Sablefish	Nearshore spp	Shelf spp	Slope spp	Total	Sablefish	Nearshore spp	Shelf spp	Slope spp	Total	Total GF	Hal. (Pac. & CA)	Shrimp / Prawns	Crabs	Salmon	HMS	CPS	Other	Total
Blaine	2	4	4	4	4	4	-	-	-	-	-	-	-	-	-	-	1	-	-	-	1	5	-	-	11	-	-	-	117	119
Bellingham	1	5	5	5	5	5	19	2	14	17	19	-	-	1	-	1	-	-	-	-	-	25	13	-	14	-	5	2	203	210
Point Roberts	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	1	-	-	-	6	6
Friday Harbor	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	3	3
Anacortes	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	1	-	-	74	74
LaConner	-	-	-	-	-	-	-	-	-	-	-	1	-	-	-	1	1	-	1	1	1	2	2	-	3	-	-	-	25	25
Everett	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	51	51
Seattle	-	-	-	-	-	-	2	-	-	2	2	-	-	-	-	-	-	-	1	-	1	3	3	-	12	1	7	1	75	93
Tacoma	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	1	1	1	1	1	1	1	1	1	1	2	-	26	27
Shelton	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	4	4
Centralia	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	14	14
Puget Sound Total	**3**	**9**	**9**	**9**	**9**	**9**	**21**	**2**	**14**	**19**	**21**	**1**	**0**	**1**	**0**	**2**	**3**	**1**	**3**	**2**	**4**	**36**	**19**	**1**	**42**	**3**	**14**	**3**	**598**	**626**
Port Townsend	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	1	-	23	23
Quilcene	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	2	2
Sequim	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	10	10
Port Angeles	-	3	3	3	3	3	14	1	13	14	15	12	6	17	8	20	-	-	4	1	4	42	19	-	1	11	2	-	25	58
Neah Bay	-	3	3	3	3	3	-	-	-	-	-	-	-	2	-	2	-	-	-	-	-	5	2	-	-	-	-	-	3	5
La Push	-	-	-	-	-	-	2	1	2	2	2	3	1	2	2	3	-	-	-	-	-	5	1	-	6	-	2	-	4	10
North WA Coast Total	**0**	**6**	**6**	**6**	**6**	**6**	**16**	**2**	**15**	**16**	**17**	**15**	**7**	**21**	**10**	**25**	**0**	**0**	**4**	**1**	**4**	**52**	**22**	**0**	**7**	**11**	**5**	**0**	**67**	**108**
Copalis	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	10	10
Aberdeen	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	1	1	-	-	-	2
Westport (WA)	5	11	5	12	11	12	11	-	9	11	11	6	-	4	4	6	7	1	21	3	22	51	16	13	100	40	58	9	44	178
Central WA Coast Total	**5**	**11**	**5**	**12**	**11**	**12**	**11**	**0**	**9**	**11**	**11**	**6**	**0**	**4**	**4**	**6**	**7**	**1**	**21**	**3**	**22**	**51**	**16**	**13**	**101**	**41**	**58**	**9**	**54**	**190**
Tokeland	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	3	-	4	2	4	4	-	4	20	-	2	-	35	57
Ilwaco	1	4	2	4	4	4	3	3	4	3	4	5	-	2	2	5	15	2	22	8	29	42	25	7	51	35	96	7	61	163
Pacific County	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	1	46	47
Columbia River	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	1	1	-	-	173	173
South WA Coast Total	**1**	**4**	**2**	**4**	**4**	**4**	**3**	**3**	**4**	**3**	**4**	**5**	**0**	**2**	**2**	**5**	**18**	**2**	**26**	**10**	**33**	**46**	**25**	**11**	**72**	**36**	**98**	**8**	**315**	**440**

TABLE 8-4. Number of vessels by vessel primary port and species group in 2001.[a/] (Page 2 of 4)

	Vessels with Limited Entry Trawl Permits						Vessels with Fixed Gear Limited Entry Permits (No Trawl Permit)					Open Access Vessels with More than 5% Revenue from Groundfish					Open Access Vessels with Less than 5% Revenue from Groundfish						Vessels Participating in Other Fisheries							
	Whiting	Sablefish	Nearshore spp	Shelf spp	Slope spp	Total	Sablefish	Nearshore spp	Shelf spp	Slope spp	Total	Sablefish	Nearshore spp	Shelf spp	Slope spp	Total	Sablefish	Nearshore spp	Shelf spp	Slope spp	Total	Total GF	Hal. (Pac. & CA)	Shrimp / Prawns	Crabs	Salmon	HMS	CPS	Other	Total
Astoria	4	31	18	31	30	31	11	-	9	7	11	11	3	9	7	12	17	4	16	9	19	73	21	23	66	27	68	19	43	164
Gearhart-Seaside	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	2	-	-	-	2
Cannon Beach	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	2	-	-	-	2
Nehalem Bay	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	2	-	-	-	-	2
Garibaldi (Tillamook)	-	3	3	3	3	3	-	-	-	-	-	-	7	5	-	7	2	12	21	2	27	37	18	-	18	47	26	1	14	71
Pacific City	-	-	-	-	-	-	-	-	-	-	-	-	17	13	-	17	-	-	-	-	-	17	-	-	2	8	5	-	2	21
Astoria-Tillamook Total	**4**	**34**	**21**	**34**	**33**	**34**	**11**	**0**	**9**	**7**	**11**	**11**	**27**	**27**	**7**	**36**	**19**	**16**	**37**	**11**	**46**	**127**	**39**	**23**	**88**	**86**	**99**	**20**	**59**	**262**
Depoe Bay	-	-	-	-	-	-	-	-	-	-	-	-	3	3	-	3	1	1	1	1	2	5	2	-	5	4	3	-	8	12
Newport	15	26	12	25	25	26	13	3	11	10	14	7	5	8	2	9	24	10	87	24	90	139	94	21	89	157	157	13	50	267
Waldport	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	6	-	-	-	-	6
Newport Total	**15**	**26**	**12**	**25**	**25**	**26**	**13**	**3**	**11**	**10**	**14**	**7**	**8**	**11**	**2**	**12**	**25**	**11**	**88**	**25**	**92**	**144**	**96**	**21**	**100**	**161**	**160**	**13**	**58**	**285**
Florence	-	-	-	-	-	-	3	-	1	1	3	-	1	1	1	1	1	1	8	-	8	12	7	-	10	27	15	1	3	30
Winchester	-	-	-	-	-	-	3	-	3	-	3	1	-	-	-	1	-	3	9	-	10	14	6	1	12	25	14	-	4	35
Charleston (Coos Bay)	4	26	17	29	27	29	8	-	7	3	9	12	15	16	7	21	5	14	30	3	34	93	18	25	59	84	77	3	47	146
Bandon	-	-	-	-	-	-	-	-	-	-	-	-	2	1	-	2	-	1	2	-	2	4	-	-	2	4	2	-	-	8
Coos Bay Total	**4**	**26**	**17**	**29**	**27**	**29**	**14**	**0**	**11**	**4**	**15**	**13**	**18**	**18**	**8**	**25**	**6**	**19**	**49**	**3**	**54**	**123**	**31**	**26**	**83**	**140**	**108**	**4**	**54**	**219**
Port Orford	-	-	-	-	-	-	11	14	14	14	14	8	35	36	33	37	-	7	5	2	7	58	12	-	30	27	11	-	53	67
Gold Beach	-	-	-	-	-	-	-	-	-	-	-	-	20	19	17	20	-	2	2	2	2	22	-	-	1	3	1	-	23	23
Brookings	-	4	3	4	4	4	3	1	2	1	3	1	25	25	9	28	1	9	9	-	12	47	3	3	33	28	20	-	34	71
Brookings Total	**0**	**4**	**3**	**4**	**4**	**4**	**14**	**15**	**16**	**15**	**17**	**9**	**80**	**80**	**59**	**85**	**1**	**18**	**16**	**4**	**21**	**127**	**15**	**3**	**64**	**58**	**32**	**0**	**110**	**161**
Crescent City	**2**	**20**	**14**	**20**	**20**	**20**	**8**	**4**	**5**	**2**	**9**	**7**	**35**	**35**	**7**	**37**	**4**	**8**	**15**	**3**	**19**	**85**	**11**	**21**	**118**	**31**	**45**	**4**	**44**	**141**
Orick	-	-	-	-	-	-	-	-	-	-	-	1	8	8	1	8	-	-	1	-	1	9	1	-	4	7	2	-	-	12
Trinidad	-	-	-	-	-	-	-	-	-	-	-	-	5	6	-	6	-	1	1	-	1	7	-	-	23	2	1	-	3	27
Eureka Area	1	16	15	16	16	16	4	2	4	4	4	13	13	12	8	17	2	1	1	-	2	39	7	5	51	33	17	1	36	78
Fields Landing	3	10	7	10	10	10	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	10	2	1	7	2	-	1	8	14
Eureka Total	**4**	**26**	**22**	**26**	**26**	**26**	**4**	**2**	**4**	**4**	**4**	**14**	**26**	**26**	**9**	**31**	**2**	**2**	**3**	**0**	**4**	**65**	**10**	**6**	**85**	**44**	**20**	**2**	**47**	**131**

TABLE 8-4. Number of vessels by vessel primary port and species group in 2001.[a/] (Page 3 of 4)

	Vessels with Limited Entry Trawl Permits						Vessels with Fixed Gear Limited Entry Permits (No Trawl Permit)					Open Access Vessels with More than 5% Revenue from Groundfish					Open Access Vessels with Less than 5% Revenue from Groundfish						Vessels Participating in Other Fisheries							
	Whit-ing	Sable-fish	Near-shore spp	Shelf spp	Slope spp	Total	Sable-fish	Near-shore spp	Shelf spp	Slope spp	Total	Sable-fish	Near-shore spp	Shelf spp	Slope spp	Total	Sable-fish	Near-shore spp	Shelf spp	Slope spp	Total	Total GF	Hal. (Pac. & CA)	Shrimp / Prawns	Crabs	Sal-mon	HMS	CPS	Other	Total
Fort Bragg	-	12	5	12	12	12	3	1	3	3	4	27	36	34	6	57	4	5	3	1	8	81	3	3	26	49	19	1	56	130
Albion	-	-	-	-	-	-	-	-	-	-	-	2	6	5	-	7	-	1	1	-	2	9	-	-	2	2	1	-	12	17
Point Arena	-	-	-	-	-	-	-	-	-	-	-	-	4	3	1	4	-	3	2	1	4	8	-	-	5	3	1	-	11	19
Fort Bragg Total	**0**	**12**	**5**	**12**	**12**	**12**	**3**	**1**	**3**	**3**	**4**	**29**	**46**	**42**	**7**	**68**	**4**	**9**	**6**	**2**	**14**	**98**	**3**	**3**	**33**	**54**	**21**	**1**	**79**	**166**
Bodega Bay	-	-	-	-	-	-	2	2	2	1	2	1	21	23	7	26	1	1	11	1	11	39	14	-	44	125	28	1	24	171
Cloverdale	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	3	2	-	3	3	4	-	6	4	1	-	17	24
Yountville	-	-	-	-	-	-	-	-	-	-	-	-	1	1	-	1	1	-	-	-	1	2	1	-	10	2	-	-	9	15
Tomales Bay	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	1	-	-	1	-	-	-	1
Point Reyes	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	6	-	6	8	1	-	-	10
Sausilito	-	-	-	-	-	-	-	-	-	-	-	1	-	1	1	1	-	4	5	-	5	6	7	-	4	21	6	1	39	53
Bodega Bay Total	**-**	**-**	**-**	**-**	**-**	**-**	**2**	**2**	**2**	**1**	**2**	**2**	**22**	**25**	**8**	**28**	**2**	**8**	**18**	**1**	**20**	**50**	**33**	**-**	**70**	**161**	**36**	**2**	**89**	**274**
Oakland	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	1	1
Alameda	-	-	-	-	-	-	-	-	-	-	-	-	2	1	1	2	-	-	-	-	-	2	-	-	-	1	-	-	2	3
Berkeley	-	-	-	-	-	-	-	-	-	-	-	1	8	9	3	10	-	-	-	-	-	10	5	-	-	4	2	-	8	15
Richmond	-	-	-	-	-	-	-	-	-	-	-	-	-	1	1	2	-	-	1	-	1	3	3	1	-	5	-	-	1	10
San Francisco	-	6	6	6	6	6	6	6	8	7	9	9	22	21	12	27	1	5	7	1	9	51	33	3	29	59	17	2	86	155
Princeton	1	6	8	8	7	8	3	2	2	3	3	8	39	36	8	44	1	6	6	3	11	66	34	2	56	74	30	10	43	135
San Francisco Total	**1**	**12**	**14**	**14**	**13**	**14**	**9**	**8**	**10**	**10**	**12**	**18**	**71**	**68**	**25**	**85**	**2**	**11**	**14**	**4**	**21**	**132**	**75**	**6**	**85**	**143**	**49**	**12**	**141**	**319**
Gilroy	-	-	-	-	-	-	-	-	-	-	-	-	10	8	2	10	-	-	-	-	-	10	-	-	1	-	1	-	8	10
Santa Cruz	-	2	2	2	2	2	-	-	-	-	-	9	11	11	10	18	1	5	4	1	6	26	18	-	7	31	19	3	19	46
Moss Landing	-	8	6	8	8	8	11	2	6	11	11	19	24	23	13	38	1	2	2	1	6	63	27	2	6	71	42	7	38	132
Monterey	-	2	2	2	2	2	-	1	-	1	1	1	25	23	6	26	2	3	1	3	6	35	23	5	1	50	10	5	42	81
Monterey Total	**0**	**12**	**10**	**12**	**12**	**12**	**11**	**3**	**6**	**12**	**12**	**29**	**70**	**65**	**31**	**92**	**4**	**10**	**7**	**5**	**18**	**134**	**68**	**7**	**15**	**152**	**72**	**15**	**107**	**269**
San Simeon	-	-	-	-	-	-	-	-	-	-	-	-	6	6	-	6	-	-	-	-	-	6	-	-	-	-	-	-	3	6
Morro Bay	-	2	2	2	2	2	-	1	2	-	2	2	56	49	10	57	2	16	13	7	20	81	26	9	19	36	68	6	55	122
Avila	1	5	2	5	5	5	-	-	1	1	1	-	50	47	2	50	-	10	8	1	10	66	32	5	17	9	31	3	46	78
Morro Bay Total	**1**	**7**	**4**	**7**	**7**	**7**	**0**	**1**	**3**	**1**	**3**	**2**	**112**	**102**	**12**	**113**	**2**	**26**	**21**	**8**	**30**	**153**	**58**	**14**	**36**	**45**	**99**	**9**	**104**	**206**

TABLE 8-4. Number of vessels by vessel primary port and species group in 2001.[a/] (Page 4 of 4)

	Vessels with Limited Entry Trawl Permits						Vessels with Fixed Gear Limited Entry Permits (No Trawl Permit)					Open Access Vessels with More than 5% Revenue from Groundfish					Open Access Vessels with Less than 5% Revenue from Groundfish						Vessels Participating in Other Fisheries							
	Whiting	Sablefish	Nearshore spp	Shelf spp	Slope spp	Total	Sablefish	Nearshore spp	Shelf spp	Slope spp	Total	Sablefish	Nearshore spp	Shelf spp	Slope spp	Total	Sablefish	Nearshore spp	Shelf spp	Slope spp	Total	Total GF	Hal. (Pac. & CA)	Shrimp / Prawns	Crabs	Salmon	HMS	CPS	Other	Total
Santa Barbara	-	-	-	-	-	-	-	-	-	-	-	-	31	16	11	31	-	25	13	10	29	60	32	15	46	4	20	10	111	136
Santa Cruz Island	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	1	-	-	-	1	-	-	1
Ventura	-	-	-	-	-	-	1	-	1	1	1	2	9	8	9	12	1	9	8	7	10	23	15	8	17	1	16	8	29	43
Oxnard	-	-	-	-	-	-	6	4	6	6	6	2	14	8	9	14	-	14	5	10	17	37	13	8	19	-	14	3	58	64
Port Hueneme	-	-	-	-	-	-	-	-	1	-	1	-	-	-	-	-	-	-	-	-	-	1	-	-	-	2	3	31	9	31
Santa Barbara Total	**0**	**0**	**0**	**0**	**0**	**0**	**7**	**4**	**8**	**7**	**8**	**4**	**54**	**32**	**29**	**57**	**1**	**48**	**26**	**27**	**56**	**121**	**61**	**31**	**82**	**7**	**54**	**52**	**207**	**275**
Terminal Island	-	-	-	-	-	-	1	1	1	1	1	2	19	9	10	19	1	9	6	2	12	32	35	7	28	2	47	26	100	126
San Pedro	-	-	-	-	-	-	-	-	-	-	-	-	7	8	3	10	-	17	12	5	18	28	16	2	18	1	51	53	59	112
Willmington	-	-	-	-	-	-	1	1	1	1	1	-	-	-	-	-	-	-	-	-	-	1	1	-	1	-	1	1	1	2
Catalina Island	-	-	-	-	-	-	-	-	-	-	-	2	6	2	4	8	-	3	2	1	4	12	10	3	15	-	12	9	26	41
Long Beach	-	-	-	-	-	-	-	-	-	-	-	-	2	3	1	3	-	-	-	-	-	3	4	-	1	-	4	1	4	6
Newport Beach	-	-	-	-	-	-	4	2	3	4	5	1	1	2	2	2	1	1	-	-	2	9	3	3	8	-	4	5	11	18
Dana Point	-	-	-	-	-	-	-	1	-	-	1	-	1	1	-	1	-	2	-	-	2	4	-	3	26	-	4	-	18	33
Los Angeles Total	**0**	**0**	**0**	**0**	**0**	**0**	**6**	**5**	**5**	**6**	**8**	**5**	**36**	**25**	**20**	**43**	**2**	**32**	**20**	**8**	**38**	**89**	**69**	**18**	**97**	**3**	**123**	**95**	**219**	**338**
North Shore	-	-	-	-	-	-	-	-	-	-	-	1	3	8	5	8	1	6	9	6	10	18	5	5	26	-	18	7	30	49
San Diego	-	-	-	-	-	-	-	1	1	-	1	1	7	6	5	10	1	5	4	1	7	18	6	2	30	-	37	11	41	65
Oceanside	-	-	-	-	-	-	5	1	2	5	5	-	1	3	2	3	-	4	2	2	4	12	2	3	9	-	15	2	14	26
San Diego Total	**0**	**0**	**0**	**0**	**0**	**0**	**5**	**2**	**3**	**5**	**6**	**2**	**11**	**17**	**12**	**21**	**2**	**15**	**15**	**9**	**21**	**48**	**13**	**10**	**65**	**0**	**70**	**20**	**85**	**140**
Other California	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	2	-	-	-	8	10
At-Sea Only	**28**	**20**	**2**	**28**	**23**	**28**	**-**	**-**	**-**	**-**	**-**	**-**	**-**	**-**	**-**	**-**	**-**	**-**	**-**	**-**	**-**	**28**	**11**	**-**	**2**	**26**	**9**	**28**	**25**	**28**
Grand Total	**68**	**229**	**146**	**242**	**232**	**243**	**158**	**57**	**138**	**136**	**178**	**179**	**623**	**601**	**252**	**771**	**104**	**237**	**389**	**126**	**517**	**1,709**	**675**	**214**	**1,247**	**1,202**	**1,172**	**297**	**2,470**	**4,588**

NOTE: The primary port is the port at which the vessel made more landings than any other port, as measured in terms of exvessel value. Vessels in the "at-sea only" row are those that made no shoreside landings. Vessels delivering at-sea that had some shoreside landings were assigned to a primary port based on their shoreside landings. Source: Derived from PacFIN monthly vessel summary files.

a/ Actual period is November 2000 through October 2001.

TABLE 8-5. Number of vessels by port by length class in 2001.[a/] (Page 1 of 2)

	Vessel Length Category							
	<40'	40'-50'	50'-60'	60'-70'	70'-150'	>150'	Unspecified	Total
Blaine	75	18	17	3	4	-	2	119
Bellingham	109	33	39	16	9	1	3	210
Point Roberts	6	-	-	-	-	-	-	6
Friday Harbor	3	-	-	-	-	-	-	3
Anacortes	70	1	2	-	-	-	1	74
LaConner	24	1	-	-	-	-	-	25
Everett	34	8	4	3	-	-	2	51
Seattle	48	19	15	5	6	-	-	93
Tacoma	17	4	4	1	-	-	-	26
Shelton	4	-	-	-	-	-	-	4
Centralia	13	1	-	-	-	-	-	14
Puget Sound Total	**403**	**85**	**81**	**28**	**19**	**1**	**8**	**625**
Port Townsend	18	1	2	1	1	-	-	23
Quilcene	2	-	-	-	-	-	-	2
Sequim	10	-	-	-	-	-	-	10
Port Angeles	36	17	4	-	1	-	-	58
Neah Bay	2	2	1	-	-	-	-	5
La Push	4	4	2	-	-	-	-	10
North WA Coast Total	**72**	**24**	**9**	**1**	**2**	**0**	**0**	**108**
Copalis	-	4	6	-	-	-	-	10
Aberdeen	2	-	-	-	-	-	-	2
Westport (WA)	56	53	41	16	12	-	-	178
Central WA Coast Total	**58**	**57**	**47**	**16**	**12**	**0**	**0**	**190**
Tokeland	50	2	2	1	2	-	-	57
Ilwaco	69	36	27	16	15	-	-	163
Pacific County	45	-	1	-	-	-	1	47
Columbia River	173	-	-	-	-	-	-	173
South WA Coast Total	**337**	**38**	**30**	**17**	**17**	**0**	**1**	**440**
Astoria	37	55	20	25	24	-	3	164
Gearhart-Seaside	2	-	-	-	-	-	-	2
Cannon Beach	2	-	-	-	-	-	-	2
Nehalem Bay	2	-	-	-	-	-	-	2
Garibaldi (Tillamook)	57	11	3	-	-	-	-	71
Pacific City	21	-	-	-	-	-	-	21
Astoria-Tillamook Total	**121**	**66**	**23**	**25**	**24**	**0**	**3**	**262**
Depoe Bay	9	3	-	-	-	-	-	12
Newport	103	89	36	20	19	-	-	267
Waldport	6	-	-	-	-	-	-	6
Newport Total	**118**	**92**	**36**	**20**	**19**	**0**	**0**	**285**
Florence	22	5	3	-	-	-	-	30
Winchester	28	1	4	1	1	-	-	35
Charleston (Coos Bay)	72	36	11	14	12	-	1	146
Bandon	7	-	1	-	-	-	-	8
Coos Bay Total								
Port Orford	67	-	-	-	-	-	-	67
Gold Beach	23	-	-	-	-	-	-	23
Brookings	56	10	3	1	1	-	-	71
Brookings Total								
Crescent City	**70**	**35**	**22**	**6**	**8**	**-**	**-**	**141**
Orick	12	-	-	-	-	-	-	12
Trinidad	26	-	-	-	-	-	1	27
Eureka Area	36	24	11	5	1	1	-	78
Fields Landing	4	1	2	1	6	-	-	14
Eureka Total	**78**	**25**	**13**	**6**	**7**	**1**	**1**	**131**

TABLE 8-5. Number of vessels by port by length class in 2001.[a/] (Page 2 of 2)

	Vessel Length Category							
	<40'	40'-50'	50'-60'	60'-70'	70'-150'	>150'	Unspecified	Total
Fort Bragg	95	18	9	5	2	-	1	130
Albion	17	-	-	-	-	-	-	17
Point Arena	19	-	-	-	-	-	-	19
Fort Bragg Total	**131**	**18**	**9**	**5**	**2**	**0**	**1**	**166**
Bodega Bay	138	24	6	2	1	-	-	171
Cloverdale	24	-	-	-	-	-	-	24
Yountville	14	-	-	-	-	-	1	15
Tomales Bay	1	-	-	-	-	-	-	1
Point Reyes	8	2	-	-	-	-	-	10
Sausilito	50	3	-	-	-	-	-	53
Bodega Bay Total	**235**	**29**	**6**	**2**	**1**	**-**	**1**	**274**
Oakland	1	-	-	-	-	-	-	1
Alameda	3	-	-	-	-	-	-	3
Berkeley	15	-	-	-	-	-	-	15
Richmond	9	-	-	-	1	-	-	10
San Francisco	120	23	5	4	3	-	-	155
Princeton	96	28	7	2	-	-	2	135
San Francisco Total	**479**	**80**	**18**	**8**	**5**	**0**	**3**	**593**
Gilroy	8	-	1	-	-	-	1	10
Santa Cruz	41	5	-	-	-	-	-	46
Moss Landing	90	20	16	4	2	-	-	132
Monterey	76	1	1	-	1	-	2	81
Monterey Total	**215**	**26**	**18**	**4**	**3**	**0**	**3**	**269**
San Simeon	6	-	-	-	-	-	-	6
Morro Bay	93	14	8	6	1	-	-	122
Avila	63	8	3	3	1	-	-	78
Morro Bay Total	**162**	**22**	**11**	**9**	**2**	**0**	**0**	**206**
Santa Barbara	118	14	1	1	1	-	1	136
Santa Cruz Island	1	-	-	-	-	-	-	1
Ventura	27	10	5	-	1	-	-	43
Oxnard	59	5	-	-	-	-	-	64
Port Hueneme	-	6	18	4	3	-	-	31
Santa Barbara Total	**205**	**35**	**24**	**5**	**5**	**0**	**1**	**275**
Terminal Island	70	19	2	1	34	-	-	126
San Pedro	64	11	14	9	14	-	-	112
Willmington	2	-	-	-	-	-	-	2
Catalina Island	40	-	-	1	-	-	-	41
Long Beach	5	1	-	-	-	-	-	6
Newport Beach	17	1	-	-	-	-	-	18
Dana Point	30	3	-	-	-	-	-	33
Los Angeles Total	**228**	**35**	**16**	**11**	**48**	**0**	**0**	**338**
North Shore	45	2	1	-	1	-	-	49
San Diego	41	16	4	1	3	-	-	65
Oceanside	21	3	-	-	2	-	-	26
San Diego Total	**107**	**21**	**5**	**1**	**6**	**0**	**0**	**140**
Other California	9	1	-	-	-	-	-	10
At-Sea Only	**-**	**-**	**-**	**-**	**15**	**-**	**6**	**21**
Grand Totals	**3,068**	**712**	**384**	**178**	**208**	**2**	**28**	**4,580**

NOTE: Does not include at-sea deliveries by catcher-processor. Include deliveries to motherships. Vessels delivering to motherships with other deliveries to shorebased processors were assigned to a port based on their shore based landings. Source: Derived from PacFIN monthly vessel summary files.

a/ Actual period is November 2000 through October 2001.

TABLE 8-6. Number of processors/buyers by primary port in 2001. [a/] (Page 1 of 5)

	Processors/Buyers Buying from Vessels with Limited Entry Trawl Permits						Processors/Buyers Buying from Vessels with Fixed Gear Limited Entry Permits (No Trawl Permit)					Processors/Buyers Buying from Open Access Vessels with More than 5% Revenue from Groundfish					Processors/Buyers Buying from Open Access Vessels with Less than 5% Revenue from Groundfish						Processors/Buyers Buying from Vessels Participating in Other Fisheries							
	Whiting	Sablefish	Near-shore spp	Shelf spp	Slope spp	Total	Sablefish	Near-shore spp	Shelf spp	Slope spp	Total	Sablefish	Near-shore spp	Shelf spp	Slope spp	Total	Sablefish	Near-shore spp	Shelf spp	Slope spp	Total	Total GF	Hal. (Pac & CA)	Shrimp/ Prawns	Crabs	Salmon	HMS	CPS	Other	Total
Blaine	1	1	1	2	1	2	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	2	-	-	1	-	-	1	5	5
Bellingham	1	1	1	3	1	3	2	1	2	2	2	-	-	-	-	-	1	-	1	1	1	4	2	-	9	-	1	1	40	40
Point Roberts	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	1	-	-	-	8	8
Friday Harbor	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	8	8
Anacortes	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	2	-	-	-	14	14
LaConner	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	1	14	14
Everett	-	-	-	-	-	-	1	-	1	1	1	-	-	-	-	-	-	-	-	-	-	1	1	-	1	1	-	-	11	11
Seattle	-	-	-	-	-	-	1	-	-	1	1	-	-	1	-	1	-	-	1	-	1	2	2	-	7	2	9	-	32	39
Tacoma	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	1	1	-	25	26
Olympia	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	2	1	-	-	9	10
Shelton	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	1	-	-	12	12
Centralia	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	2	-	-	8	9
Puget Sound Total	**2**	**2**	**2**	**5**	**2**	**5**	**4**	**1**	**3**	**4**	**4**	**0**	**0**	**1**	**0**	**1**	**1**	**0**	**2**	**1**	**2**	**9**	**5**	**0**	**23**	**8**	**11**	**3**	**186**	**196**
Port Townsend	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	1	-	13	13
Quilcene	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	15	15
Sequim	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	2	-	-	-	5	5
Port Angeles	-	1	-	2	1	3	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	3	-	-	1	5	2	-	28	29
Neah Bay	-	7	6	7	7	7	1	-	-	1	1	1	-	1	-	2	-	-	-	-	-	7	4	-	-	3	-	-	7	8
La Push	-	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	-	-	1	1	1	1	2	-	1	1	2	-	3	4
Quillayute	-	1	-	1	1	1	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	1	1	-	1	2	1	-	2	4
North Washington Coast Total	**0**	**10**	**7**	**11**	**10**	**12**	**2**	**1**	**1**	**2**	**2**	**2**	**1**	**2**	**1**	**3**	**0**	**0**	**1**	**1**	**1**	**12**	**7**	**0**	**5**	**11**	**6**	**0**	**73**	**78**
Copalis	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	1	-	1	-	-	-	1	2
Aberdeen	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-		-	-	1	3	1	-	2	5
Westport (WA)	1	2	1	2	2	2	4	-	2	3	4	2	-	2	1	3	1	-	5	1	5	6	5	1	16	10	10	3	10	22
Central WA Coast Total	**1**	**2**	**1**	**2**	**2**	**2**	**4**	**0**	**2**	**3**	**4**	**2**	**0**	**2**	**1**	**3**	**1**	**0**	**5**	**1**	**5**	**6**	**6**	**1**	**18**	**13**	**11**	**3**	**13**	**29**

TABLE 8-6. Number of processors/buyers by primary port in 2001. [a/] (Page 2 of 5)

	Processors/Buyers Buying from Vessels with Limited Entry Trawl Permits						Processors/Buyers Buying from Vessels with Fixed Gear Limited Entry Permits (No Trawl Permit)					Processors/Buyers Buying from Open Access Vessels with More than 5% Revenue from Groundfish					Processors/Buyers Buying from Open Access Vessels with Less than 5% Revenue from Groundfish						Processors/Buyers Buying from Vessels Participating in Other Fisheries							
	Whiting	Sablefish	Nearshore spp	Shelf spp	Slope spp	Total	Sablefish	Nearshore spp	Shelf spp	Slope spp	Total	Sablefish	Nearshore spp	Shelf spp	Slope spp	Total	Sablefish	Nearshore spp	Shelf spp	Slope spp	Total	Total GF	Hal. (Pac & CA)	Shrimp/ Prawns	Crabs	Salmon	HMS	CPS	Other	Total
Tokeland	-	-	-	-	-	-	-	-	-	-	-	-	-	1	-	1	2	-	3	3	3	3	1	2	10	-	1	-	14	17
Ilwaco	1	2	2	2	2	2	1	1	1	1	2	1	-	1	1	1	2	1	4	2	4	5	8	2	7	5	9	2	16	19
Pacific County	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	2	1	-	1	21	22
Columbia River	-	-	-	-	-	-	-	-	-	-	-	-	2	2	-	2	-	1	1	1	1	2	1	-	-	2	1	-	23	23
South WA Coast Total	**1**	**2**	**2**	**2**	**2**	**2**	**1**	**1**	**1**	**1**	**2**	**1**	**2**	**4**	**1**	**4**	**4**	**2**	**8**	**6**	**8**	**10**	**10**	**4**	**19**	**8**	**11**	**3**	**74**	**81**
Astoria	2	4	3	5	5	5	6	2	3	4	6	2	5	5	3	5	4	2	5	4	6	8	8	4	9	9	6	7	8	19
Gearhart-Seaside	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-		-	-	-	2	-	-	-	2
Cannon Beach	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	1	-	-	-	1
Nehalem Bay	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	1	-	-	-	1	1
Garibaldi (Tillamook)	-	1	2	1	1	2	2	1	2	-	2	-	3	4	-	4	1	4	6	-	6	9	10	1	9	10	5	-	10	25
Netarts	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-		-	-	2	-	-	-	-	2
Pacific City	-	-	-	-	-	-	-	-	-	-	-	-	3	3	-	3	-	-	-	-	-	3	1	-	3	3	3	-	1	5
Astoria-Tillamook Total	**2**	**5**	**5**	**6**	**6**	**7**	**8**	**3**	**5**	**4**	**8**	**2**	**11**	**12**	**3**	**12**	**5**	**6**	**11**	**4**	**12**	**20**	**19**	**5**	**24**	**25**	**14**	**7**	**20**	**55**
Siletz Bay	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-		-	-	1	-	-	-	-	1
Depoe Bay	-	-	-	-	-	-	-	-	-	-	-	-	2	2	-	2	1	1	1	-	2	2	2	-	3	2	1	-	2	3
Newport	4	7	5	7	7	9	6	6	8	4	11	4	6	11	2	12	5	5	15	3	16	24	25	3	25	44	33	4	9	63
Waldport	-	-	-	-	-	-	-	-	-	-	-	-	1	1	-	1	-	-	-	-	-	1	-	-	6	1	1	-	1	6
Newport Total	**4**	**7**	**5**	**7**	**7**	**9**	**6**	**6**	**8**	**4**	**11**	**4**	**9**	**14**	**2**	**15**	**6**	**6**	**16**	**3**	**18**	**27**	**27**	**3**	**35**	**47**	**35**	**4**	**12**	**73**
Florence	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	4	-	4	4	2	-	7	10	7	-	-	15
Winchester	-	-	-	-	-	-	-	-	2	-	2	-	-	-	-	-	-	2	2	-	2	3	4	-	6	5	12	1	3	16
Charleston (Coos Bay)	1	2	3	4	4	5	3	-	2	1	4	2	2	4	1	4	2	5	7	2	7	9	6	2	7	17	25	1	7	33
Bandon	-	-	-	1	-	1	-	-	-	-	-	-	2	2	1	2	-	1	1	1	1	2	1	-	3	7	5	-	1	10
Coos Bay Total	**1**	**2**	**3**	**5**	**4**	**6**	**3**	**0**	**4**	**1**	**6**	**2**	**4**	**6**	**2**	**6**	**2**	**8**	**14**	**3**	**14**	**18**	**13**	**2**	**23**	**39**	**49**	**2**	**11**	**74**

TABLE 8-6. Number of processors/buyers by primary port in 2001.[a/] (Page 3 of 5)

	Processors/Buyers Buying from Vessels with Limited Entry Trawl Permits						Processors/Buyers Buying from Vessels with Fixed Gear Limited Entry Permits (No Trawl Permit)					Processors/Buyers Buying from Open Access Vessels with More than 5% Revenue from Groundfish					Processors/Buyers Buying from Open Access Vessels with Less than 5% Revenue from Groundfish						Processors/Buyers Buying from Vessels Participating in Other Fisheries							
	Whiting	Sablefish	Near-shore spp	Shelf spp	Slope spp	Total	Sablefish	Near-shore spp	Shelf spp	Slope spp	Total	Sablefish	Near-shore spp	Shelf spp	Slope spp	Total	Sablefish	Near-shore spp	Shelf spp	Slope spp	Total	Total GF	Hal. (Pac & CA)	Shrimp/ Prawns	Crabs	Salmon	HMS	CPS	Other	Total
Port Orford	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	1	-	1	-	1	-	-	1
Gold Beach	-	-	1	1	-	1	1	1	1	1	1	1	1	1	1	1	-	1	1	1	1	1	1	-	1	1	1	-	1	1
Brookings	1	4	2	3	4	4	2	2	3	1	4	1	8	7	5	8	1	3	3	1	3	10	1	3	8	9	12	1	7	16
Brookings Total	**1**	**4**	**3**	**4**	**4**	**5**	**3**	**3**	**4**	**2**	**5**	**2**	**9**	**8**	**6**	**9**	**1**	**4**	**4**	**2**	**4**	**11**	**3**	**3**	**10**	**10**	**14**	**1**	**8**	**18**
Crescent City	**2**	**4**	**3**	**5**	**4**	**5**	**4**	**6**	**8**	**4**	**8**	**4**	**13**	**14**	**7**	**15**	**3**	**3**	**7**	**3**	**7**	**17**	**3**	**7**	**20**	**7**	**13**	**5**	**11**	**31**
Orick	-	-	-	-	-	-	-	-	-	-	-	-	4	4	1	4	-	-	-	-	-	4	1	-	1	3	1	-	-	4
Trinidad	-	-	-	1	-	1	-	-	-	-	-	-	4	4	-	4	-	-	-	-	-	4	-	1	5	1	2	-	1	7
Eureka Area	-	1	-	2	2	2	2	4	4	2	4	3	4	4	3	4	1	2	1	-	2	5	-	2	10	7	6	-	6	21
Eureka Total	**0**	**1**	**0**	**3**	**2**	**3**	**2**	**4**	**4**	**2**	**4**	**3**	**12**	**12**	**4**	**12**	**1**	**2**	**1**	**0**	**2**	**13**	**1**	**3**	**16**	**11**	**9**	**0**	**7**	**32**
Fort Bragg	-	-	1	-	1	2	1	1	1	1	1	1	9	9	3	10	-	3	2	1	3	11	-	-	5	7	12	-	7	22
Albion	-	-	-	-	-	-	-	-	1	-	1	-	-	-	-	-	-	-	-	-	-	1	-	-	1	-	-	-	-	1
Point Arena	-	-	-	-	-	-	-	-	1	-	1	1	1	-	-	1	-	1	3	1	3	3	-	1	2	6	2	-	1	6
Elk	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-		-	-	-	-	-	-	1	1
Fort Bragg Total	**0**	**0**	**1**	**0**	**1**	**2**	**1**	**1**	**3**	**1**	**3**	**2**	**10**	**9**	**3**	**11**	**0**	**4**	**5**	**2**	**6**	**15**	**0**	**1**	**8**	**13**	**14**	**0**	**9**	**30**
Bodega Bay	-	2	2	2	2	2	1	1	4	3	4	1	10	13	6	14	-	3	6	2	6	18	5	2	10	24	10	1	10	44
Cloverdale	-	-	-	-	-	-	-	1	-	-	1	-	-	-	-	-	-	2	2	-	3	3	3	-	4	4	2	-	4	8
Yountville	-	-	-	-	-	-	-	-	-	-	-	-	1	1	-	1	2	1	1	-	3	4	1	-	6	2	-	1	11	13
Tomales Bay	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-		1	-	-	1	-	-	-	1
Point Reyes	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	1	-	1	1	-	-	-	1
Sausilito	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	2	-	2	2	2	-	2	6	3	-	5	9
Bodega Bay Total	**-**	**2**	**2**	**2**	**2**	**2**	**1**	**2**	**4**	**3**	**5**	**1**	**11**	**14**	**6**	**15**	**2**	**6**	**11**	**2**	**14**	**27**	**13**	**2**	**23**	**38**	**15**	**2**	**30**	**76**
Alameda	-	-	-	-	-	-	-	-	-	-	-	-	1	-	-	1	-	-	-	-	-	1	-	-	1	2	-	-	1	3
Berkeley	-	-	-	-	-	-	-	-	-	-	-	-	3	3	1	4	-	-	-	1	1	5	2	-	1	3	1	-	1	6
Richmond	-	-	-	-	-	-	1	1	1	1	1	1	1	2	2	3	-	1	1	1	1	3	2	1	1	5	1	1	2	8
San Francisco	-	3	4	5	5	6	2	11	12	4	13	5	20	19	12	24	-	6	5	1	8	31	14	6	11	13	6	2	34	48
Princeton	1	5	6	5	5	6	1	5	5	2	7	4	20	19	5	23	1	5	3	1	6	29	13	2	30	30	19	6	18	59
San Francisco Total	**1**	**8**	**10**	**10**	**10**	**12**	**4**	**17**	**18**	**7**	**21**	**10**	**45**	**43**	**20**	**55**	**1**	**12**	**9**	**4**	**16**	**69**	**31**	**9**	**44**	**53**	**27**	**9**	**56**	**124**

TABLE 8-6. Number of processors/buyers by primary port in 2001. [a/] (Page 4 of 5)

	Processors/Buyers Buying from Vessels with Limited Entry Trawl Permits						Processors/Buyers Buying from Vessels with Fixed Gear Limited Entry Permits (No Trawl Permit)					Processors/Buyers Buying from Open Access Vessels with More than 5% Revenue from Groundfish					Processors/Buyers Buying from Open Access Vessels with Less than 5% Revenue from Groundfish						Processors/Buyers Buying from Vessels Participating in Other Fisheries							
	Whiting	Sablefish	Near-shore spp	Shelf spp	Slope spp	Total	Sablefish	Near-shore spp	Shelf spp	Slope spp	Total	Sablefish	Near-shore spp	Shelf spp	Slope spp	Total	Sablefish	Near-shore spp	Shelf spp	Slope spp	Total	Total GF	Hal. (Pac & CA)	Shrimp/Prawns	Crabs	Sal-mon	HMS	CPS	Other	Total
Gilroy	-	-	-	-	-	-	-	-	-	-	-	-	3	3	-	3	-	-	-	-	-	3	-	-	-	-	-	-	2	3
Santa Cruz	-	4	5	5	4	5	1	1	1	2	2	4	12	9	6	12	1	5	4	-	6	14	12	-	9	14	12	4	9	24
Moss Landing	1	2	1	2	2	2	4	4	4	6	8	3	8	6	6	9	2	2	3	3	7	14	11	4	6	20	15	2	7	30
Monterey	1	1	2	2	1	2	-	1	-	1	1	1	7	7	3	7	3	3	3	2	7	10	4	4	3	5	4	3	8	13
Monterey Total	**2**	**7**	**8**	**9**	**7**	**9**	**5**	**6**	**5**	**9**	**11**	**8**	**30**	**25**	**15**	**31**	**6**	**10**	**10**	**5**	**20**	**41**	**27**	**8**	**18**	**39**	**31**	**9**	**26**	**70**
San Simeon	-	-	-	-	-	-	-	-	-	-	-	-	2	2	-	2	-	-	-	-	-	2	-	-	-	1	-	1	2	2
Morro Bay	-	3	1	4	4	4	2	1	1	2	2	2	7	4	4	8	1	5	6	3	7	11	7	3	6	8	17	3	8	21
Avila	-	1	2	1	-	2	-	1	2	-	2	-	7	7	1	7	-	3	2	-	4	9	4	1	3	2	6	1	7	12
Morro Bay Total	**0**	**4**	**3**	**5**	**4**	**6**	**2**	**2**	**3**	**2**	**4**	**2**	**16**	**13**	**5**	**17**	**1**	**8**	**8**	**3**	**11**	**22**	**11**	**4**	**9**	**11**	**23**	**5**	**17**	**35**
Santa Barbara	-	1	1	2	1	2	-	-	-	-	-	-	4	4	2	4	1	9	7	5	13	17	13	14	20	3	7	8	25	37
Ventura	-	1	1	1	1	1	4	2	3	4	4	2	11	9	9	12	1	12	9	10	14	17	13	11	21	-	12	7	18	27
Oxnard	-	-	-	-	-	-	7	6	6	7	11	2	10	7	6	11	-	8	7	7	11	16	10	7	16	-	11	3	16	27
Port Hueneme	1	1	1	1	1	1	1	-	1	1	1	1	2	2	1	2	-	2	1	1	2	2	3	2	2	2	3	8	3	8
Santa Barbara Total	**1**	**3**	**3**	**4**	**3**	**4**	**12**	**8**	**10**	**12**	**16**	**5**	**27**	**22**	**18**	**29**	**2**	**31**	**24**	**23**	**40**	**52**	**39**	**34**	**59**	**5**	**33**	**26**	**62**	**99**
Terminal Island	-	-	-	-	-	-	-	-	-	-	-	2	9	3	4	9	2	3	4	2	4	10	6	3	9	-	7	10	23	31
San Pedro	-	-	-	-	-	-	2	3	2	2	4	1	5	4	3	6	-	9	7	3	10	14	9	-	12	2	21	10	26	34
Willmington	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	1	-	-	-	1	1
Catalina Island	-	-	-	-	-	-	2	2	2	2	3	1	5	3	3	7	-	5	1	-	5	10	5	4	10	-	7	4	14	17
Long Beach	-	-	-	-	-	-	-	-	-	-	-	-	2	1	1	2	1	1	-	1	1	2	2	1	3	-	-	2	4	4
Newport Beach	-	-	-	-	-	-	2	2	2	2	2	1	1	1	1	1	1	4	1	-	5	5	4	5	10	-	4	3	7	12
Dana Point	-	-	-	-	-	-	1	-	-	1	1	1	3	3	2	3	-	1	-	-	1	3	1	2	10	-	4	1	6	13
Los Angeles Total	**0**	**0**	**0**	**0**	**0**	**0**	**7**	**7**	**6**	**7**	**10**	**6**	**25**	**15**	**14**	**28**	**4**	**23**	**13**	**6**	**26**	**44**	**27**	**15**	**55**	**2**	**43**	**30**	**81**	**112**
North Shore	-	-	-	-	-	-	-	-	-	-	-	1	4	7	5	8	2	6	8	5	9	11	6	4	12	2	8	5	10	16
San Diego	-	-	-	-	-	-	-	2	1	-	2	-	6	5	3	7	1	4	4	2	5	10	2	1	18	-	12	6	15	23
Oceanside	-	-	-	-	-	-	-	1	-	-	1	-	3	2	2	4	-	4	1	2	4	5	2	1	5	1	3	2	4	8
San Diego Total	**0**	**0**	**0**	**0**	**0**	**0**	**0**	**3**	**1**	**0**	**3**	**1**	**13**	**14**	**10**	**19**	**3**	**14**	**13**	**9**	**18**	**26**	**10**	**6**	**35**	**3**	**23**	**13**	**29**	**47**

TABLE 8-6. Number of processors/buyers by primary port in 2001. [a/] (Page 5 of 5)

	Processors/Buyers Buying from Vessels with Limited Entry Trawl Permits						Processors/Buyers Buying from Vessels with Fixed Gear Limited Entry Permits (No Trawl Permit)					Processors/Buyers Buying from Open Access Vessels with More than 5% Revenue from Groundfish					Processors/Buyers Buying from Open Access Vessels with Less than 5% Revenue from Groundfish						Processors/Buyers Buying from Vessels Participating in Other Fisheries							
	Whit-ing	Sable-fish	Near-shore spp	Shelf spp	Slope spp	Total	Sable-fish	Near-shore spp	Shelf spp	Slope spp	Total	Sable-fish	Near-shore spp	Shelf spp	Slope spp	Total	Sable-fish	Near-shore spp	Shelf spp	Slope spp	Total	Total GF	Hal. (Pac & CA)	Shrimp/ Prawns	Crabs	Sal-mon	HMS	CPS	Other	Total
Other California	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	3	-	-	-	7	10
At-Sea Only	**12**	**11**	**1**	**12**	**12**	**12**	**-**	**-**	**-**	**-**	**-**	**-**	**-**	**-**	**-**	**-**	**-**	**-**	**-**	**-**	**-**	**12**	**8**	**-**	**1**	**11**	**6**	**12**	**13**	**13**
Grand Totals	**30**	**74**	**59**	**92**	**82**	**103**	**69**	**71**	**90**	**68**	**127**	**57**	**238**	**230**	**118**	**285**	**43**	**139**	**162**	**78**	**224**	**451**	**260**	**107**	**448**	**354**	**388**	**134**	**745**	**1,283**

Source: Derived from PacFIN monthly vessel summary files.

a/ Actual period is November 2000 through October 2001.

TABLE 8-7. Number of buyers/processors by purchase value of raw product (exvessel value) in 2001.[a/] (Page 1 of 1)

	Level of Purchases in Exvessel Value						
	<$5,000	$5,000- $20,000	$20,000- $100,000	$100,000- $300,000	$300,000- $1,000,000	>$1,000,000	Total
Puget Sound	51	40	52	18	19	16	196
North Washington Coast	35	14	15	6	4	4	78
Central WA Coast	9	6	6	1	2	5	29
South WA Coast	31	25	15	4	3	3	81
Astoria - Tillamook	25	8	10	1	7	4	55
Newport	34	17	14	1	3	4	73
Coos Bay	36	26	5	5	0	0	74
Brookings	4	3	6	1	0	0	18
Crescent City	11	11	1	1	3	4	31
Eureka	17	9	3	3	0	0	32
Fort Bragg	16	6	4	0	0	0	30
Bodega Bay - San Francisco	104	39	28	13	13	3	200
Monterey	40	12	8	6	2	2	70
Morro Bay	16	9	4	2	2	2	35
Santa Barbara	32	19	21	15	8	4	99
Los Angeles	37	17	23	16	10	10	113
San Diego	13	10	11	9	0	0	47
At-Sea Only	0	-	-	0	0	0	13
Total	492	254	223	100	76	60	1,283

NOTE: "*" = Values omitted to preserve confidentiality.

a/ Actual period is November 2000 through October 2001.

TABLE 8-8a. Income and employment from commercial fishing activities by port group in 2001.[a/] (Page 1 of 1)

	All Commercial Fishery						All Groundfish			
Port Group Area	Commercial Fishery-Related Income ($,000)	Fishery-Related Income as a share of Total Personal Income		Commercial Fishery-Related Employment	Fishery-Related Employment as a share of Total Employment		Income ($,000)	Employ.	Groundfish-Related Income as a share of Total Fishery Income	
		(Percent)	(Rank)		(Percent)	(Rank)			(Percent)	(Rank)
Puget Sound	14,344	0.01%	17	531	0.03%	16	8,694	322	60.61%	1
North WA Coast	8,262	0.36%	9	357	1.14%	8	4,865	210	58.89%	2
Central WA Coast	29,858	2.03%	5	1,091	4.26%	6	7,442	272	24.93%	10
South WA Coast	21,053	4.78%	1	957	14.24%	1	1,557	71	7.39%	14
Astoria/Tillamook	46,402	3.29%	4	1,959	7.72%	4	24,122	1,019	51.98%	3
Newport	45,709	4.27%	2	1,968	10.76%	2	22,122	952	48.40%	5
Coos Bay	23,476	0.20%	11	948	0.44%	11	9,266	374	39.47%	7
Brookings	8,792	1.77%	6	400	5.76%	5	3,754	171	42.70%	6
Crescent City	19,111	3.90%	3	773	9.43%	3	6,246	253	32.68%	9
Eureka	14,729	0.50%	8	591	1.11%	9	7,501	301	50.93%	4
Fort Bragg	15,740	0.73%	7	650	1.82%	7	6,183	255	39.28%	8
Bodega Bay/ San Francisco	39,330	0.02%	15	1,205	0.04%	15	5,744	176	14.60%	13
Monterey	34,174	0.16%	12	1,146	0.39%	12	5,091	171	14.90%	12
Morro Bay	10,348	0.16%	13	374	0.36%	13	2,482	90	23.99%	11
Santa Barbara	98,377	0.26%	10	3,075	0.78%	10	1,396	44	1.42%	16
Los Angeles	149,075	0.04%	14	3,840	0.06%	14	1,148	30	0.77%	17
San Diego	13,431	0.01%	16	367	0.03%	17	625	17	4.65%	15
TOTAL	592,209	0.06%		20,230	0.15%		118,239	4,726	19.97%	

Note: Includes total income and employment impacts: wages and salaries paid to primary producers, processors and suppliers, and the additional income and employment generated when wages and salaries are spent (PFMC FEAM 9/02).

a/ Actual period is November 2000 through October 2001.

TABLE 8-8b. Income and employment from commercial fishing activities by port group in 2001.[a/] (Page 1 of 1)

	Groundfish Limited Entry Trawl				Other Groundfish Gear			
Port Group Area	Income ($,000)	Employ.	Limited Entry Groundfish Trawl-Related Income as a share of Fishery Income		Income ($,000)	Employ.	Other Groundfish-Related Income as a share of Fishery Income	
			(Percent)	(Rank)			(Percent)	(Rank)
Puget Sound	6,558	243	45.72%	2	2,136	79	14.89%	3
North WA Coast	1,318	57	15.96%	10	3,547	153	42.93%	1
Central WA Coast	6,558	240	21.96%	9	885	32	2.96%	14
South WA Coast	1,377	63	6.54%	14	180	8	0.85%	16
Astoria/Tillamook	22,338	943	48.14%	1	1,784	75	3.85%	13
Newport	19,991	861	43.74%	3	2,132	92	4.66%	10
Coos Bay	7,718	312	32.88%	5	1,548	63	6.59%	8
Brookings	1,985	90	22.58%	8	1,769	80	20.12%	2
Crescent City	5,019	203	26.26%	7	1,227	50	6.42%	9
Eureka	6,437	258	43.70%	4	1,064	43	7.23%	7
Fort Bragg	4,503	186	28.61%	6	1,680	69	10.68%	5
Bodega Bay/San Francisco	4,176	128	10.62%	11	1,569	48	3.99%	12
Monterey	2,579	86	7.55%	13	2,512	84	7.35%	6
Morro Bay	1,095	40	10.58%	12	1,388	50	13.41%	4
Santa Barbara	9	0	0.01%	16	1,387	43	1.41%	15
Los Angeles	1	0	0.00%	17	1,147	30	0.77%	17
San Diego	4	0	0.03%	15	621	17	4.62%	11
TOTAL	91,664	3,709	15.48%		26,575	1,017	4.49%	

Note: Includes total income and employment impacts: wages and salaries paid to primary producers, processors and suppliers, and the additional income and employment generated when wages and salaries are spent (PFMC FEAM 9/02).

a/ Actual period is November 2000 through October 2001.

TABLE 8-9. Effort, personal income, and jobs related to the West Coast recreational ocean fisheries in 2001. (Page 1 of 1)

					Coastal Community Income Impacts for the Recreational Fishery			
		Angler Trips (1,000s)			($1,000s)			
Area		Charter	Private	Total	Charter	Private	Total	Total Jobs
Washington Coast	Total	59	88	147	$5,335	$3,285	$8,620	392
	Groundfish	12	10	23	$1,134	$385	$1,519	69
Oregon	Total	70	140	211	$6,382	$4,911	$11,293	514
	Groundfish	47	22	69	$4,227	$783	$5,011	228
North/Central California[a/]	Total	221	901	1,122	$27,294	$54,172	$81,466	3,363
	Groundfish	141	164	305	$17,414	$9,860	$27,274	1,126
Southern California[b/]	Total	577	1,757	2,334	$72,321	$81,023	$153,345	5,536
	Groundfish	204	252	456	$25,569	$11,621	$37,190	1,343
California Total	Total	798	2,658	3,456	$99,616	$135,195	$234,811	8,899
	Groundfish	345	416	761	$43,983	$21,481	$64,465	2,468
Grand Total	Total	927	2,886	3,813	$111,332	$143,392	$254,724	9,823
	Groundfish	404	449	853	$48,345	$22,649	$70,994	2,765

a/ Includes counties from Monterey north.

b/ Includes counties from San Luis Obispo south.

TABLE 8-10. Urban, rural, and rural farm and non-farm population by state, port group, county, and port. (Source: U.S. Census, 2000, Summary File 3, Table P5.) (Page 1 of 4)

	Total Population		Urban		Rural		Farm		Non-Farm	
State-Port Group-County-Port	Place	BG equiv	Place	BG equiv	Place	BG equiv	Place	BG equiv	Place	BG equiv
Washington	5,894,121		81.99%		18.01%		0.77%		17.24%	
Puget Sound	**986,634**	**1,094,327**	**99.66%**	**97.18%**	**0.34%**	**2.82%**	**0.00%**	**0.05%**	**0.34%**	**2.77%**
Whatcom	166,814		67.74%		32.26%		1.42%		30.83%	
Blaine	3,713	8,757	94.86%	76.21%	5.14%	23.79%	0.00%	0.00%	5.14%	23.79%
Bellingham Bay	66,815	84,788	99.48%	91.96%	0.52%	8.04%	0.00%	0.09%	0.52%	7.95%
San Juan	14,077		0.00%		100.00%		3.13%		96.87%	
Friday Harbor	2,008	6,894	0.00%	0.00%	100.00%	100.00%	0.00%	2.15%	100.00%	97.85%
Skagit	102,979		67.06%		32.94%		1.24%		31.70%	
Anacortes	14,707	21,610	95.78%	79.18%	4.22%	20.82%	0.16%	0.26%	4.07%	20.56%
La Conner	782	1,407	99.36%	55.22%	0.64%	44.78%	0.00%	6.11%	0.64%	38.66%
Snohomish	606,024		89.01%		10.99%		0.26%		10.73%	
Everett	91,290	131,885	99.94%	99.15%	0.06%	0.85%	0.00%	0.09%	0.06%	0.76%
King	1,737,034		96.26%		3.74%		0.07%		3.67%	
Seattle	563,375	563,247	100.00%	100.00%	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%
Pierce	700,820		92.15%		7.85%		0.15%		7.70%	
Tacoma	193,177	175,882	99.93%	100.00%	0.07%	0.00%	0.00%	0.00%	0.07%	0.00%
Thurston	207,355		75.34%		24.66%		0.70%		23.96%	
Olympia	42,345	80,443	100.00%	97.88%	0.00%	2.12%	0.00%	0.04%	0.00%	2.07%
Mason	49,405		25.32%		74.68%		0.92%		73.77%	
Shelton	8,422	19,414	100.00%	63.36%	0.00%	36.64%	0.00%	0.30%	0.00%	36.34%
North Washington Coast	**34,950**	**58,855**	**94.59%**	**63.07%**	**5.41%**	**36.93%**	**0.00%**	**0.41%**	**5.41%**	**36.52%**
Jefferson	25,953		44.80%		55.20%		0.94%		54.26%	
Port Townsend	8,325	11,549	93.42%	67.96%	6.58%	32.04%	0.00%	0.48%	6.58%	31.55%
Clallam			52.24%		47.76%		0.64%		47.12%	
Sequim	4,323	16,710	92.53%	46.77%	7.47%	53.23%	0.00%	0.66%	7.47%	52.57%
Port Angeles	18,472	27,992	99.16%	76.65%	0.84%	23.35%	0.00%	0.19%	0.84%	23.16%
Port Angeles E	3,050		97.25%		2.75%		0.00%		2.75%	
Neah Bay	780	1,356	0.00%	0.00%	100.00%	100.00%	0.00%	0.00%	100.00%	100.00%
La Push		1,248		0.00%		100.00%		2.08%		97.92%
South & Central WA Coast	**3,587**	**39,574**	**21.38%**	**60.52%**	**78.62%**	**39.48%**	**0.00%**	**0.50%**	**78.62%**	**38.98%**
Grays Harbor	67,194		60.60%		39.40%		0.90%		38.49%	
Copalis Beach	448	1,597	0.00%	0.00%	100.00%	100.00%	0.00%	0.00%	100.00%	100.00%
Grays Harbor		18,921		79.33%		20.67%		0.45%		20.22%
Westport	2,165	2,802	0.00%	0.00%	100.00%	100.00%	0.00%	0.00%	100.00%	100.00%
Pacific	20,984		48.88%		51.12%		1.38%		49.73%	
Willapa Bay		12,667		59.15%		40.85%		0.47%		40.37%
Ilwaco/Chinook	974	3,587	78.75%	40.37%	21.25%	59.63%	0.00%	1.48%	21.25%	58.15%

TABLE 8-10. Urban, rural, and rural farm and non-farm population by state, port group, county, and port. (Source: U.S. Census, 2000, Summary File 3, Table P5.) (Page 2 of 4)

	Total Population		Urban		Rural		Farm		Non-Farm	
State-Port Group-County-Port	Place	BG equiv	Place	BG equiv	Place	BG equiv	Place	BG equiv	Place	BG equiv
Oregon	3,421,399		78.70%		21.30%		1.87%		19.42%	
Astoria	**18,177**	**38,957**	**90.36%**	**71.51%**	**9.64%**	**28.49%**	**0.06%**	**0.53%**	**9.59%**	**27.96%**
Clatsop	35,630		58.92%		41.08%		1.08%		39.99%	
Astoria	9,807	20,648	99.75%	65.43%	0.25%	34.57%	0.00%	0.65%	0.25%	33.92%
Gearhart	948	7,913	90.19%	89.32%	9.81%	10.68%	0.84%	0.35%	8.97%	10.32%
Seaside	5,822	7,913	99.40%	89.32%	0.60%	10.68%	0.00%	0.35%	0.60%	10.32%
Cannon Beach	1,600	2,483	0.00%	8.58%	100.00%	91.42%	0.13%	0.60%	99.88%	90.82%
Tillamook	**6,289**	**19,876**	**69.55%**	**28.51%**	**30.45%**	**71.49%**	**0.32%**	**3.08%**	**30.13%**	**68.41%**
Tillamook	24,262		23.74%		76.26%		3.10%		73.16%	
Nehalem Bay	261	3,076	0.00%	0.00%	100.00%	100.00%	0.00%	1.07%	100.00%	98.93%
Tillamook/Garibaldi	4,374	11,997	100.00%	47.23%	0.00%	52.77%	0.00%	3.28%	0.00%	49.50%
Netarts Bay	705	1,631	0.00%	0.00%	100.00%	100.00%	2.84%	3.37%	97.16%	96.63%
Pacific City	949	3,172	0.00%	0.00%	100.00%	100.00%	0.00%	4.16%	100.00%	95.84%
Newport	**14,553**	**24,335**	**81.04%**	**61.21%**	**18.96%**	**38.79%**	**0.03%**	**0.85%**	**18.93%**	**37.94%**
Lincoln	44,479		61.98%		38.02%		1.12%		36.90%	
Salmon River		1,072		68.38%		31.62%		0.00%		31.62%
Depoe Bay	1,188	1,914	80.05%	84.54%	19.95%	15.46%	0.00%	0.00%	19.95%	15.46%
Siletz Bay	1,174	2,742	0.00%	0.00%	100.00%	100.00%	0.34%	4.27%	99.66%	95.73%
Newport	9,493	11,921	95.46%	78.28%	4.54%	21.72%	0.00%	0.12%	4.54%	21.60%
Waldport	2,054	4,846	86.71%	63.00%	13.29%	37.00%	0.00%	0.62%	13.29%	36.38%
Yachats	644	1,840	0.00%	8.70%	100.00%	91.30%	0.00%	2.50%	100.00%	88.80%
Coos Bay	**26,171**	**56,901**	**97.83%**	**80.44%**	**2.17%**	**19.56%**	**0.00%**	**0.80%**	**2.17%**	**18.76%**
Lane	322,959		80.58%		19.42%		1.13%		18.29%	
Florence	7,318	10,701	100.00%	79.24%	0.00%	20.76%	0.00%	0.33%	0.00%	20.43%
Douglas	100,399		58.11%		41.89%		2.99%		38.90%	
Winchester Bay	530	6,413	45.66%	70.36%	54.34%	29.64%	0.00%	1.39%	54.34%	28.26%
Coos	62,779		62.56%		37.44%		1.41%		36.03%	
Coos Bay	15,443	33,105	99.50%	90.62%	0.50%	9.38%	0.00%	0.12%	0.50%	9.26%
Bandon	2,880	6,682	92.92%	41.63%	7.08%	58.37%	0.00%	4.35%	7.08%	54.01%
Brookings	**8,380**	**20,137**	**64.00%**	**49.18%**	**36.00%**	**50.82%**	**0.00%**	**0.39%**	**36.00%**	**50.43%**
Curry	21,137		46.86%		53.14%		0.76%		52.39%	
Port Orford	1,153	2,055	0.00%	0.00%	100.00%	100.00%	0.00%	0.68%	100.00%	99.32%
Gold Beach	1,864	4,754	0.00%	0.00%	100.00%	100.00%	0.00%	1.11%	100.00%	98.89%
Brookings	5,363	13,328	100.00%	74.31%	0.00%	25.69%	0.00%	0.08%	0.00%	25.61%

TABLE 8-10. Urban, rural, and rural farm and non-farm population by state, port group, county, and port. (Source: U.S. Census, 2000, Summary File 3, Table P5.) (Page 3 of 4)

	Total Population		Urban		Rural		Farm		Non-Farm	
State-Port Group-County-Port	Place	BG equiv	Place	BG equiv	Place	BG equiv	Place	BG equiv	Place	BG equiv
California			94.46%		5.54%		0.33%		5.21%	
Crescent City	**10,054**	**24,472**	**97.04%**	**76.28%**	**2.96%**	**23.72%**	**0.00%**	**0.20%**	**2.96%**	**23.52%**
Del Norte	27,507		67.86%		32.14%		0.18%		31.96%	
Crescent City	3,888	24,472	99.31%	76.28%	0.69%	23.72%	0.00%	0.20%	0.69%	23.52%
Bertsch/Oceanview CDP	2,097		87.08%		12.92%		0.00%		12.92%	
Crescent City North CDP	4,069		100.00%		0.00%		0.00%		0.00%	
Eureka	**26,260**	**52,460**	**98.74%**	**82.48%**	**1.26%**	**17.52%**	**0.00%**	**0.14%**	**1.26%**	**17.38%**
Humboldt	126,518		69.50%		30.50%		1.00%		29.49%	
Trinidad	331	3,316	0.00%	0.00%	100.00%	100.00%	0.00%	0.42%	100.00%	99.58%
Eureka (Includes Fields Landing)	25,929	49,144	100.00%	88.04%	0.00%	11.96%	0.00%	0.13%	0.00%	11.83%
Fort Bragg	**7,514**	**21,237**	**92.60%**	**43.87%**	**7.40%**	**56.13%**	**0.32%**	**1.42%**	**7.08%**	**54.72%**
Mendocino	86,265		54.04%		45.96%		2.03%		43.94%	
Fort Bragg	7,028	13,249	99.00%	70.31%	1.00%	29.69%	0.26%	0.26%	0.74%	29.43%
Albion		4,075		0.00%		100.00%		4.44%		95.56%
Point Arena	486	3,913	0.00%	0.00%	100.00%	100.00%	1.23%	2.20%	98.77%	97.80%
Bodega Bay	**9,901**	**15,952**	**73.98%**	**49.05%**	**26.02%**	**50.95%**	**0.53%**	**5.07%**	**25.49%**	**45.89%**
Sonoma	458,614		85.71%		14.29%		1.01%		13.28%	
Bodega Bay	1,518	3,529	0.00%	1.53%	100.00%	98.47%	0.00%	5.72%	100.00%	92.75%
Marin	247,289		94.18%		5.82%		0.31%		5.51%	
Tomales Bay	210	503	0.00%	0.00%	100.00%	100.00%	4.76%	20.28%	95.24%	79.72%
Point Reyes	848	4,150	0.00%	0.00%	100.00%	100.00%	4.95%	12.14%	95.05%	87.86%
Sausalito	7,325	7,770	100.00%	100.00%	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%
San Francisco	**1,450,928**	**1,484,046**	99.92%	99.67%	0.08%	0.33%	0.00%	0.01%	0.08%	0.32%
San Francisco	776,733		100.00%		0.00%		0.00%		0.00%	
San Francisco	776,733	776,733	100.00%	100.00%	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%
Contra Costa	948,816		97.89%		2.11%		0.06%		2.05%	
Richmond	99,716	110,835	99.03%	99.11%	0.97%	0.89%	0.00%	0.00%	0.97%	0.89%
Alameda	1,443,741		99.43%		0.57%		0.02%		0.55%	
Berkeley	102,743	101,711	100.00%	100.00%	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%
Oakland	399,477	399,477	99.97%	99.97%	0.03%	0.03%	0.00%	0.00%	0.03%	0.03%
Alameda	72,259	72,259	99.96%	99.96%	0.04%	0.04%	0.00%	0.00%	0.04%	0.04%
San Mateo	707,161		98.63%		1.37%		0.03%		1.34%	
Princeton		23,031		83.84%		16.16%		0.45%		15.70%

TABLE 8-10. Urban, rural, and rural farm and non-farm population by state, port group, county, and port. (Source: U.S. Census, 2000, Summary File 3, Table P5.) (Page 4 of 4)

	Total Population		Urban		Rural		Farm		Non-Farm	
State-Port Group-County-Port	Place	BG equiv	Place	BG equiv	Place	BG equiv	Place	BG equiv	Place	BG equiv
Monterey	**84,439**	**112,344**	**99.64%**	**92.52%**	**0.36%**	**7.48%**	**0.00%**	**0.03%**	**0.36%**	**7.45%**
Santa Cruz	255,602		85.34%		14.66%		0.28%		14.38%	
Santa Cruz	54,364	78,699	100.00%	93.22%	0.00%	6.78%	0.00%	0.04%	0.00%	6.74%
Monterey	401,762		89.16%		10.84%		0.46%		10.39%	
Moss Landing	302	1,832	0.00%	15.17%	100.00%	84.83%	0.00%	0.16%	100.00%	84.66%
Monterey	29,773	31,813	100.00%	95.25%	0.00%	4.75%	0.00%	0.00%	0.00%	4.75%
Morro Bay	**10,308**	**40,812**	**100.00%**	**87.68%**	**0.00%**	**12.32%**	**0.00%**	**1.48%**	**0.00%**	**10.84%**
San Luis Obispo	246,681		81.18%		18.82%		1.06%		17.76%	
Morro Bay	10,308	37,457	100.00%	88.93%	0.00%	11.07%	0.00%	1.47%	0.00%	9.60%
Avila Beach		3,355		73.71%		26.29%		1.58%		24.71%
Santa Barbara	**284,637**	**400,353**	**99.94%**	**99.21%**	**0.06%**	**0.79%**	**0.00%**	**0.06%**	**0.06%**	**0.73%**
Santa Barbara	399,347		95.16%		4.84%		0.49%		4.35%	
Santa Barbara	92,196	92,252	99.81%	100.00%	0.19%	0.00%	0.00%	0.00%	0.19%	0.00%
Ventura	753,197		96.81%		3.19%		0.42%		2.77%	
Ventura		111,370		97.44%		2.56%		0.21%		2.35%
Oxnard	170,595	171,084	99.99%	99.81%	0.01%	0.19%	0.00%	0.00%	0.01%	0.19%
Port Hueneme	21,846	25,647	100.00%	100.00%	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%
Los Angeles	**568,912**	**703,511**	**100.00%**	**100.00%**	**0.00%**	**0.00%**	**0.00%**	**0.00%**	**0.00%**	**0.00%**
Los Angeles	9,519,338		99.29%		0.71%		0.01%		0.70%	
San Pedro		80,641		100.00%		0.00%		0.00%		0.00%
Willmington		53,802		100.00%		0.00%		0.00%		0.00%
Long Beach	461,381	463,767	100.00%	100.00%	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%
Terminal Island		1,281		100.00%		0.00%		0.00%		0.00%
Orange	2,846,289		99.81%		0.19%		0.00%		0.19%	
Newport Beach	70,022	74,156	100.00%	100.00%	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%
Newport Coast CDP	2,658		100.00%		0.00%		0.00%		0.00%	
Dana Point	34,851	29,864	100.00%	100.00%	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%
San Diego	**1,384,246**	**1,336,350**	99.58%	99.58%	0.42%	0.42%	0.03%	0.03%	0.39%	0.39%
San Diego	2,813,833		96.13%		3.87%		0.25%		3.61%	
Oceanside	160,905	163,414	99.37%	99.17%	0.63%	0.83%	0.19%	0.22%	0.44%	0.61%
San Diego	1,223,341	1,172,936	99.61%	99.64%	0.39%	0.36%	0.00%	0.00%	0.39%	0.36%

Port names in italic- no census place.

Port Angeles East, Bertsch-Oceanview, Crescent City North, and Newport Coast- no separate block group equivalent.

*Includes Fields Landing.

TABLE 8-11. Racial composition by state, port group, county, and port. (Source: U.S. Census, 2000, Summary File 3, Table P6.) (Page 1 of 4)

	Total Population		White		Black		Native American		Hawaiian-Pac. Is.		Other		Two or More Races	
State-Port Group-County-Port	Place	BG Equiv	Place	BG Equiv	Place	BG Equiv	Place	BG Equiv	Place	BG Equiv	Place	BG Equiv	Place	BG Equiv
Washington	5,894,121		81.69%		3.14%		1.55%		5.45%		0.37%		3.89%	
Puget Sound	**986,634**	**1,094,327**	**73.32%**	**74.95%**	**7.38%**	**6.64%**	**1.33%**	**1.39%**	**10.10%**	**9.40%**	**0.44%**	**0.44%**	**2.45%**	**2.37%**
Whatcom	166,814		88.32%		0.61%		2.82%		2.65%		0.07%		2.51%	
Blaine	3,713	8,757	86.70%	90.91%	3.47%	1.86%	0.59%	0.32%	1.89%	1.04%	0.00%	0.00%	2.37%	3.39%
Bellingham Bay	66,815	84,788	88.02%	88.97%	0.80%	0.67%	1.51%	1.42%	4.01%	3.74%	0.12%	0.11%	2.11%	1.96%
San Juan	14,077		95.56%		0.09%		0.72%		0.49%		0.13%		0.72%	
Friday Harbor	2,008	6,894	92.98%	96.17%	0.00%	0.19%	2.14%	0.94%	0.85%	0.25%	0.00%	0.28%	2.84%	0.94%
Skagit	102,979		86.37%		0.30%		1.85%		1.42%		0.11%		7.46%	
Anacortes	14,707	21,610	92.20%	90.56%	0.18%	0.12%	1.52%	4.01%	1.69%	1.39%	0.02%	0.05%	1.81%	1.40%
La Conner	782	1,407	89.51%	81.95%	3.20%	1.78%	1.92%	1.07%	0.26%	0.21%	0.00%	0.00%	0.38%	12.37%
Snohomish	606,024		85.48%		1.58%		1.34%		5.86%		0.21%		1.88%	
Everett	91,290	131,885	80.84%	81.63%	3.14%	2.84%	1.85%	1.70%	6.63%	6.26%	0.27%	0.28%	3.22%	2.89%
King	1,737,034		75.58%		5.27%		0.91%		10.81%		0.48%		2.55%	
Seattle	563,375	563,247	70.03%	70.05%	8.29%	8.30%	1.00%	1.00%	13.11%	13.10%	0.45%	0.45%	2.31%	2.30%
Pierce	700,820		78.33%		6.95%		1.35%		4.95%		0.72%		2.12%	
Tacoma	193,177	175,882	69.25%	69.08%	11.22%	11.13%	1.94%	2.12%	7.42%	7.32%	0.70%	0.76%	2.69%	2.75%
Thurston	207,355		85.38%		2.31%		1.52%		4.54%		0.58%		1.76%	
Olympia	42,345	80,443	84.80%	85.75%	1.92%	1.73%	1.34%	1.27%	5.49%	5.19%	0.23%	0.39%	1.72%	1.47%
Mason	49,405		88.27%		1.20%		3.67%		0.96%		0.64%		2.05%	
Shelton	8,422	19,414	85.47%	86.16%	0.17%	2.06%	2.17%	2.15%	1.09%	1.07%	0.96%	0.80%	6.10%	3.58%
North Washington Coast	**34,950**	**58,855**	**90.90%**	**90.20%**	**0.41%**	**0.29%**	**3.79%**	**4.67%**	**1.52%**	**1.48%**	**0.08%**	**0.07%**	**0.53%**	**0.47%**
Jefferson	25,953		92.27%		0.34%		2.32%		1.12%		0.09%		0.40%	
Port Townsend	8,325	11,549	93.48%	93.25%	0.47%	0.42%	1.20%	1.19%	1.44%	1.45%	0.00%	0.00%	0.34%	0.29%
Clallam	64,525		89.08%		0.72%		5.03%		1.35%		0.09%		1.16%	
Sequim	4,323	16,710	93.48%	94.14%	0.00%	0.03%	1.02%	1.47%	2.54%	1.69%	0.00%	0.00%	1.67%	0.73%
Port Angeles	18,472	27,992	92.06%	91.47%	0.56%	0.40%	2.49%	3.35%	1.36%	1.44%	0.11%	0.12%	0.37%	0.36%
Port Angeles E	3,050		93.77%		0.00%		3.31%		1.67%		0.00%		0.36%	
Neah Bay	780	1,356	10.64%	11.50%	0.26%	0.15%	79.62%	79.35%	0.00%	0.37%	0.90%	0.52%	0.51%	0.44%
La Push		1,248		66.59%		0.24%		28.37%		0.96%		0.00%		1.28%
South & Central WA Coast	**3,587**	**39,574**	**92.95%**	**90.37%**	**0.20%**	**0.23%**	**2.06%**	**2.60%**	**0.20%**	**1.83%**	**0.00%**	**0.04%**	**2.40%**	**2.09%**
Grays Harbor	67,194		88.62%		0.26%		4.95%		0.95%		0.18%		1.95%	
Copalis Beach	448	1,597	97.77%	95.37%	0.00%	0.00%	0.00%	0.38%	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%
Grays Harbor		18,921		89.20%		0.38%		3.65%		1.39%		0.09%		2.44%
Westport	2,165	2,802	94.55%	94.79%	0.32%	0.25%	2.82%	2.36%	0.18%	0.14%	0.00%	0.00%	0.60%	0.46%
Pacific	20,984		90.51%		0.15%		2.10%		2.39%		0.00%		1.96%	
Willapa Bay		12,667		89.60%		0.10%		1.96%		3.58%		0.00%		2.18%
Ilwaco/Chinook	974	3,587	87.17%	93.53%	0.00%	0.00%	1.33%	0.53%	0.31%	0.08%	0.00%	0.00%	7.49%	2.09%

TABLE 8-11. Racial composition by state, port group, county, and port. (Source: U.S. Census, 2000, Summary File 3, Table P6.) (Page 2 of 4)

	Total Population		White		Black		Native American		Hawaiian-Pac. Is.		Other		Two or More Races	
State-Port Group-County-Port	Place	BG Equiv	Place	BG Equiv	Place	BG Equiv	Place	BG Equiv	Place	BG Equiv	Place	BG Equiv	Place	BG Equiv
Oregon	3,421,399		86.44%		1.55%		1.27%		2.90%		0.22%		4.29%	
Astoria	**18,177**	**38,957**	**91.58%**	**92.56%**	**0.46%**	**0.47%**	**0.86%**	**0.96%**	**0.95%**	**0.88%**	**0.07%**	**0.21%**	**2.71%**	**1.94%**
Clatsop	35,630		92.53%		0.71%		0.86%		0.98%		0.19%		1.80%	
Astoria	9,807	20,648	89.59%	91.11%	0.83%	0.83%	0.98%	0.87%	1.27%	1.17%	0.00%	0.27%	2.93%	1.90%
Gearhart	948	7,913	96.94%	94.28%	0.00%	0.05%	0.42%	1.18%	0.42%	0.56%	0.00%	0.15%	0.00%	1.97%
Seaside	5,822	7,913	93.71%	94.28%	0.00%	0.05%	0.91%	1.18%	0.65%	0.56%	0.21%	0.15%	2.68%	1.97%
Cannon Beach	1,600	2,483	92.88%	93.64%	0.13%	0.20%	0.19%	0.32%	0.31%	0.48%	0.00%	0.00%	3.06%	1.97%
Tillamook	**6,289**	**19,876**	**94.39%**	**94.53%**	**0.13%**	**0.24%**	**0.11%**	**0.40%**	**0.11%**	**0.55%**	**0.00%**	**0.08%**	**3.10%**	**1.87%**
Tillamook	24,262		94.37%		0.19%		0.50%		0.50%		0.11%		1.72%	
Nehalem Bay	261	3,076	98.47%	96.72%	0.00%	0.00%	0.00%	0.36%	0.00%	0.65%	0.00%	0.00%	0.00%	0.85%
Tillamook / Garibaldi	4,374	11,997	93.60%	93.22%	0.00%	0.33%	0.16%	0.50%	0.16%	0.70%	0.00%	0.13%	4.46%	2.53%
Netarts Bay	705	1,631	93.76%	96.44%	1.13%	0.49%	0.00%	0.49%	0.00%	0.37%	0.00%	0.00%	0.00%	0.00%
Pacific City	949	3,172	97.37%	96.34%	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%	1.32%
Newport	**14,553**	**24,335**	**88.50%**	**89.65%**	**0.25%**	**0.29%**	**3.39%**	**3.20%**	**1.09%**	**0.68%**	**0.08%**	**0.09%**	**2.79%**	**1.88%**
Lincoln	44,479		90.34%		0.22%		2.73%		0.67%		0.26%		1.88%	
Salmon River		1,072		96.08%		0.00%		2.99%		0.00%		0.00%		0.00%
Depoe Bay	1,188	1,914	92.17%	92.89%	0.67%	0.94%	2.27%	1.41%	0.34%	0.21%	0.17%	0.10%	0.34%	0.21%
Siletz Bay	1,174	2,742	72.49%	76.48%	0.00%	0.00%	19.34%	14.41%	1.02%	0.51%	0.26%	0.11%	0.85%	0.36%
Newport	9,493	11,921	89.21%	89.82%	0.26%	0.27%	1.92%	1.98%	1.18%	0.94%	0.06%	0.05%	3.93%	3.21%
Waldport	2,054	4,846	89.58%	92.41%	0.10%	0.14%	2.82%	1.49%	1.31%	0.68%	0.00%	0.00%	0.93%	0.70%
Yachats	644	1,840	97.05%	93.80%	0.31%	0.76%	0.00%	0.92%	0.47%	0.16%	0.00%	0.54%	0.00%	1.41%
Coos Bay	**26,171**	**56,901**	**91.93%**	**92.16%**	**0.37%**	**0.28%**	**1.47%**	**2.13%**	**0.62%**	**0.55%**	**0.07%**	**0.06%**	**1.41%**	**1.14%**
Lane	322,959		90.47%		0.75%		1.09%		1.89%		0.18%		2.02%	
Florence	7,318	10,701	95.93%	95.97%	0.52%	0.57%	1.31%	1.08%	0.22%	0.20%	0.00%	0.00%	0.23%	0.16%
Douglas	100,399		93.72%		0.19%		1.58%		0.59%		0.05%		0.86%	
Winchester Bay	530	6,413	93.77%	93.92%	0.00%	0.08%	0.75%	0.70%	0.00%	0.55%	0.00%	0.00%	0.00%	1.06%
Coos	62,779		91.54%		0.21%		2.55%		0.55%		0.11%		1.19%	
Coos Bay	15,443	33,105	89.94%	90.49%	0.23%	0.21%	1.59%	2.63%	0.94%	0.78%	0.12%	0.10%	1.94%	1.41%
Bandon	2,880	6,682	92.12%	92.68%	0.87%	0.37%	1.39%	2.72%	0.00%	0.00%	0.00%	0.00%	1.88%	1.42%
Brookings	**8,380**	**20,137**	**92.41%**	**93.31%**	**0.19%**	**0.12%**	**2.06%**	**2.32%**	**1.46%**	**0.82%**	**0.08%**	**0.03%**	**1.23%**	**1.04%**
Curry	21,137		93.02%		0.12%		2.41%		0.79%		0.03%		1.02%	
Port Orford	1,153	2,055	92.89%	93.38%	0.26%	0.15%	1.47%	1.46%	0.17%	0.44%	0.00%	0.00%	1.65%	1.02%
Gold Beach	1,864	4,754	95.92%	95.65%	0.27%	0.15%	1.66%	1.43%	0.00%	0.29%	0.38%	0.15%	0.21%	0.17%
Brookings	5,363	13,328	91.09%	92.47%	0.15%	0.11%	2.33%	2.77%	2.24%	1.07%	0.00%	0.00%	1.49%	1.36%

TABLE 8-11. Racial composition by state, port group, county, and port. (Source: U.S. Census, 2000, Summary File 3, Table P6.) (Page 3 of 4)

	Total Population		White		Black		Native American		Hawaiian-Pac. Is.		Other		Two or More Races	
State-Port Group-County-Port	Place	BG Equiv	Place	BG Equiv	Place	BG Equiv	Place	BG Equiv	Place	BG Equiv	Place	BG Equiv	Place	BG Equiv
California	33,871,648		59.41%		6.55%		0.92%		10.87%		0.34%		16.90%	
Crescent City	**10,054**	**24,472**	**79.33%**	**79.15%**	**0.45%**	**4.72%**	**5.32%**	**5.44%**	**3.81%**	**2.47%**	**0.00%**	**0.20%**	**4.24%**	**3.04%**
Del Norte	27,507		78.84%		4.28%		5.71%		2.22%		0.18%		3.84%	
Crescent City	3,888	24,472	77.44%	79.15%	0.67%	4.72%	6.20%	5.44%	4.91%	2.47%	0.00%	0.20%	5.22%	3.04%
Bertsch-Oceanview CDP	2,097		82.74%		0.00%		7.39%		3.29%		0.00%		2.67%	
Crescent City North CDP	4,069		79.38%		0.47%		3.42%		3.02%		0.00%		4.10%	
Eureka	**26,260**	**52,460**	**82.93%**	**85.50%**	**1.20%**	**1.12%**	**4.15%**	**4.01%**	**2.86%**	**2.16%**	**0.16%**	**0.18%**	**2.26%**	**1.99%**
Humboldt	126,518		84.82%		0.77%		5.60%		1.47%		0.11%		2.36%	
Trinidad	331	3,316	88.82%	86.37%	2.42%	0.84%	1.21%	7.00%	1.51%	0.24%	0.00%	0.12%	1.21%	2.20%
Eureka*	25,929	49,144	82.85%	85.44%	1.18%	1.14%	4.19%	3.81%	2.87%	2.29%	0.17%	0.18%	2.27%	1.98%
Fort Bragg	**7,514**	**21,237**	**78.51%**	**85.37%**	**1.70%**	**0.72%**	**2.68%**	**2.86%**	**0.08%**	**0.61%**	**0.00%**	**0.00%**	**10.90%**	**5.93%**
Mendocino	86,265		80.74%		0.69%		4.92%		0.96%		0.11%		8.13%	
Fort Bragg	7,028	13,249	79.04%	84.73%	1.82%	1.15%	2.46%	2.15%	0.04%	0.48%	0.00%	0.00%	10.37%	6.94%
Albion		4,075		92.52%		0.00%		0.00%		1.06%		0.00%		3.53%
Point Arena	486	3,913	70.78%	80.09%	0.00%	0.00%	5.76%	8.25%	0.62%	0.59%	0.00%	0.00%	18.52%	4.98%
Bodega Bay	**9,901**	**15,952**	**90.13%**	**89.04%**	**0.55%**	**0.34%**	**0.49%**	**0.66%**	**4.06%**	**2.99%**	**0.00%**	**0.00%**	**2.17%**	**4.35%**
Sonoma	458,614		81.46%		1.41%		1.13%		3.07%		0.16%		8.57%	
Bodega Bay	1,518	3,529	86.23%	86.26%	0.72%	0.31%	0.53%	1.56%	1.38%	1.73%	0.00%	0.00%	10.41%	8.98%
Marin	247,289		84.00%		2.90%		0.32%		4.43%		0.15%		4.54%	
Tomales Bay	210	503	92.38%	92.05%	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%	4.77%
Point Reyes	848	4,150	85.50%	86.43%	0.00%	0.00%	3.18%	0.89%	2.59%	0.96%	0.00%	0.00%	3.66%	7.88%
Sausalito	7,325	7,770	91.41%	91.51%	0.59%	0.55%	0.19%	0.18%	4.90%	4.84%	0.00%	0.00%	0.35%	0.33%
San Francisco	**1,450,928**	**1,484,046**	**44.35%**	**45.01%**	**17.52%**	**17.25%**	**0.52%**	**0.53%**	**23.95%**	**23.53%**	**0.52%**	**0.51%**	**8.18%**	**8.20%**
San Francisco	776,733		49.61%		7.60%		0.45%		30.89%		0.46%		6.44%	
San Francisco	776,733	776,733	49.61%	49.61%	7.60%	7.60%	0.45%	0.45%	30.89%	30.89%	0.46%	0.46%	6.44%	6.44%
Contra Costa	948,816		65.30%		9.22%		0.58%		10.88%		0.36%		8.17%	
Richmond	99,716	110,835	31.41%	34.20%	35.80%	33.51%	0.68%	0.72%	12.12%	11.98%	0.40%	0.32%	14.22%	13.69%
Alameda	1,443,741		48.65%		14.71%		0.63%		20.35%		0.64%		8.97%	
Berkeley	102,743	101,711	59.17%	58.96%	13.51%	13.64%	0.44%	0.44%	16.22%	16.27%	0.16%	0.16%	4.76%	4.77%
Oakland	399,477	399,477	31.27%	31.27%	35.37%	35.37%	0.62%	0.62%	15.05%	15.05%	0.65%	0.65%	11.83%	11.83%
Alameda	72,259	72,259	56.91%	56.91%	5.80%	5.80%	0.64%	0.64%	25.88%	25.88%	1.10%	1.10%	3.32%	3.32%
San Mateo	707,161		59.31%		3.45%		0.39%		20.10%		1.21%		10.16%	
Princeton		23,031		81.04%		1.84%		0.67%		2.63%		0.38%		8.96%

TABLE 8-11. Racial composition by state, port group, county, and port. (Source: U.S. Census, 2000, Summary File 3, Table P6.) (Page 4 of 4)

	Total Population		White		Black		Native American		Hawaiian-Pac. Is.		Other		Two or More Races	
State-Port Group-County-Port	Place	BG Equiv	Place	BG Equiv	Place	BG Equiv	Place	BG Equiv	Place	BG Equiv	Place	BG Equiv	Place	BG Equiv
Monterey	**84,439**	**112,344**	**79.23%**	**79.91%**	**1.97%**	**1.85%**	**1.10%**	**1.00%**	**6.08%**	**5.16%**	**0.12%**	**0.22%**	**7.29%**	**7.74%**
Santa Cruz	255,602		75.11%		1.08%		1.05%		3.28%		0.17%		15.22%	
Santa Cruz	54,364	78,699	78.84%	80.43%	1.69%	1.59%	1.40%	1.17%	5.14%	4.19%	0.10%	0.24%	8.68%	8.31%
Monterey	401,762		55.89%		3.73%		0.98%		6.03%		0.45%		28.12%	
Moss Landing	302	1,832	44.70%	39.90%	0.00%	3.93%	0.00%	1.20%	0.00%	3.71%	0.00%	0.00%	29.14%	43.18%
Monterey	29,773	31,813	80.30%	80.93%	2.51%	2.37%	0.56%	0.58%	7.87%	7.66%	0.17%	0.18%	4.52%	4.30%
Morro Bay	**10,308**	**40,812**	**89.51%**	**89.66%**	**0.58%**	**0.47%**	**0.93%**	**0.47%**	**1.07%**	**2.83%**	**0.05%**	**0.03%**	**4.71%**	**3.60%**
San Luis Obispo	246,681		84.59%		1.85%		0.80%		2.78%		0.07%		6.14%	
Morro Bay	10,308	37,457	89.51%	89.17%	0.58%	0.52%	0.93%	0.49%	1.07%	2.91%	0.05%	0.04%	4.71%	3.78%
Avila Beach		3,355		95.17%		0.00%		0.18%		1.88%		0.00%		1.55%
Santa Barbara	**284,637**	**400,353**	**53.46%**	**60.79%**	**3.13%**	**2.59%**	**1.02%**	**1.00%**	**5.75%**	**4.88%**	**0.35%**	**0.30%**	**31.79%**	**25.97%**
Santa Barbara	399,347		72.68%		2.27%		1.08%		3.91%		0.23%		15.39%	
Santa Barbara	92,196	92,252	73.77%	73.87%	1.83%	1.77%	0.89%	0.91%	2.60%	2.49%	0.11%	0.13%	17.24%	17.22%
Ventura	753,197		69.78%		1.87%		0.83%		5.20%		0.22%		18.06%	
Ventura		111,370		78.40%		1.30%		0.97%		2.88%		0.17%		11.86%
Oxnard	170,595	171,084	41.94%	42.31%	3.53%	3.48%	0.95%	0.93%	7.41%	7.35%	0.51%	0.49%	40.86%	40.72%
Port Hueneme	21,846	25,647	57.65%	60.55%	5.57%	5.17%	2.21%	1.96%	6.01%	5.65%	0.10%	0.23%	22.40%	20.33%
Los Angeles	**568,912**	**703,511**	**53.59%**	**53.13%**	**12.15%**	**10.90%**	**0.75%**	**0.84%**	**10.39%**	**9.23%**	**0.96%**	**0.88%**	**17.24%**	**19.79%**
Los Angeles	9,519,338		48.56%		9.63%		0.72%		11.92%		0.29%		23.77%	
San Pedro		80,641		62.95%		6.16%		1.14%		4.52%		0.34%		18.35%
Willmington		53,802		36.11%		3.96%		1.21%		3.18%		0.81%		48.67%
Long Beach	461,381	463,767	45.15%	45.23%	14.87%	14.81%	0.81%	0.82%	11.93%	12.01%	1.12%	1.11%	20.64%	20.53%
Terminal Island		1,281		43.25%		27.09%		0.94%		1.87%		1.48%		23.19%
Orange	2,846,289		64.75%		1.55%		0.62%		13.57%		0.30%		14.94%	
Newport Beach	70,022	74,156	91.57%	90.82%	0.47%	0.54%	0.47%	0.46%	3.94%	4.18%	0.19%	0.19%	1.03%	1.24%
Newport Coast CDP	2,658		82.69%		0.26%		0.00%		17.04%		0.00%		0.00%	
Dana Point	34,851	29,864	86.89%	86.92%	0.49%	0.34%	0.50%	0.50%	2.47%	2.61%	0.53%	0.55%	6.16%	6.06%
San Diego	**1,384,246**	**1,336,350**	**60.78%**	**61.23%**	**7.57%**	**7.37%**	**0.64%**	**0.63%**	**12.67%**	**12.40%**	**0.61%**	**0.60%**	**12.74%**	**12.79%**
San Diego	2,813,833		66.36%		5.63%		0.84%		8.84%		0.48%		12.89%	
Oceanside	160,905	163,414	66.13%	66.21%	6.35%	6.25%	0.78%	0.69%	5.59%	5.60%	1.41%	1.42%	14.66%	14.79%
San Diego	1,223,341	1,172,936	60.08%	60.53%	7.73%	7.53%	0.62%	0.62%	13.60%	13.35%	0.51%	0.49%	12.49%	12.51%

Port names in italic- no census place. Port Angeles East, Bertsch-Oceanview, Crescent City North, and Newport Coast- no separate block group equivalent.

*Includes Fields Landing.

TABLE 8-12. Hispanic population by state, port group, county, and port. (Source: U.S. Census, 2000, Summary File 3, Table P7.) (Page 1 of 3)

	Total Population		Hispanic	
State-Port Group-County-Port	Place	BG equiv	Place	BG equiv
Washington	5,894,121		7.46%	
Puget Sound	**986,634**	**1,094,327**	**5.68%**	**5.49%**
Whatcom	166,814		4.99%	
Blaine	3,713	8,757	4.09%	4.82%
Bellingham Bay	66,815	84,788	4.77%	4.36%
San Juan	14,077		2.69%	
Friday Harbor	2,008	6,894	5.93%	2.52%
Skagit	102,979		11.25%	
Anacortes	14,707	21,610	3.03%	2.53%
La Conner	782	1,407	3.32%	14.00%
Snohomish	606,024		4.51%	
Everett	91,290	131,885	6.87%	6.44%
King	1,737,034		5.48%	
Seattle	563,375	563,247	5.26%	5.24%
Pierce	700,820		5.50%	
Tacoma	193,177	175,882	6.85%	6.96%
Thurston	207,355		4.37%	
Olympia	42,345	80,443	4.62%	4.03%
Mason	49,405		4.77%	
Shelton	8,422	19,414	11.83%	7.81%
North Washington Coast	**34,950**	**58,855**	**2.90%**	**2.33%**
Jefferson	25,953		1.75%	
Port Townsend	8,325	11,549	2.37%	2.11%
Clallam	64,525		3.39%	
Sequim	4,323	16,710	4.02%	2.02%
Port Angeles	18,472	27,992	3.05%	2.48%
Port Angeles E	3,050		1.18%	
Neah Bay	780	1,356	5.26%	4.79%
La Push		1,248		2.32%
South & Central WA Coast	**3,587**	**39,574**	**4.10%**	**4.97%**
Grays Harbor	67,194		4.83%	
Copalis Beach	448	1,597	0.00%	0.00%
Grays Harbor		18,921		5.45%
Westport	2,165	2,802	2.63%	2.03%
Pacific	20,984		5.25%	
Willapa Bay		12,667		5.64%
Ilwaco/Chinook	974	3,587	9.24%	4.60%
Oregon	3,421,399		8.01%	
Astoria	**18,177**	**38,957**	**6.60%**	**5.07%**
Clatsop	35,630		4.61%	
Astoria	9,807	20,648	6.34%	4.36%
Gearhart	948	7,913	1.69%	5.60%
Seaside	5,822	7,913	6.51%	5.60%
Cannon Beach	1,600	2,483	11.44%	7.61%
Tillamook	**6,289**	**19,876**	**7.38%**	**5.08%**
Tillamook	24,262		5.07%	
Nehalem Bay	261	3,076	1.53%	3.19%
Tillamook / Garibaldi	4,374	11,997	8.60%	6.55%
Netarts Bay	705	1,631	6.95%	3.00%
Pacific City	949	3,172	3.69%	2.43%

TABLE 8-12. Hispanic population by state, port group, county, and port. (Source: U.S. Census, 2000, Summary File 3, Table P7.) (Page 2 of 3)

	Total Population		Hispanic	
State-Port Group-County-Port	Place	BG equiv	Place	BG equiv
Newport	**14,553**	**24,335**	**6.27%**	**4.80%**
Lincoln	44,479		4.72%	
Salmon River		1,072		4.94%
Depoe Bay	1,188	1,914	1.52%	0.94%
Siletz Bay	1,174	2,742	1.96%	2.77%
Newport	9,493	11,921	8.36%	7.26%
Waldport	2,054	4,846	2.48%	1.75%
Yachats	644	1,840	4.19%	3.86%
Coos Bay	**26,171**	**56,901**	**3.84%**	**3.11%**
Lane	322,959		4.49%	
Florence	7,318	10,701	1.46%	1.64%
Douglas	100,399		2.83%	
Winchester Bay	530	6,413	1.32%	2.79%
Coos	62,779		3.17%	
Coos Bay	15,443	33,105	5.12%	3.79%
Bandon	2,880	6,682	3.47%	2.39%
Brookings	**8,380**	**20,137**	**3.77%**	**3.39%**
Curry	21,137		3.34%	
Port Orford	1,153	2,055	2.69%	3.21%
Gold Beach	1,864	4,754	2.20%	2.38%
Brookings	5,363	13,328	4.55%	3.77%
California	33,871,648		32.38%	
Crescent City	**10,054**	**24,472**	**9.33%**	**13.01%**
Del Norte	27,507		13.48%	
Crescent City	3,888	24,472	10.75%	13.01%
Bertsch-Oceanview	2,097		7.25%	
Crescent City North	4,069		9.04%	
Eureka	**26,260**	**52,460**	**7.17%**	**6.18%**
Humboldt	126,518		6.13%	
Trinidad	331	3,316	4.83%	5.85%
Eureka*	25,929	49,144	7.20%	6.21%
Fort Bragg	**7,514**	**21,237**	**22.56%**	**14.14%**
Mendocino	86,265		16.23%	
Fort Bragg	7,028	13,249	21.91%	15.53%
Albion		4,075		8.59%
Point Arena	486	3,913	31.89%	15.21%
Bodega Bay	**9,901**	**15,952**	**6.11%**	**9.16%**
Sonoma	458,614		17.36%	
Bodega Bay	1,518	3,529	15.74%	12.41%
Marin	247,289		11.10%	
Tomales Bay	210	503	4.76%	3.78%
Point Reyes	848	4,150	12.15%	18.10%
Sausalito	7,325	7,770	3.45%	3.26%
San Francisco	**1,450,928**	**1,484,046**	**16.57%**	**16.65%**
San Francisco	776,733		14.11%	
San Francisco	776,733	776,733	14.11%	14.11%
Contra Costa	948,816		17.71%	
Richmond	99,716	110,835	26.85%	26.11%
Alameda	1,443,741		18.97%	
Berkeley	102,743	101,711	9.76%	9.80%
Oakland	399,477	399,477	21.89%	21.89%
Alameda	72,259	72,259	9.10%	9.10%
San Mateo	707,161		21.83%	
Princeton		23,031		19.92%

TABLE 8-12. Hispanic population by state, port group, county, and port. (Source: U.S. Census, 2000, Summary File 3, Table P7.) (Page 3 of 3)

	Total Population		Hispanic	
State-Port Group-County-Port	Place	BG equiv	Place	BG equiv
Monterey	**84,439**	**112,344**	**15.13%**	**15.98%**
Santa Cruz	255,602		26.83%	
Santa Cruz	54,364	78,699	17.29%	17.08%
Monterey	401,762		46.89%	
Moss Landing	302	1,832	29.14%	59.99%
Monterey	29,773	31,813	11.03%	10.72%
Morro Bay	**10,308**	**40,812**	**11.86%**	**10.88%**
San Luis Obispo	246,681		16.26%	
Morro Bay	10,308	37,457	11.86%	11.58%
Avila Beach		3,355		3.07%
Santa Barbara	**284,637**	**400,353**	**54.28%**	**45.72%**
Santa Barbara	399,347		34.24%	
Santa Barbara	92,196	92,252	35.02%	35.03%
Ventura	753,197		33.45%	
Ventura		111,370		24.57%
Oxnard	170,595	171,084	66.35%	66.30%
Port Hueneme	21,846	25,647	41.28%	38.73%
Los Angeles	**568,912**	**703,511**	**30.53%**	**35.84%**
Los Angeles	9,519,338		44.58%	
San Pedro		80,641		41.68%
Willmington		53,802		83.44%
Long Beach	461,381	463,767	35.75%	35.56%
Terminal Island		1,281		41.76%
Orange	2,846,289		30.79%	
Newport Beach	70,022	74,156	4.66%	4.87%
Newport Coast CDP	2,658		4.70%	
Dana Point	34,851	29,864	15.48%	15.32%
San Diego	**1,384,246**	**1,336,350**	**25.95%**	**25.95%**
San Diego	2,813,833		26.69%	
Oceanside	160,905	163,414	30.26%	30.36%
San Diego	1,223,341	1,172,936	25.38%	25.33%

Port names in italic- no census place. Port Angeles East, Bertsch-Oceanview, Crescent City North, and Newport Coast- no separate block group equivalent.

*Includes Fields Landing.

TABLE 8-13. Age groups by state, port group, county, and port. (Source: U.S. Census, 2000, Summary File 3, Table P8.) (Page 1 of 3)

	Total Population		Age 16 and under		Age 17-64		Age 65 and up	
State-Port Group-County-Port	Place	BG Equiv	Place	BG Equiv	Place	BG Equiv	Place	BG Equiv
Washington	5,894,121		24.17%		64.60%		11.23%	
Puget Sound	**986,634**	**1,094,327**	**17.96%**	**18.48%**	**69.88%**	**69.39%**	**12.17%**	**12.13%**
Whatcom	166,814		22.72%		65.64%		11.64%	
Blaine	3,713	8,757	24.97%	23.98%	57.12%	61.94%	17.91%	14.08%
Bellingham Bay	66,815	84,788	16.13%	17.75%	71.12%	69.82%	12.75%	12.42%
San Juan	14,077		18.58%		62.34%		19.08%	
Friday Harbor	2,008	6,894	22.16%	19.86%	60.06%	60.91%	17.78%	19.23%
Skagit	102,979		24.65%		60.78%		14.57%	
Anacortes	14,707	21,610	22.19%	20.68%	57.33%	58.29%	20.49%	21.03%
La Conner	782	1,407	19.18%	26.72%	61.89%	60.13%	18.93%	13.15%
Snohomish	606,024		25.85%		65.03%		9.12%	
Everett	91,290	131,885	23.63%	24.18%	66.09%	66.19%	10.28%	9.62%
King	1,737,034		21.16%		68.36%		10.47%	
Seattle	563,375	563,247	14.61%	14.61%	73.29%	73.28%	12.10%	12.10%
Pierce	700,820		25.66%		64.16%		10.19%	
Tacoma	193,177	175,882	24.38%	24.41%	63.84%	63.78%	11.79%	11.81%
Thurston	207,355		23.66%		65.03%		11.31%	
Olympia	42,345	80,443	20.34%	21.52%	66.59%	65.29%	13.07%	13.19%
Mason	49,405		21.97%		61.63%		16.41%	
Shelton	8,422	19,414	24.32%	22.62%	58.12%	63.68%	17.56%	13.70%
North Washington Coast	**34,950**	**58,855**	**20.53%**	**20.45%**	**57.25%**	**58.09%**	**22.22%**	**21.47%**
Jefferson	25,953		18.42%		60.54%		21.04%	
Port Townsend	8,325	11,549	18.97%	18.38%	60.25%	61.64%	20.78%	19.98%
Clallam	64,525		20.44%		58.22%		21.34%	
Sequim	4,323	16,710	14.02%	16.97%	40.30%	51.01%	45.69%	32.02%
Port Angeles	18,472	27,992	22.35%	22.48%	58.98%	60.40%	18.67%	17.12%
Port Angeles E	3,050		19.93%		61.34%		18.72%	
Neah Bay	780	1,356	32.44%	34.51%	62.05%	60.55%	5.51%	4.94%
La Push		1,248		25.16%		65.38%		9.46%
South & Central WA Coast	**3,587**	**39,574**	**21.35%**	**22.78%**	**58.52%**	**58.52%**	**20.13%**	**18.70%**
Grays Harbor	67,194		24.17%		60.45%		15.38%	
Copalis Beach	448	1,597	10.04%	21.85%	61.16%	59.05%	28.79%	19.10%
Grays Harbor		18,921		25.53%		60.07%		14.40%
Westport	2,165	2,802	22.26%	21.02%	59.68%	58.67%	18.06%	20.31%
Pacific	20,984		19.99%		57.59%		22.42%	
Willapa Bay		12,667		20.03%		56.31%		23.66%
Ilwaco/Chinook	974	3,587	24.54%	19.71%	54.72%	57.85%	20.74%	22.44%
Oregon	3,421,399		23.28%		63.93%		12.80%	
Astoria	**18,177**	**38,957**	**20.58%**	**21.05%**	**62.27%**	**62.82%**	**17.15%**	**16.13%**
Clatsop	35,630		21.86%		62.69%		15.45%	
Astoria	9,807	20,648	22.44%	22.47%	61.87%	63.15%	15.68%	14.38%
Gearhart	948	7,913	18.67%	19.65%	64.24%	62.63%	17.09%	17.72%
Seaside	5,822	7,913	18.83%	19.65%	60.96%	62.63%	20.22%	17.72%
Cannon Beach	1,600	2,483	16.63%	18.16%	68.31%	61.22%	15.06%	20.62%
Tillamook	**6,289**	**19,876**	**20.21%**	**19.61%**	**61.47%**	**59.78%**	**18.32%**	**20.61%**
Tillamook	24,262		20.64%		59.76%		19.60%	
Nehalem Bay	261	3,076	29.50%	14.21%	57.85%	57.09%	12.64%	28.71%
Tillamook / Garibaldi	4,374	11,997	23.41%	22.46%	59.95%	59.46%	16.64%	18.09%
Netarts Bay	705	1,631	11.63%	13.49%	63.83%	63.76%	24.54%	22.75%
Pacific City	949	3,172	9.27%	17.21%	67.76%	61.57%	22.97%	21.22%

TABLE 8-13. Age groups by state, port group, county, and port. (Source: U.S. Census, 2000, Summary File 3, Table P8.) (Page 2 of 3)

	Total Population		Age 16 and under		Age 17-64		Age 65 and up	
State-Port Group-County-Port	Place	BG Equiv	Place	BG Equiv	Place	BG Equiv	Place	BG Equiv
Newport	**14,553**	**24,335**	**20.48%**	**18.85%**	**60.40%**	**60.87%**	**19.12%**	**20.28%**
Lincoln	44,479		20.11%		60.53%		19.37%	
Salmon River		1,072		8.40%		70.90%		20.71%
Depoe Bay	1,188	1,914	12.88%	12.49%	59.18%	59.98%	27.95%	27.53%
Siletz Bay	1,174	2,742	25.89%	24.65%	61.50%	62.18%	12.61%	13.17%
Newport	9,493	11,921	20.54%	19.87%	61.84%	61.78%	17.62%	18.35%
Waldport	2,054	4,846	23.32%	19.50%	54.92%	55.80%	21.76%	24.70%
Yachats	644	1,840	14.75%	14.62%	56.99%	61.47%	28.26%	23.91%
Coos Bay	**26,171**	**56,901**	**18.75%**	**19.39%**	**55.96%**	**57.59%**	**25.29%**	**23.02%**
Lane	322,959		21.48%		65.22%		13.30%	
Florence	7,318	10,701	15.06%	15.40%	46.76%	48.66%	38.18%	35.94%
Douglas	100,399		22.51%		59.70%		17.80%	
Winchester Bay	530	6,413	17.36%	19.29%	64.53%	55.47%	18.11%	25.25%
Coos	62,779		20.27%		60.66%		19.07%	
Coos Bay	15,443	33,105	20.75%	21.14%	61.16%	60.74%	18.09%	18.11%
Bandon	2,880	6,682	17.64%	17.17%	49.86%	58.35%	32.50%	24.48%
Brookings	**8,380**	**20,137**	**21.41%**	**17.55%**	**55.73%**	**55.50%**	**22.86%**	**26.95%**
Curry	21,137		17.74%		55.34%		26.91%	
Port Orford	1,153	2,055	16.39%	15.33%	57.16%	59.37%	26.45%	25.30%
Gold Beach	1,864	4,754	20.28%	18.32%	63.36%	59.09%	16.36%	22.59%
Brookings	5,363	13,328	22.88%	17.62%	52.77%	53.62%	24.35%	28.76%
California	33,871,648		25.81%		63.60%		10.59%	
Crescent City	**10,054**	**24,472**	**28.05%**	**23.04%**	**58.84%**	**64.80%**	**13.11%**	**12.16%**
Del Norte	27,507		23.39%		63.99%		12.61%	
Crescent City	3,888	24,472	29.37%	23.04%	57.20%	64.80%	13.43%	12.16%
Bertsch-Oceanview CDP	2,097		25.99%		59.32%		14.69%	
Crescent City North CDP	4,069		27.84%		60.16%		11.99%	
Eureka	**26,260**	**52,460**	**21.23%**	**21.30%**	**64.72%**	**64.62%**	**14.06%**	**14.09%**
Humboldt	126,518		21.86%		65.56%		12.57%	
Trinidad	331	3,316	13.60%	18.12%	67.67%	65.89%	18.73%	15.98%
Eureka*	25,929	49,144	21.32%	21.51%	64.68%	64.53%	14.00%	13.96%
Fort Bragg	**7,514**	**21,237**	**23.54%**	**20.53%**	**63.12%**	**63.86%**	**13.34%**	**15.60%**
Mendocino	86,265		23.74%		62.71%		13.55%	
Fort Bragg	7,028	13,249	22.91%	21.21%	63.46%	63.60%	13.63%	15.19%
Albion		4,075		17.52%		65.62%		16.86%
Point Arena	486	3,913	32.72%	21.39%	58.23%	62.92%	9.05%	15.69%
Bodega Bay	**9,901**	**15,952**	**7.93%**	**11.29%**	**77.55%**	**73.87%**	**14.52%**	**14.84%**
Sonoma	458,614		22.92%		64.53%		12.54%	
Bodega Bay	1,518	3,529	10.87%	12.92%	64.95%	67.72%	24.18%	19.35%
Marin	247,289		19.12%		67.35%		13.53%	
Tomales Bay	210	503	9.52%	18.29%	77.14%	73.56%	13.33%	8.15%
Point Reyes	848	4,150	15.92%	18.63%	72.64%	65.40%	11.44%	15.98%
Sausalito	7,325	7,770	6.35%	6.18%	80.74%	81.20%	12.91%	12.63%
San Francisco	**1,450,928**	**1,484,046**	**17.57%**	**17.71%**	**70.13%**	**70.04%**	**12.29%**	**12.25%**
San Francisco	776,733		13.68%		72.55%		13.77%	
San Francisco	776,733	776,733	13.68%	13.68%	72.55%	72.55%	13.77%	13.77%
Contra Costa	948,816		25.06%		63.67%		11.27%	
Richmond	99,716	110,835	26.10%	26.12%	64.26%	63.87%	9.64%	10.01%
Alameda	1,443,741		23.26%		66.51%		10.23%	
Berkeley	102,743	101,711	13.23%	13.22%	76.52%	76.53%	10.25%	10.25%
Oakland	399,477	399,477	23.65%	23.65%	65.90%	65.90%	10.45%	10.45%
Alameda	72,259	72,259	20.24%	20.24%	66.61%	66.61%	13.15%	13.15%
San Mateo	707,161		21.63%		65.89%		12.48%	
Princeton		23,031		22.35%		68.67%		8.97%

TABLE 8-13. Age groups by state, port group, county, and port. (Source: U.S. Census, 2000, Summary File 3, Table P8.) (Page 3 of 3)

	Total Population		Age 16 and under		Age 17-64		Age 65 and up	
State-Port Group-County-Port	Place	BG Equiv	Place	BG Equiv	Place	BG Equiv	Place	BG Equiv
Monterey	**84,439**	**112,344**	**16.01%**	**16.80%**	**73.20%**	**72.16%**	**10.79%**	**11.04%**
Santa Cruz	255,602		22.34%		67.76%		9.90%	
Santa Cruz	54,364	78,699	16.22%	17.04%	75.36%	73.64%	8.42%	9.31%
Monterey	401,762		26.88%		63.12%		10.00%	
Moss Landing	302	1,832	20.20%	21.72%	79.80%	68.61%	0.00%	9.66%
Monterey	29,773	31,813	15.60%	15.91%	69.18%	68.71%	15.22%	15.38%
Morro Bay	**10,308**	**40,812**	**12.97%**	**16.22%**	**62.35%**	**61.60%**	**24.68%**	**22.18%**
San Luis Obispo	246,681		20.00%		65.53%		14.46%	
Morro Bay	10,308	37,457	12.97%	16.47%	62.35%	61.60%	24.68%	21.93%
Avila Beach		3,355		13.41%		61.55%		25.04%
Santa Barbara	**284,637**	**400,353**	**26.03%**	**25.46%**	**64.01%**	**63.78%**	**9.96%**	**10.76%**
Santa Barbara	399,347		23.40%		63.94%		12.66%	
Santa Barbara	92,196	92,252	18.61%	19.13%	67.65%	66.60%	13.73%	14.28%
Ventura	753,197		26.88%		63.09%		10.03%	
Ventura		111,370		23.74%		63.83%		12.43%
Oxnard	170,595	171,084	30.02%	30.00%	62.15%	62.25%	7.83%	7.75%
Port Hueneme	21,846	25,647	26.15%	25.41%	63.17%	63.66%	10.68%	10.93%
Los Angeles	**568,912**	**703,511**	**25.64%**	**26.09%**	**64.09%**	**63.83%**	**10.27%**	**10.08%**
Los Angeles	9,519,338		26.54%		63.73%		9.74%	
San Pedro		80,641		25.45%		63.24%		11.31%
Willmington		53,802		33.49%		60.19%		6.31%
Long Beach	461,381	463,767	27.75%	27.67%	63.22%	63.29%	9.03%	9.04%
Terminal Island		1,281		0.00%		95.16%		4.84%
Orange	2,846,289		25.60%		64.61%		9.80%	
Newport Beach	70,022	74,156	15.07%	15.05%	67.51%	67.89%	17.42%	17.06%
Newport Coast CDP	2,658		23.97%		70.96%		5.08%	
Dana Point	34,851	29,864	19.02%	18.55%	68.23%	68.97%	12.75%	12.49%
San Diego	**1,384,246**	**1,336,350**	**23.08%**	**22.99%**	**66.15%**	**66.15%**	**10.77%**	**10.86%**
San Diego	2,813,833		24.30%		64.55%		11.15%	
Oceanside	160,905	163,414	26.06%	26.40%	60.39%	60.05%	13.55%	13.55%
San Diego	1,223,341	1,172,936	22.69%	22.51%	66.91%	67.00%	10.40%	10.49%

Port names in italic- no census place.

Port Angeles East, Bertsch-Oceanview, Crescent City North, and Newport Coast- no separate block group equivalent.

*Includes Fields Landing.

TABLE 8-14. Educational attainment by state, port group, county, and port. (Source: U.S. Census, 2000, Summary File 3, Table P37.) (Page 1 of 3)

	Population 25 yrs & up		High School Grad		Som Coll. Or Grad		Post-Coll. Degree		Total- HS grad and above	
State-Port Group-County-Port	Place	BG Equiv	Place	BG Equiv	Place	BG Equiv	Place	BG Equiv	Place	BG Equiv
Washington	3,827,507		24.91%		52.85%		9.32%			
Puget Sound	**678,214**	**749,916**	**19.83%**	**20.21%**	**54.41%**	**54.57%**	**13.65%**	**13.30%**	**87.89%**	**88.08%**
Whatcom	102,787		27.58%		51.00%		8.92%		87.50%	
Blaine	2,505	5,959	28.42%	30.53%	44.07%	46.99%	9.02%	8.89%	81.52%	86.41%
Bellingham Bay	39,202	51,246	23.02%	23.37%	54.35%	54.81%	11.18%	11.00%	88.54%	89.17%
San Juan	10,691		18.68%		60.54%		15.20%		94.42%	
Friday Harbor	1,351	5,113	31.38%	21.73%	50.93%	57.62%	8.88%	13.57%	91.19%	92.92%
Skagit	66,959		26.35%		50.61%		7.00%		83.95%	
Anacortes	10,275	15,574	25.20%	23.99%	56.03%	56.34%	8.05%	9.00%	89.27%	89.33%
La Conner	576	952	17.71%	15.86%	61.11%	56.51%	12.33%	11.45%	91.15%	83.82%
Snohomish	388,997		25.91%		56.37%		6.90%		89.18%	
Everett	57,162	83,240	27.23%	26.78%	51.71%	53.33%	5.43%	5.44%	84.37%	85.55%
King	1,188,740		19.17%		57.76%		13.33%		90.26%	
Seattle	409,582	409,471	15.26%	15.23%	56.90%	56.93%	17.31%	17.35%	89.47%	89.51%
Pierce	442,665		29.78%		50.17%		6.92%		86.87%	
Tacoma	123,992	112,969	29.10%	29.50%	47.62%	47.08%	6.88%	6.60%	83.59%	83.18%
Thurston	135,686		23.78%		54.62%		11.11%		89.50%	
Olympia	28,217	52,810	20.79%	20.25%	55.82%	56.77%	14.98%	14.72%	91.59%	91.74%
Mason	33,936		32.46%		46.26%		4.99%		83.72%	
Shelton	5,352	12,582	30.01%	32.62%	45.65%	43.20%	3.38%	4.22%	79.04%	80.04%
North Washington Coast	**24,836**	**42,346**	**26.64%**	**26.49%**	**50.77%**	**52.02%**	**8.71%**	**9.15%**	**86.12%**	**87.66%**
Jefferson	19,551		27.15%		53.90%		10.51%		91.57%	
Port Townsend	6,266	8,710	22.55%	22.85%	56.72%	57.13%	12.45%	12.93%	91.72%	92.90%
Clallam	45,711		27.77%		49.84%		7.88%		85.49%	
Sequim	3,446	12,962	30.01%	27.11%	43.76%	52.08%	8.47%	9.04%	82.24%	88.23%
Port Angeles	12,520	19,130	27.91%	27.23%	49.66%	50.56%	7.55%	7.83%	85.12%	85.62%
Port Angeles E	2,193		23.99%		52.49%		6.25%		82.72%	
Neah Bay	411	720	36.50%	34.72%	43.07%	43.47%	2.19%	3.75%	81.75%	81.94%
La Push		824		31.07%		38.23%		6.19%		75.49%
South & Central WA Coast	**2,544**	**27,295**	**36.05%**	**33.11%**	**37.70%**	**40.25%**	**6.68%**	**5.46%**	**80.42%**	**78.82%**
Grays Harbor	44,588		34.33%		41.98%		4.78%		81.09%	
Copalis Beach	377	1,166	42.18%	40.91%	22.02%	31.05%	13.26%	9.18%	77.45%	81.13%
Grays Harbor		12,247		33.55%		40.65%		4.57%		78.77%
Westport	1,503	1,986	36.73%	37.56%	38.39%	38.37%	5.06%	4.18%	80.17%	80.11%
Pacific	15,298		31.52%		41.29%		6.08%		78.89%	
Willapa Bay		9,236		31.45%		40.03%		5.97%		77.45%
Ilwaco/Chinook	664	2,660	31.02%	30.08%	45.03%	44.59%	6.63%	7.14%	82.68%	81.80%
Oregon	2,250,998		26.27%		50.18%		8.68%		85.13%	
Astoria	**12,622**	**26,633**	**25.28%**	**27.39%**	**52.69%**	**50.99%**	**7.57%**	**6.66%**	**85.53%**	**85.03%**
Clatsop	24,069		29.05%		50.01%		6.50%		85.56%	
Astoria	6,641	13,623	26.05%	29.92%	52.04%	49.64%	7.60%	6.23%	85.69%	85.79%
Gearhart	707	5,618	19.80%	26.18%	58.70%	50.64%	12.73%	6.37%	91.23%	83.20%
Seaside	4,149	5,618	27.57%	26.18%	49.70%	50.64%	5.28%	6.37%	82.55%	83.20%
Cannon Beach	1,125	1,774	15.73%	15.61%	63.73%	63.53%	12.53%	11.72%	92.00%	90.87%
Tillamook	**4,280**	**14,209**	**38.74%**	**37.18%**	**40.58%**	**41.68%**	**4.63%**	**6.13%**	**83.95%**	**85.00%**
Tillamook	17,145		36.97%		41.04%		6.08%		84.09%	
Nehalem Bay	158	2,446	31.01%	32.22%	53.80%	43.79%	1.90%	10.55%	86.71%	86.55%
Tillamook / Garibaldi	2,777	8,093	44.18%	40.85%	38.89%	40.02%	2.77%	3.51%	85.85%	84.38%
Netarts Bay	553	1,300	32.01%	32.15%	41.05%	41.08%	5.79%	11.23%	78.84%	84.46%
Pacific City	792	2,370	25.88%	32.53%	43.56%	45.53%	10.86%	7.72%	80.30%	85.78%

TABLE 8-14. Educational attainment by state, port group, county, and port. (Source: U.S. Census, 2000, Summary File 3, Table P37.) (Page 2 of 3)

	Population 25 yrs & up		High School Grad		Som Coll. Or Grad		Post-Coll. Degree		Total- HS grad and above	
State-Port Group-County-Port	Place	BG Equiv	Place	BG Equiv	Place	BG Equiv	Place	BG Equiv	Place	BG Equiv
Newport	**10,350**	**17,839**	**25.73%**	**26.36%**	**48.59%**	**49.26%**	**10.54%**	**9.64%**	**84.86%**	**85.27%**
Lincoln	32,000		28.98%		47.53%		8.38%		84.88%	
Salmon River		914		19.26%		64.22%		9.74%		93.22%
Depoe Bay	963	1,574	23.99%	25.10%	53.37%	51.78%	10.49%	8.83%	87.85%	85.71%
Siletz Bay	762	1,855	42.91%	39.19%	34.65%	37.68%	1.71%	3.45%	79.27%	80.32%
Newport	6,660	8,500	24.07%	24.38%	48.68%	48.56%	11.89%	11.31%	84.64%	84.25%
Waldport	1,469	3,662	28.59%	27.31%	47.86%	49.81%	7.28%	8.79%	83.73%	85.91%
Yachats	496	1,334	16.53%	24.96%	61.69%	55.10%	15.73%	10.87%	93.95%	90.93%
Coos Bay	**19,074**	**41,141**	**30.82%**	**30.98%**	**45.44%**	**45.83%**	**6.81%**	**6.23%**	**83.08%**	**83.03%**
Lane	210,601		25.87%		51.74%		9.92%		87.53%	
Florence	5,754	8,388	29.77%	31.75%	47.18%	47.19%	8.24%	6.86%	85.19%	85.79%
Douglas	68,783		34.65%		41.39%		4.93%		80.98%	
Winchester Bay	376	4,747	36.97%	30.78%	42.02%	44.93%	7.45%	5.12%	86.44%	80.83%
Coos	44,667		30.73%		45.11%		5.72%		81.56%	
Coos Bay	10,736	22,927	32.16%	31.12%	42.45%	44.42%	6.24%	6.01%	80.85%	81.56%
Bandon	2,208	5,079	26.00%	29.26%	56.07%	50.76%	5.75%	7.19%	87.82%	87.20%
Brookings	**6,092**	**15,440**	**31.39%**	**32.10%**	**45.09%**	**42.49%**	**6.48%**	**6.71%**	**82.96%**	**81.30%**
Curry	16,168		32.11%		42.84%		6.73%		81.67%	
Port Orford	910	1,610	28.57%	29.94%	47.14%	48.32%	9.34%	8.88%	85.05%	87.14%
Gold Beach	1,363	3,621	23.62%	26.82%	45.27%	43.99%	7.85%	10.83%	76.74%	81.63%
Brookings	3,819	10,209	34.83%	34.31%	44.54%	41.04%	5.32%	4.91%	84.68%	80.26%
California	21,298,900		20.13%		47.13%		9.53%		76.79%	
Crescent City	**6,282**	**16,488**	**25.09%**	**27.05%**	**47.09%**	**41.28%**	**3.25%**	**3.03%**	**75.42%**	**71.35%**
Del Norte	18,459		27.47%		41.17%		3.00%		71.64%	
Crescent City	2,346	16,488	24.47%	27.05%	43.27%	41.28%	3.54%	3.03%	71.27%	71.35%
Bertsch-Oceanview CDP	1,396		27.29%		49.86%		1.93%		79.08%	
Crescent City North CDP	2,540		24.45%		49.09%		3.70%		77.24%	
Eureka	**17,296**	**35,157**	**26.57%**	**26.32%**	**49.59%**	**51.51%**	**5.68%**	**6.97%**	**81.83%**	**84.81%**
Humboldt	81,501		25.72%		51.79%		7.40%		84.91%	
Trinidad	263	2,414	12.17%	24.73%	58.17%	49.59%	17.87%	10.48%	88.21%	84.80%
Eureka*	17,033	32,743	26.79%	26.44%	49.46%	51.65%	5.49%	6.72%	81.74%	84.81%
Fort Bragg	**4,853**	**15,058**	**32.10%**	**23.91%**	**43.62%**	**49.06%**	**5.15%**	**11.02%**	**80.88%**	**83.99%**
Mendocino	56,886		26.04%		46.83%		7.96%		80.83%	
Fort Bragg	4,585	9,159	32.87%	29.37%	43.01%	45.59%	5.21%	6.97%	81.09%	81.93%
Albion		3,120		13.14%		53.17%		23.43%		89.74%
Point Arena	268	2,779	19.03%	17.99%	54.10%	55.85%	4.10%	10.47%	77.24%	84.31%
Bodega Bay	**8,762**	**13,408**	**7.78%**	**10.40%**	**60.64%**	**58.83%**	**27.36%**	**24.64%**	**95.78%**	**93.88%**
Sonoma	306,564		20.41%		54.80%		9.71%		84.92%	
Bodega Bay	1,266	2,871	13.90%	17.31%	47.31%	52.49%	25.36%	19.26%	86.57%	89.06%
Marin	183,694		12.44%		58.28%		20.52%		91.25%	
Tomales Bay	157	335	23.57%	19.10%	45.22%	51.34%	21.02%	14.63%	89.81%	85.07%
Point Reyes	653	3,103	15.16%	13.79%	62.02%	56.62%	15.62%	19.53%	92.80%	89.95%
Sausalito	6,686	7,099	5.53%	5.72%	63.39%	62.71%	29.03%	29.53%	97.95%	97.96%

TABLE 8-14. Educational attainment by state, port group, county, and port. (Source: U.S. Census, 2000, Summary File 3, Table P37.) (Page 3 of 3)

	Population 25 yrs & up		High School Grad		Som Coll. Or Grad		Post-Coll. Degree		Total- HS grad and above	
State-Port Group-County-Port	Place	BG Equiv	Place	BG Equiv	Place	BG Equiv	Place	BG Equiv	Place	BG Equiv
San Francisco	**1,037,954**	**1,060,260**	**15.10%**	**15.17%**	**48.87%**	**48.93%**	**16.10%**	**16.03%**	**80.08%**	**80.13%**
San Francisco	595,805		13.87%		50.91%		16.42%		81.19%	
San Francisco	595,805	595,805	13.87%	13.87%	50.91%	50.91%	16.42%	16.42%	81.19%	81.19%
Contra Costa	625,641		19.81%		54.93%		12.17%		86.91%	
Richmond	62,662	69,801	21.82%	22.30%	45.28%	45.64%	8.26%	7.86%	75.35%	75.80%
Alameda	953,716		19.05%		49.64%		13.67%		82.36%	
Berkeley	66,133	65,372	8.61%	8.65%	49.32%	49.30%	34.30%	34.20%	92.24%	92.16%
Oakland	261,402	261,402	17.66%	17.66%	43.40%	43.40%	12.89%	12.89%	73.95%	73.95%
Alameda	51,952	51,952	16.57%	16.57%	56.87%	56.87%	15.00%	15.00%	88.44%	88.44%
San Mateo	490,285		17.45%		53.26%		14.57%		85.28%	
Princeton		15,928		14.03%		52.58%		17.58%		84.19%
Monterey	**54,890**	**74,465**	**15.00%**	**15.35%**	**57.01%**	**57.06%**	**17.97%**	**16.86%**	**89.98%**	**89.26%**
Santa Cruz	164,999		16.56%		54.18%		12.48%		83.22%	
Santa Cruz	33,896	50,950	14.49%	15.22%	57.12%	57.71%	17.49%	16.05%	89.10%	88.99%
Monterey	244,128		18.58%		41.13%		8.72%		68.43%	
Moss Landing	185	1,161	21.08%	18.43%	24.32%	29.63%	23.24%	6.03%	68.65%	54.09%
Monterey	20,809	22,354	15.76%	15.47%	57.12%	56.99%	18.70%	19.26%	91.59%	91.72%
Morro Bay	**7,911**	**30,406**	**24.02%**	**18.60%**	**55.95%**	**59.67%**	**10.58%**	**12.93%**	**90.54%**	**91.20%**
San Luis Obispo	159,196		21.81%		54.43%		9.33%		85.58%	
Morro Bay	7,911	27,743	24.02%	19.36%	55.95%	59.12%	10.58%	12.33%	90.54%	90.81%
Avila Beach		2,663		10.70%		65.38%		19.15%		95.23%
Santa Barbara	**170,399**	**249,910**	**18.33%**	**18.74%**	**41.60%**	**45.63%**	**8.58%**	**9.46%**	**68.51%**	**73.82%**
Santa Barbara	246,729		19.03%		48.81%		11.41%		79.24%	
Santa Barbara	61,096	63,258	15.14%	15.01%	50.54%	50.88%	15.65%	15.99%	81.32%	81.88%
Ventura	471,756		19.70%		50.87%		9.53%		80.10%	
Ventura		74,412		20.05%		54.04%		10.94%		85.02%
Oxnard	96,399	96,654	19.46%	19.27%	35.43%	35.51%	4.57%	4.62%	59.46%	59.40%
Port Hueneme	12,904	15,586	24.96%	24.28%	45.37%	46.96%	5.11%	5.86%	75.44%	77.10%
Los Angeles	**359,294**	**440,572**	**17.09%**	**17.88%**	**49.77%**	**47.35%**	**10.87%**	**9.86%**	**77.73%**	**75.09%**
Los Angeles	5,882,948		18.84%		42.28%		8.78%		69.90%	
San Pedro		52,081		21.60%		45.87%		7.85%		75.32%
Willmington		28,418		20.14%		18.78%		2.39%		41.31%
Long Beach	277,410	279,276	18.82%	18.83%	45.66%	45.84%	8.19%	8.18%	72.66%	72.84%
Terminal Island		1,182		26.23%		30.54%		6.51%		63.28%
Orange	1,813,456		17.50%		51.58%		10.38%		79.46%	
Newport Beach	54,755	57,811	9.64%	9.60%	65.70%	65.85%	21.41%	21.20%	96.74%	96.64%
Newport Coast CDP	1,865		4.56%		60.59%		33.35%		98.50%	
Dana Point	25,264	21,804	15.21%	15.45%	59.65%	59.37%	15.82%	16.09%	90.67%	90.91%
San Diego	**879,930**	**850,910**	**17.58%**	**17.51%**	**52.33%**	**52.23%**	**12.66%**	**12.79%**	**82.57%**	**82.52%**
San Diego	1,773,327		19.85%		51.88%		10.86%		82.58%	
Oceanside	100,688	102,022	22.21%	22.16%	51.31%	51.29%	7.31%	7.32%	80.83%	80.77%
San Diego	779,242	748,888	16.98%	16.87%	52.46%	52.36%	13.35%	13.53%	82.80%	82.76%

Port names in italic- no census place.

Port Angeles East, Bertsch-Oceanview, Crescent City North, and Newport Coast- no separate block group equivalent.

*Includes Fields Landing.

Notes: Table P37 breaks out population by sex, values are summed for calculations. “Some Coll. Or Grad” sums fields some college, less than 1 year; some college, 1 or more years; no degree; Associate degree; and Bachelor's degree. “Post-Coll. Degree” sums fields Master's degree, professional school degree, and Doctorate degree.

TABLE 8-15. Labor force, unemployed as a percent of labor force, employed population and population employed in private sector jobs in agriculture, forestry, fishing and hunting by state, port group, county, and port. (Source: U.S. Census, 2000, Summary File 3, Tables P43 and P51.) (Page 1 of 4)

	Pop. In Labor Force		Unemployed		Pop. Employed		Resouce Occupation	
State-Port Group-County-Port	Place	BG equiv	Place	BG equiv	Place	BG equiv	Place	BG equiv
Washington	3,953,698		4.71%		70.66%		1.54%	
Puget Sound	**712,701**	**784,645**	**4.80%**	**4.71%**	**72.76%**	**72.81%**	**0.37%**	**0.44%**
Whatcom	113,770		5.66%		71.00%		2.11%	
Blaine	2,413	5,804	4.81%	4.91%	64.98%	68.49%	0.37%	1.57%
Bellingham Bay	48,958	61,367	7.88%	6.87%	68.84%	70.08%	0.53%	0.69%
San Juan	9,551		2.26%		69.17%		1.99%	
Friday Harbor	1,410	4,631	3.90%	2.07%	73.69%	68.75%	1.77%	1.38%
Skagit	67,527		5.04%		67.72%		3.59%	
Anacortes	9,506	14,249	3.51%	3.26%	63.63%	63.63%	1.28%	1.54%
La Conner	570	913	2.11%	2.74%	72.98%	71.52%	2.28%	10.08%
Snohomish	408,038		3.88%		74.03%		0.57%	
Everett	62,256	89,980	6.01%	5.39%	67.87%	70.24%	0.32%	0.39%
King	1,231,594		3.54%		75.45%		0.28%	
Seattle	424,042	424,022	4.09%	4.08%	75.82%	75.83%	0.23%	0.23%
Pierce	463,026		4.68%		67.85%		0.54%	
Tacoma	128,143	116,174	5.72%	5.73%	67.73%	67.83%	0.53%	0.39%
Thurston	140,121		4.53%		71.71%		1.15%	
Olympia	29,904	56,100	3.79%	4.12%	72.71%	71.77%	0.65%	0.66%
Mason	30,460		5.75%		63.41%		2.53%	
Shelton	5,499	11,405	5.82%	6.56%	62.94%	66.56%	3.13%	3.42%
North Washington Coast	**23,104**	**38,610**	**5.44%**	**4.95%**	**61.11%**	**61.50%**	**1.53%**	**1.92%**
Jefferson	17,129		4.57%		63.43%		1.90%	
Port Townsend	5,713	7,917	5.22%	4.70%	67.43%	67.39%	1.07%	1.06%
Clallam	40,783		4.99%		59.96%		3.10%	
Sequim	2,753	10,704	2.72%	2.70%	39.99%	52.03%	2.03%	1.91%
Port Angeles	12,137	18,486	5.58%	5.65%	62.35%	64.26%	1.52%	1.83%
Port Angeles E	2,053		5.94%		64.49%		0.63%	
Neah Bay	448	764	19.20%	18.98%	60.94%	61.26%	8.48%	8.25%
La Push		739		8.39%		67.12%		6.90%
South & Central WA Coast	**2,318**	**24,873**	**5.65%**	**5.60%**	**59.32%**	**61.41%**	**4.40%**	**3.72%**
Grays Harbor	42,860		5.85%		64.29%		4.30%	
Copalis Beach	285	989	11.23%	7.89%	40.00%	50.05%	0.00%	1.11%
Grays Harbor		11,911		5.83%		64.13%		3.85%
Westport	1,397	1,804	5.08%	4.93%	61.13%	62.97%	6.30%	5.38%
Pacific	13,264		5.08%		60.23%		4.78%	
Willapa Bay		7,797		5.45%		57.93%		3.72%
Ilwaco/Chinook	636	2,372	4.40%	4.47%	63.99%	62.69%	2.20%	2.91%

TABLE 8-15. Labor force, unemployed as a percent of labor force, employed population and population employed in private sector jobs in agriculture, forestry, fishing and hunting by state, port group, county, and port. (Source: U.S. Census, 2000, Summary File 3, Tables P43 and P51.) (Page 2 of 4)

	Pop. In Labor Force		Unemployed		Pop. Employed		Resouce Occupation	
State-Port Group-County-Port	Place	BG equiv	Place	BG equiv	Place	BG equiv	Place	BG equiv
Oregon	2,306,034		4.88%		70.59%		1.88%	
Astoria	**12,607**	**26,702**	**4.17%**	**4.65%**	**68.07%**	**68.37%**	**1.47%**	**2.07%**
Clatsop	24,171		4.80%		68.25%		2.94%	
Astoria	6,746	14,043	4.94%	5.76%	66.16%	66.43%	2.16%	3.18%
Gearhart	659	5,451	4.10%	3.21%	74.36%	71.29%	0.76%	0.86%
Seaside	4,010	5,451	3.12%	3.21%	69.35%	71.29%	0.72%	0.86%
Cannon Beach	1,192	1,757	3.44%	4.67%	71.06%	65.74%	0.42%	0.80%
Tillamook	**4,401**	**13,358**	**3.61%**	**3.35%**	**70.10%**	**67.34%**	**5.00%**	**7.31%**
Tillamook	16,131		3.15%		67.92%		7.13%	
Nehalem Bay	168	2,121	1.79%	3.44%	76.19%	61.95%	0.00%	5.42%
Tillamook / Garibaldi	3,019	7,847	2.91%	3.24%	73.00%	69.66%	6.86%	8.22%
Netarts Bay	515	1,176	6.41%	4.34%	60.58%	64.97%	0.00%	4.51%
Pacific City	699	2,214	5.01%	3.16%	63.09%	65.54%	1.86%	7.41%
Newport	**9,855**	**16,565**	**6.43%**	**6.04%**	**64.79%**	**63.37%**	**2.20%**	**2.48%**
Lincoln	29,934		5.87%		64.35%		2.35%	
Salmon River		848		5.54%		59.20%		0.00%
Depoe Bay	827	1,358	3.63%	5.30%	62.64%	57.36%	2.54%	1.55%
Siletz Bay	739	1,761	3.92%	4.94%	67.66%	68.20%	2.98%	5.34%
Newport	6,522	8,273	6.65%	6.18%	66.80%	66.58%	2.44%	2.54%
Waldport	1,330	3,103	9.55%	7.90%	57.29%	57.65%	0.83%	1.58%
Yachats	437	1,222	3.20%	3.11%	56.75%	58.84%	0.92%	3.03%
Coos Bay	**17,088**	**37,005**	**5.99%**	**5.83%**	**57.58%**	**58.91%**	**1.80%**	**2.52%**
Lane	221,434		4.78%		70.21%		1.22%	
Florence	4,648	6,757	5.23%	5.11%	47.55%	49.31%	1.83%	1.48%
Douglas	65,221		5.24%		63.89%		2.70%	
Winchester Bay	307	3,960	9.77%	7.47%	45.93%	53.86%	2.61%	4.55%
Coos	40,967		5.70%		61.48%		3.32%	
Coos Bay	10,263	21,915	6.49%	6.07%	62.81%	62.57%	1.98%	2.18%
Bandon	1,870	4,373	4.49%	4.21%	55.72%	59.94%	0.64%	4.02%
Brookings	**5,414**	**12,943**	**3.75%**	**4.22%**	**62.98%**	**59.28%**	**2.20%**	**3.02%**
Curry	13,547		4.66%		58.91%		3.17%	
Port Orford	730	1,291	4.66%	5.19%	54.52%	58.17%	4.38%	7.20%
Gold Beach	1,197	3,083	2.67%	3.24%	70.43%	65.55%	2.09%	1.59%
Brookings	3,487	8,569	3.93%	4.42%	62.20%	57.19%	1.78%	2.91%

TABLE 8-15. Labor force, unemployed as a percent of labor force, employed population and population employed in private sector jobs in agriculture, forestry, fishing and hunting by state, port group, county, and port. (Source: U.S. Census, 2000, Summary File 3, Tables P43 and P51.) (Page 3 of 4)

	Pop. In Labor Force		Unemployed		Pop. Employed		Resouce Occupation	
State-Port Group-County-Port	Place	BG equiv	Place	BG equiv	Place	BG equiv	Place	BG equiv
California	21,763,678		5.10%		67.63%		1.13%	
Crescent City	**6,004**	**12,947**	**6.85%**	**6.94%**	**58.24%**	**60.96%**	**2.81%**	**2.55%**
Del Norte	14,769		7.24%		60.66%		3.53%	
Crescent City	2,220	12,947	8.29%	6.94%	54.68%	60.96%	1.94%	2.55%
Bertsch-Oceanview CDP	1,325		6.79%		57.43%		3.92%	
Crescent City North CDP	2,459		5.57%		61.90%		3.01%	
Eureka	**17,117**	**34,478**	**6.75%**	**6.29%**	**63.45%**	**65.25%**	**1.92%**	**1.99%**
Humboldt	83,373		6.25%		66.48%		2.80%	
Trinidad	232	2,126	5.17%	10.07%	71.98%	57.81%	0.00%	3.90%
Eureka*	16,885	32,352	6.78%	6.04%	63.33%	65.74%	1.95%	1.86%
Fort Bragg	**5,043**	**14,438**	**5.89%**	**5.04%**	**67.08%**	**68.96%**	**5.33%**	**5.14%**
Mendocino	56,458		5.34%		68.33%		4.55%	
Fort Bragg	4,733	9,013	6.13%	6.15%	65.92%	67.74%	5.30%	4.70%
Albion		2,818		2.31%		70.65%		6.25%
Point Arena	310	2,607	2.26%	4.18%	84.84%	71.38%	5.81%	5.45%
Bodega Bay	**8,300**	**12,680**	**1.73%**	**1.84%**	**78.82%**	**77.51%**	**1.08%**	**2.78%**
Sonoma	313,439		3.26%		73.13%		1.73%	
Bodega Bay	1,091	2,496	1.74%	2.16%	65.44%	68.31%	2.66%	3.45%
Marin	174,003		2.27%		74.05%		0.32%	
Tomales Bay	165	375	3.64%	1.60%	91.52%	86.13%	9.70%	7.47%
Point Reyes	648	2,985	1.23%	2.08%	76.23%	75.01%	5.40%	7.67%
Sausalito	6,396	6,824	1.74%	1.63%	81.04%	81.49%	0.16%	0.15%
San Francisco	**1,028,276**	**1,050,134**	**4.39%**	**4.35%**	**71.82%**	**71.88%**	**0.09%**	**0.12%**
San Francisco	578,066		3.57%		74.01%		0.08%	
San Francisco	578,066	578,066	3.57%	3.57%	74.01%	74.01%	0.08%	0.08%
Contra Costa	631,736		3.59%		71.45%		0.23%	
Richmond	62,980	70,028	5.70%	5.47%	67.91%	68.01%	0.16%	0.16%
Alameda	969,813		4.16%		71.44%		0.12%	
Berkeley	76,228	75,468	4.28%	4.28%	73.24%	73.21%	0.04%	0.04%
Oakland	259,802	259,802	6.13%	6.13%	67.26%	67.26%	0.12%	0.12%
Alameda	51,200	51,200	3.33%	3.33%	72.83%	72.83%	0.09%	0.09%
San Mateo	489,964		2.49%		73.81%		0.28%	
Princeton		15,570		2.45%		77.48%		1.64%

TABLE 8-15. Labor force, unemployed as a percent of labor force, employed population and population employed in private sector jobs in agriculture, forestry, fishing and hunting by state, port group, county, and port. (Source: U.S. Census, 2000, Summary File 3, Tables P43 and P51.) (Page 4 of 4)

	Pop. In Labor Force		Unemployed		Pop. Employed		Resouce Occupation	
State-Port Group-County-Port	Place	BG equiv	Place	BG equiv	Place	BG equiv	Place	BG equiv
Monterey	**63,055**	**83,154**	**4.01%**	**4.02%**	**69.44%**	**70.22%**	**0.77%**	**0.97%**
Santa Cruz	177,328		4.70%		72.96%		3.02%	
Santa Cruz	40,027	57,651	4.83%	4.65%	74.06%	73.72%	0.72%	0.88%
Monterey	248,579		6.30%		65.97%		7.87%	
Moss Landing	259	1,281	17.37%	8.74%	80.31%	69.16%	7.72%	9.21%
Monterey	22,769	24,222	2.41%	2.27%	61.19%	61.95%	0.78%	0.73%
Morro Bay	**7,272**	**28,664**	**2.46%**	**2.53%**	**61.67%**	**67.04%**	**2.28%**	**2.36%**
San Luis Obispo	161,072		4.29%		68.09%		2.19%	
Morro Bay	7,272	26,221	2.46%	2.59%	61.67%	67.16%	2.28%	2.56%
Avila Beach		2,443		1.92%		65.74%		0.20%
Santa Barbara	**184,403**	**262,398**	**4.98%**	**4.57%**	**68.79%**	**69.84%**	**4.24%**	**3.35%**
Santa Barbara	264,489		4.92%		68.33%		4.10%	
Santa Barbara	66,236	65,759	4.45%	3.99%	72.10%	71.77%	0.54%	0.58%
Ventura	491,100		3.89%		70.93%		2.54%	
Ventura		75,361		3.93%		72.55%		1.02%
Oxnard	103,952	104,299	5.50%	5.52%	67.72%	67.85%	6.85%	6.96%
Port Hueneme	14,215	16,979	3.71%	3.89%	61.24%	62.57%	2.34%	2.26%
Los Angeles	**369,178**	**451,558**	**5.86%**	**5.86%**	**67.20%**	**66.65%**	**0.09%**	**0.12%**
Los Angeles	6,015,559		5.89%		65.72%		0.11%	
San Pedro		52,204		5.01%		65.94%		0.29%
Willmington		30,346		6.89%		60.19%		0.25%
Long Beach	288,260	290,174	6.83%	6.83%	65.73%	65.76%	0.08%	0.08%
Terminal Island		98		15.31%		57.14%		0.00%
Orange	1,880,724		3.78%		71.19%		0.20%	
Newport Beach	53,446	56,751	2.23%	2.21%	71.69%	72.13%	0.07%	0.08%
Newport Coast CDP	1,943		0.00%		70.72%		0.00%	
Dana Point	25,529	21,985	2.93%	3.01%	74.03%	74.79%	0.21%	0.13%
San Diego	**935,006**	**903,128**	**4.33%**	**4.33%**	**66.89%**	**66.82%**	**0.22%**	**0.23%**
San Diego	1,874,264		4.18%		66.23%		0.40%	
Oceanside	104,176	105,364	3.97%	3.86%	65.33%	65.41%	0.70%	0.75%
San Diego	830,830	797,764	4.38%	4.39%	67.09%	67.01%	0.16%	0.16%

Port names in italic- no census place.

Port Angeles East, Bertsch-Oceanview, Crescent City North, and Newport Coast- no separate block group equivalent.

*Includes Fields Landing.

Notes: Tables P43 and P51 break out population by sex, values are summed for calculations. “Pop. in Labor Force” from Table P43 is for population 16 years old and over. “Pop. Employed” from table P51 is Employed civilian population 16 years and over. “Resource Occupation” sums (for both sexes) private for-profit wage and salary workers and self-employed workers in own not incorporated business in agriculture, forestry, fishing and hunting industries (NAICS 21) from table P51.

TABLE 8-16. Household income indicators by state, port group, county, and port. (Source: U.S. Census, 2000, Summary File 3, Tables P54, P56 and P93.) (Page 1 of 4)

State-Port Group-County-Port			Total Households		Median Income	Average Income		Below Poverty Level	
			Place	BG Equiv	Place	Place	BG Equiv	Place	BG Equiv
Washington			2,272,261		$45,776	$58,653		9.82%	
Puget Sound			**429,785**	**471,269**		**$57,891**	**$58,327**	**11.99%**	**11.56%**
	Whatcom		64,464		$40,005	$51,119		13.65%	
		Blaine	1,485	3,407	$36,900	$50,060	$59,765	14.75%	11.09%
		Bellingham Bay	28,012	34,785	$32,530	$45,139	$48,163	19.49%	17.19%
	San Juan		6,468		$43,491	$67,202		9.63%	
		Friday Harbor	900	3,058	$35,139	$44,305	$69,525	11.78%	8.80%
	Skagit		38,814		$42,381	$55,622		9.55%	
		Anacortes	6,097	8,999	$41,930	$53,547	$59,298	7.77%	7.50%
		La Conner	365	571	$42,344	$50,875	$55,993	8.77%	6.48%
	Snohomish		224,966		$53,060	$62,386		6.48%	
		Everett	36,255	51,630	$40,100	$50,092	$53,698	10.82%	9.48%
	King		711,235		$53,157	$71,101		7.84%	
		Seattle	258,635	258,524	$45,736	$64,511	$64,610	10.71%	10.70%
	Pierce		260,897		$45,204	$54,972		9.59%	
		Tacoma	76,127	69,563	$37,879	$47,251	$46,514	14.08%	14.40%
	Thurston		81,666		$46,975	$56,343		8.76%	
		Olympia	18,673	34,143	$40,846	$49,929	$53,831	12.47%	10.72%
	Mason		18,876		$39,586	$45,665		11.70%	
		Shelton	3,236	6,589	$32,500	$39,186	$42,728	17.24%	13.93%
North Washington Coast			**15,761**	**25,849**		**$41,388**	**$45,252**	**14.26%**	**12.61%**
	Jefferson		11,649		$37,869	$49,079		11.33%	
		Port Townsend	3,912	5,362	$34,536	$47,433	$49,712	14.08%	12.55%
	Clallam		27,187		$36,449	$44,940		12.16%	
		Sequim	2,155	7,590	$27,880	$34,941	$45,632	15.36%	10.41%
		Port Angeles	8,079	11,960	$33,130	$40,209	$43,718	13.18%	12.93%
		Port Angeles E	1,348		$34,730	$43,067	$43,718		
		Neah Bay	267	470	$21,635	$32,037	$31,128	33.33%	32.77%
		La Push		467			$41,382		20.34%
South & Central WA Coast			**1,579**	**16,376**		**$38,804**	**$40,188**	**15.77%**	**14.99%**
	Grays Harbor		26,807		$34,160	$41,862		15.12%	
		Copalis Beach	226	732	$33,194	$33,729	$32,520	19.03%	13.39%
		Grays Harbor		7,351			$42,877		15.60%
		Westport	934	1,248	$32,037	$40,522	$39,929	15.10%	15.54%
	Pacific		9,089		$31,209	$39,521		13.99%	
		Willapa Bay		5,450			$36,976		14.99%
		Ilwaco/Chinook	419	1,595	$29,632	$37,712	$42,493	15.51%	12.41%

TABLE 8-16. Household income indicators by state, port group, county, and port. (Source: U.S. Census, 2000, Summary File 3, Tables P54, P56 and P93.) (Page 2 of 4)

State-Port Group-County-Port				Total Households		Median Income	Average Income		Below Poverty Level	
				Place	BG Equiv	Place	Place	BG Equiv	Place	BG Equiv
Oregon				1,335,109		$40,916	$52,816		10.79%	
	Astoria			**8,058**	**16,503**		**$42,807**	**$45,399**	**14.01%**	**12.27%**
		Clatsop		14,741		$36,301	$46,206		11.74%	
			Astoria	4,269	8,369	$33,011	$42,039	$44,314	15.20%	12.44%
			Gearhart	417	3,513	$43,047	$56,584	$45,941	7.67%	12.47%
			Seaside	2,665	3,513	$31,074	$38,751	$45,941	13.96%	12.47%
			Cannon Beach	707	1,108	$39,271	$54,614	$50,167	10.75%	9.75%
	Tillamook			**2,742**	**8,521**		**$39,311**	**$42,730**	**11.89%**	**11.44%**
		Tillamook		10,214		$34,269	$44,627		10.89%	
			Nehalem Bay	83	1,457	$40,250	$47,455	$44,006	8.43%	12.77%
			Tillamook / Garibaldi	1,830	4,935	$29,875	$36,301	$39,725	14.15%	12.75%
			Netarts Bay	336	755	$31,204	$39,180	$45,072	10.71%	7.55%
			Pacific City	493	1,374	$33,250	$49,199	$50,880	4.87%	7.50%
	Newport			**6,413**	**10,728**		**$44,497**	**$44,715**	**12.38%**	**10.92%**
		Lincoln		19,352		$32,769	$42,409		12.14%	
			Salmon River		552			$50,572		6.88%
			Depoe Bay	608	973	$35,417	$49,811	$45,157	8.06%	7.40%
			Siletz Bay	445	1,028	$38,542	$38,382	$44,845	15.73%	10.70%
			Newport	4,153	5,144	$31,996	$45,750	$46,405	12.18%	11.45%
			Waldport	877	2,194	$33,301	$36,789	$40,280	15.05%	11.90%
			Yachats	330	837	$32,308	$47,671	$41,426	11.21%	12.07%
	Coos Bay			**11,698**	**24,746**		**$39,844**	**$39,553**	**14.41%**	**14.83%**
		Lane		130,616		$36,942	$48,062		14.11%	
			Florence	3,601	5,081	$30,505	$36,489	$37,920	11.27%	11.43%
		Douglas		39,867		$33,223	$41,157		12.84%	
			Winchester Bay	254	2,891	$30,139	$36,951	$35,659	20.08%	16.57%
		Coos		26,181		$31,542	$41,013		14.82%	
			Coos Bay	6,538	13,875	$31,212	$41,237	$40,522	15.80%	16.32%
			Bandon	1,305	2,899	$29,492	$42,682	$41,662	15.02%	11.90%
	Brookings			**3,637**	**9,102**		**$38,045**	**$39,563**	**12.68%**	**13.28%**
		Curry		9,554		$30,117	$39,638		13.18%	
			Port Orford	572	985	$23,289	$32,845	$34,361	19.76%	19.70%
			Gold Beach	805	2,143	$30,243	$37,501	$41,286	12.17%	12.41%
			Brookings	2,260	5,974	$31,656	$39,556	$39,803	11.06%	12.54%

TABLE 8-16. Household income indicators by state, port group, county, and port. (Source: U.S. Census, 2000, Summary File 3, Tables P54, P56 and P93.) (Page 3 of 4)

			Total Households		Median Income	Average Income		Below Poverty Level	
State-Port Group-County-Port			Place	BG Equiv	Place	Place	BG Equiv	Place	BG Equiv
California			11,512,020		$47,493	$65,628		11.82%	
Crescent City			**3,951**	**8,029**		**$33,119**	**$39,654**	**22.55%**	**18.48%**
	Del Norte		9,185		$29,642	$39,136		18.20%	
		Crescent City	1,541	8,029	$20,133	$29,916	$39,654	30.69%	18.48%
		Bertsch-Oceanview CDP	822		$26,300	$31,490		16.67%	
		Crescent City North CDP	1,588		$29,478	$37,070		17.70%	
Eureka			**11,004**	**21,653**		**$37,712**	**$41,482**	**20.86%**	**17.33%**
	Humboldt		51,235		$31,226	$41,746		18.68%	
		Trinidad	170	1,530	$40,000	$58,371	$40,884	8.24%	21.76%
		Eureka*	10,834	20,123	$25,849	$37,388	$41,527	21.05%	17.00%
Fort Bragg			**3,046**	**8,956**		**$36,769**	**$49,781**	**17.20%**	**12.47%**
	Mendocino		33,331		$35,996	$49,512		13.74%	
		Fort Bragg	2,861	5,463	$28,539	$36,999	$44,081	17.09%	13.31%
		Albion		1,855			$64,880		10.67%
		Point Arena	185	1,638	$27,083	$33,218	$51,693	18.92%	11.72%
Bodega Bay			**5,426**	**8,054**		**$125,927**	**$108,183**	**4.15%**	**6.28%**
	Sonoma		172,690		$53,076	$67,258		6.97%	
		Bodega Bay	696	1,625	$56,818	$79,250	$68,835	1.44%	5.11%
	Marin		100,736		$71,306	$108,756		5.51%	
		Tomales Bay	77	182	$51,953	$63,468	$59,781	0.00%	12.09%
		Point Reyes	378	1,719	$57,292	$88,572	$73,645	7.41%	12.45%
		Sausalito	4,275	4,528	$87,469	$137,954	$137,361	4.37%	4.13%
San Francisco			**590,839**	**602,476**		**$71,723**	**$72,303**	**12.39%**	**12.28%**
	San Francisco		329,850		$55,221	$80,325		10.23%	
		San Francisco	329,850	329,850	$55,221	$80,325	$80,325	10.23%	10.23%
	Contra Costa		344,422		$63,675	$83,675		6.60%	
		Richmond	34,752	38,832	$44,210	$55,686	$55,324	13.80%	13.47%
	Alameda		523,787		$55,946	$72,629		9.82%	
		Berkeley	45,007	44,576	$44,485	$68,437	$67,906	18.33%	18.42%
		Oakland	150,971	150,971	$40,055	$57,267	$57,267	16.07%	16.07%
		Alameda	30,259	30,259	$56,285	$73,388	$73,388	7.10%	7.10%
	San Mateo		254,219		$70,819	$98,874		4.95%	
		Princeton		7,988			$128,189		4.39%
Monterey			**33,133**	**43,865**		**$64,130**	**$67,623**	**11.04%**	**10.25%**
	Santa Cruz		91,244		$53,998	$72,455		9.54%	
		Santa Cruz	20,368	29,842	$50,605	$66,273	$68,772	13.07%	11.54%
	Monterey		121,199		$48,305	$63,944		10.26%	
		Moss Landing	109	569	$66,442	$77,728	$61,468	6.42%	7.03%
		Monterey	12,656	13,454	$49,109	$60,563	$65,336	7.82%	7.50%

TABLE 8-16. Household income indicators by state, port group, county, and port. (Source: U.S. Census, 2000, Summary File 3, Tables P54, P56 and P93.) (Page 4 of 4)

State-Port Group-County-Port			Total Households		Median Income	Average Income		Below Poverty Level	
			Place	BG Equiv	Place	Place	BG Equiv	Place	BG Equiv
Morro Bay			**5,045**	**18,374**		**$43,120**	**$56,804**	**13.16%**	**9.07%**
	San Luis Obispo		92,732		$42,428	$55,550		11.80%	
		Morro Bay	5,045	16,662	$34,379	$43,120	$55,327	13.16%	9.35%
		Avila Beach		1,712			$71,171		6.31%
Santa Barbara			**86,553**	**131,413**		**$61,202**	**$63,423**	**11.15%**	**9.86%**
	Santa Barbara		136,769		$46,677	$65,782		11.60%	
		Santa Barbara	35,720	36,839	$47,498	$66,844	$70,205	10.82%	10.71%
	Ventura		243,503		$59,666	$75,130		7.17%	
		Ventura		42,208			$64,487		7.48%
		Oxnard	43,577	43,765	$48,603	$58,449	$58,778	11.58%	11.44%
		Port Hueneme	7,256	8,601	$42,246	$49,964	$52,788	10.17%	9.94%
Los Angeles			**211,882**	**257,269**		**$68,938**	**$64,901**	**15.23%**	**15.57%**
	Los Angeles		3,136,279		$42,189	$61,811		15.13%	
		San Pedro		30,632			$55,066		14.02%
		Willmington		14,385			$43,188		23.78%
		Long Beach	163,279	164,342	$37,270	$52,981	$53,101	18.24%	18.15%
		Terminal Island		104			$38,963		35.58%
	Orange		936,154		$58,820	$77,543		7.74%	
		Newport Beach	33,148	35,157	$83,455	$132,084	$129,577	4.81%	4.92%
		Newport Coast CDP	1,006		$164,653	$264,648		2.98%	
		Dana Point	14,449	12,649	$63,043	$90,776	$87,190	6.02%	5.97%
San Diego			**507,673**	**492,399**	**$92,034**	**$61,873**	**$61,947**	**11.73%**	**11.87%**
	San Diego		995,492		$47,067	$63,204		10.34%	
		Oceanside	56,547	56,857	$46,301	$56,809	$57,492	9.17%	8.96%
		San Diego	451,126	435,542	$45,733	$62,508	$62,529	12.05%	12.25%

Port names in italic- no census place.

Port Angeles East, Bertsch-Oceanview, Crescent City North, and Newport Coast- no separate block group equivalent.

*Includes Fields Landing.

Note: Average household income calculated by dividing aggregate household income in 1999 from table P54 by the total number of households given in table P52.

TABLE 8-17a. Coastal Counties Economic Profile: 2001. (Page 1 of 2)

State	County	Population	Personal Income ($,000)	Per Capita Personal Income ($)	Rank	Wages & Salaries ($,000)	Wage & Salary Employment	Average Annual Wage	Rank
Washington	Whatcom	170,673	4,192,379	$24,564	32	2,114,526	74,361	$28,436	26
	Skagit	105,236	2,901,787	$27,574	22	1,344,262	46,755	$28,751	24
	Snohomish	623,890	18,379,862	$29,460	17	8,474,469	232,347	$36,473	12
	King	1,753,901	80,617,305	$45,965	4	57,968,327	1,224,623	$47,336	3
	Pierce	718,918	19,123,592	$26,601	24	8,985,363	278,938	$32,213	20
	Thurston	212,831	6,015,831	$28,266	20	2,997,554	91,221	$32,860	19
	Clallam	65,304	1,671,533	$25,596	28	577,617	22,655	$25,496	34
	Jefferson	26,467	763,572	$28,850	18	218,382	9,134	$23,909	41
	Grays Harbor	68,233	1,521,515	$22,299	42	700,511	25,101	$27,908	28
	Pacific	20,766	447,144	$21,533	43	148,885	6,691	$22,252	45
	Wahkiakum	3,769	86,440	$22,934	38	22,741	903	$25,184	38
	Cowlitz	93,752	2,309,418	$24,633	31	1,279,646	40,655	$31,476	22
	Clark	359,337	10,335,767	$28,763	19	4,163,231	124,370	$33,475	17
	Skaminia	9,991	224,570	$22,477	41	50,724	2,036	$24,914	39
	Klickitat	19,301	412,819	$21,388	44	169,524	6,360	$26,655	31
Oregon	Clatsop	35,619	878,501	$24,664	30	415,343	16,462	$25,230	36
	Tillamook	24,477	571,762	$23,359	36	210,304	8,696	$24,184	40
	Lincoln	44,162	1,072,817	$24,293	34	424,292	17,844	$23,778	42
	Lane	324,300	8,419,843	$25,963	25	4,227,811	150,099	$28,167	27
	Douglas	100,309	2,311,002	$23,039	37	1,060,450	39,622	$26,764	30
	Coos	62,374	1,424,226	$22,834	39	569,451	22,366	$25,461	35
	Curry	21,071	519,836	$24,671	29	154,578	6,940	$22,273	44
	Columbia	44,267	1,147,914	$25,932	27	308,356	10,735	$28,724	25
	Multnomah	669,762	22,831,399	$34,089	11	17,622,969	472,626	$37,287	11
	Hood River	20,528	462,060	$22,509	40	248,852	10,494	$23,714	43
	Wasco	23,769	577,671	$24,304	33	265,875	9,683	$27,458	29
	Del Norte	27,367	483,737	$17,676	45	204,647	7,992	$25,606	33

TABLE 8-17a. Coastal Counties Economic Profile: 2001. (Page 2 of 2)

State	County	Population	Personal Income ($,000)	Per Capita Personal Income ($)	Rank	Wages & Salaries ($,000)	Wage & Salary Employment	Average Annual Wage	Rank
California									
	Humboldt	126,591	3,026,604	$23,909	35	1,361,763	53,072	$25,659	32
	Mendocino	86,800	2,252,193	$25,947	26	905,491	35,949	$25,188	37
	Sonoma	466,466	16,172,878	$34,671	10	7,499,243	209,407	$35,812	13
	Marin	248,837	15,697,430	$63,083	1	5,241,032	121,340	$43,193	6
	Napa	127,926	4,744,264	$37,086	7	2,320,881	67,268	$34,502	15
	Solano	405,565	10,881,241	$26,830	23	4,591,746	136,863	$33,550	16
	Contra Costa	978,729	41,098,522	$41,992	5	16,175,738	363,372	$44,516	5
	Alameda	1,475,331	56,974,006	$38,618	6	34,485,200	748,518	$46,071	4
	San Francisco	775,978	43,311,877	$55,816	3	38,416,304	630,154	$60,963	2
	San Mateo	708,710	41,038,760	$57,906	2	24,514,233	396,229	$61,869	1
	Santa Cruz	255,697	9,426,281	$36,865	8	3,833,732	111,000	$34,538	14
	Monterey	409,008	12,229,942	$29,901	16	5,824,801	182,700	$31,882	21
	San Luis Obispo	251,126	7,010,602	$27,917	21	3,046,755	105,685	$28,829	23
	Santa Barbara	401,339	13,540,609	$33,739	13	6,476,417	194,714	$33,261	18
	Ventura	770,285	24,828,184	$32,232	14	11,972,971	320,403	$37,368	10
	Los Angeles	9,677,220	296,232,770	$30,611	15	179,269,456	4,424,333	$40,519	7
	Orange	2,900,200	106,284,489	$36,647	9	60,852,829	1,526,308	$39,869	8
	San Diego	2,869,900	97,240,725	$33,883	12	53,507,978	1,420,849	$37,659	9
	TOTAL	28,586,082	991,695,679	$34,692		575,225,260	14,007,873	$41,064	

Source: U.S. Department of Commerce / Bureau of Economic Analysis / Regional Economic Information System (REIS)

TABLE 8-17b. Coastal Counties Economic Profile: 2001. (Page 1 of 2)

State	County	Dividends, Interest & Rent ($,000)	D.I.&.R. per capita	Rank	Transfer Payments ($,000)	Transfer Payments per capita	Rank	net Residence Adjustment ($,000)	Res. Adj. per capita	Rank
Washington	Whatcom	970,114	$5,684	30	679,149	$3,979	27	42,842	$251	26
	Skagit	695,957	$6,613	20	493,386	$4,688	18	53,395	$507	22
	Snohomish	2,829,326	$4,535	39	2,058,977	$3,300	41	3,958,718	$6,345	6
	King	14,961,952	$8,531	8	6,481,483	$3,695	31	-7,413,977	-$4,227	43
	Pierce	3,285,154	$4,570	38	2,860,860	$3,979	26	2,254,601	$3,136	11
	Thurston	1,110,777	$5,219	36	872,466	$4,099	25	514,280	$2,416	14
	Clallam	540,259	$8,273	11	386,682	$5,921	3	8,204	$126	33
	Jefferson	260,172	$9,830	5	149,161	$5,636	5	76,700	$2,898	12
	Grays Harbor	296,361	$4,343	42	383,310	$5,618	6	16,004	$235	27
	Pacific	116,668	$5,618	33	130,744	$6,296	1	14,706	$708	18
	Wahkiakum	23,808	$6,317	23	20,009	$5,309	11	14,438	$3,831	10
	Cowlitz	404,617	$4,316	43	479,724	$5,117	14	-39,028	-$416	39
	Clark	2,021,252	$5,625	32	1,328,400	$3,697	30	2,060,315	$5,734	8
	Skaminia	44,631	$4,467	40	36,471	$3,650	34	82,443	$8,252	4
	Klickitat	108,962	$5,645	31	102,486	$5,310	10	3,147	$163	31
Oregon	Clatsop	205,219	$5,762	27	158,028	$4,437	19	3,206	$90	34
	Tillamook	153,343	$6,265	24	128,198	$5,237	13	3,252	$133	32
	Lincoln	295,467	$6,691	19	246,222	$5,575	7	-2,714	-$61	35
	Lane	1,975,383	$6,091	25	1,428,727	$4,406	20	53,082	$164	30
	Douglas	522,790	$5,212	37	551,145	$5,494	8	-16,694	-$166	36
	Coos	354,778	$5,688	29	355,443	$5,699	4	17,938	$288	25
	Curry	180,741	$8,578	7	130,570	$6,197	2	10,012	$475	23
	Columbia	193,854	$4,379	41	181,823	$4,107	24	393,134	$8,881	3
	Multnomah	4,528,166	$6,761	18	2,851,081	$4,257	21	-5,298,341	-$7,911	44
	Hood River	118,773	$5,786	26	72,295	$3,522	37	-19,937	-$971	41
	Wasco	136,543	$5,745	28	116,760	$4,912	16	15,241	$641	20

TABLE 8-17b. Coastal Counties Economic Profile: 2001. (Page 2 of 2)

State	County	Dividends, Interest & Rent ($,000)	D.I.&.R. per capita	Rank	Transfer Payments ($,000)	Transfer Payments per capita	Rank	net Residence Adjustment ($,000)	Res. Adj. per capita	Rank
California	Del Norte	90,459	$3,305	45	147,523	$5,391	9	-17,987	-$657	40
	Humboldt	672,509	$5,312	35	647,486	$5,115	15	-41,460	-$328	37
	Mendocino	587,738	$6,771	17	455,472	$5,247	12	15,980	$184	28
	Sonoma	3,900,414	$8,362	10	1,703,132	$3,651	33	1,327,120	$2,845	13
	Marin	4,531,883	$18,212	1	868,723	$3,491	38	3,311,965	$13,310	1
	Napa	1,152,754	$9,011	6	529,143	$4,136	23	218,052	$1,705	15
	Solano	1,611,915	$3,974	44	1,324,642	$3,266	42	2,552,806	$6,294	7
	Contra Costa	8,293,067	$8,473	9	3,610,056	$3,689	32	9,013,445	$9,209	2
	Alameda	9,457,498	$6,410	21	5,770,910	$3,912	28	1,726,178	$1,170	17
	San Francisco	9,065,200	$11,682	3	3,647,078	$4,700	17	-14,618,935	-$18,839	45
	San Mateo	9,428,151	$13,303	2	2,238,066	$3,158	44	952,615	$1,344	16
	Santa Cruz	1,992,530	$7,793	12	844,294	$3,302	40	1,805,743	$7,062	5
	Monterey	2,839,193	$6,942	15	1,366,320	$3,341	39	121,598	$297	24
	San Luis Obispo	1,940,351	$7,727	13	935,292	$3,724	29	151,125	$602	21
	Santa Barbara	4,206,721	$10,482	4	1,415,228	$3,526	36	-145,358	-$362	38
	Ventura	4,874,431	$6,328	22	2,469,328	$3,206	43	3,066,579	$3,981	9
	Los Angeles	53,683,113	$5,547	34	40,382,542	$4,173	22	-18,831,606	-$1,946	42
	Orange	20,321,546	$7,007	14	8,765,149	$3,022	45	2,000,111	$690	19
	San Diego	19,845,857	$6,915	16	10,441,722	$3,638	35	474,703	$165	29
	TOTAL	194,830,397	$6,816		110,245,706	$3,857		-10,112,359	-$354	

Source: U.S. Department of Commerce / Bureau of Economic Analysis / Regional Economic Information System (REIS).

TABLE 8-18. County unemployment rates, 2002. (Page 1 of 1)

State County	Unemployment Rate (2002)	Rank
Washington	7.2%	
Whatcom	6.3%	14
Skagit	7.7%	29
Snohomish	7.7%	28
King	6.5%	16
Pierce	7.5%	26
Thurston	5.8%	12
Clallam	7.5%	25
Jefferson	6.6%	18
Grays Harbor	9.5%	39
Pacific	8.6%	34
Wahkiakum	7.7%	30
Cowlitz	10.8%	43
Clark	9.1%	36
Skaminia	11.3%	44
Klickitat	14.3%	45
Oregon	7.5%	
Clatsop	6.5%	15
Tillamook	6.0%	13
Lincoln	7.7%	27
Lane	6.8%	22
Douglas	8.9%	35
Coos	8.6%	33
Curry	6.7%	19
Columbia	10.4%	41
Multnomah	8.5%	32
Hood River	9.5%	38
Wasco	9.8%	40
California	6.7%	
Del Norte	9.2%	37
Humboldt	6.5%	17
Mendocino	7.2%	23
Sonoma	4.5%	7
Marin	4.0%	2
Napa	4.3%	5
Solano	5.5%	11
Contra Costa	5.2%	9
Alameda	6.8%	21
San Francisco	7.3%	24
San Mateo	5.0%	8
Santa Cruz	8.0%	31
Monterey	10.4%	42
San Luis Obispo	3.4%	1
Santa Barbara	4.2%	4
Ventura	5.5%	10
Los Angeles	6.8%	20
Orange	4.1%	3
San Diego	4.3%	6
National	5.8%	

Source: U.S. Bureau of Labor Statistics.

TABLE 8-19. Thresholds for reference communities. (Page 1 of 1)

	Block Groups	Total Population	Thresholds				
			Nonwhite	Native Am	Hispanic	Av Income	Poverty
North	3,024	3,591,291	29.67%	2.47%	8.07%	$40,622.24	14.73%
Central	3,041	4,537,804	65.93%	0.96%	28.03%	$50,541.69	13.90%
South	5,592	8,320,410	64.97%	1.21%	50.76%	$41,998.59	17.98%

TABLE 8-20. Summary of qualifying communities. (Page 1 of 3)

			% Nonwhite		% Native Am.		% Hispanic		Income		Poverty	
			B	P	B	P	B	P	B	P	B	P
Washington												
	Puget Sound											
		Blaine										░
		Bellingham Bay									▓	░
		Friday Harbor										
		Anacortes			▓							
		La Conner					▓					
		Everett										
		Seattle	▓	░								
		Tacoma	▓	░								
		Olympia										
		Shelton						░		░		░
	North Washington Coast											
		Port Townsend										
		Sequim								░		░
		Port Angeles			▓	░				░		
		Port Angeles E			▓	░						░
		Neah Bay	▓	░	▓	░			▓	░	▓	░
		La Push	▓		▓						▓	
	South & Central WA Coast											
		Copalis Beach							▓	░		░
		Grays Harbor			▓						▓	
		Westport				░			▓	░	▓	░
		Willapa Bay							▓		▓	
		Ilwaco/Chinook						░		░		░
Oregon												
	Astoria											
		Astoria										░
		Gearhart										
		Seaside								░		
		Cannon Beach						░				
	Tillamook											
		Nehalem Bay										
		Tillamook / Garibaldi						░	▓	░		
		Netarts Bay								░		
		Pacific City										
	Newport											
		Salmon River			▓							
		Depoe Bay										
		Siletz Bay			▓	░		░		░		░
		Newport										
		Waldport				░			▓	░		░
		Yachats										
	Coos Bay											
		Florence							▓	░		
		Winchester Bay							▓	░	▓	░
		Coos Bay			▓				▓		▓	░
		Bandon			▓							░

TABLE 8-20. Summary of qualifying communities. (Page 2 of 3)

			% Nonwhite		% Native Am.		% Hispanic		Income		Poverty	
			B	P	B	P	B	P	B	P	B	P
	Brookings											
		Port Orford							■	▒	■	▒
		Gold Beach								▒		
		Brookings			■				■	▒		
California												
	Crescent City											
		Crescent City			■	▒	■	▒	■	▒	■	▒
	Eureka											
		Trinidad			■				■		■	
		Eureka			■	▒				▒	■	▒
	Fort Bragg											
		Fort Bragg					■	▒		▒		▒
		Albion					■					
		Point Arena			■		■					
	Bodega Bay											
		Bodega Bay										
		Tomales Bay										
		Point Reyes				▒						
		Sausalito										
	San Francisco											
		San Francisco										
		Richmond		▒								
		Berkeley									■	▒
		Oakland	■	▒							■	▒
		Alameda										
		Princeton										
	Monterey											
		Santa Cruz			■	▒						
		Moss Landing			■		■	▒				
		Monterey										
	Morro Bay											
		Morro Bay								▒		
		Avila Beach										
	Santa Barbara											
		Santa Barbara										
		Ventura										
		Oxnard					■	▒				
		Port Hueneme			■	▒						
	Los Angeles											
		San Pedro										
		Willmington			■		■				■	
		Long Beach									■	▒
		Terminal Island							■		■	
		Newport Beach										
		Dana Point										
	San Diego											
		Oceanside										
		San Diego										
Totals												
	North		4	3	15	8	5	7	13	20	12	19
	Central		1	2	2	2	1	1	0	1	2	2
	South		0	0	2	1	2	1	1	0	3	1
Grand Total			5	5	19	11	8	9	14	21	17	22

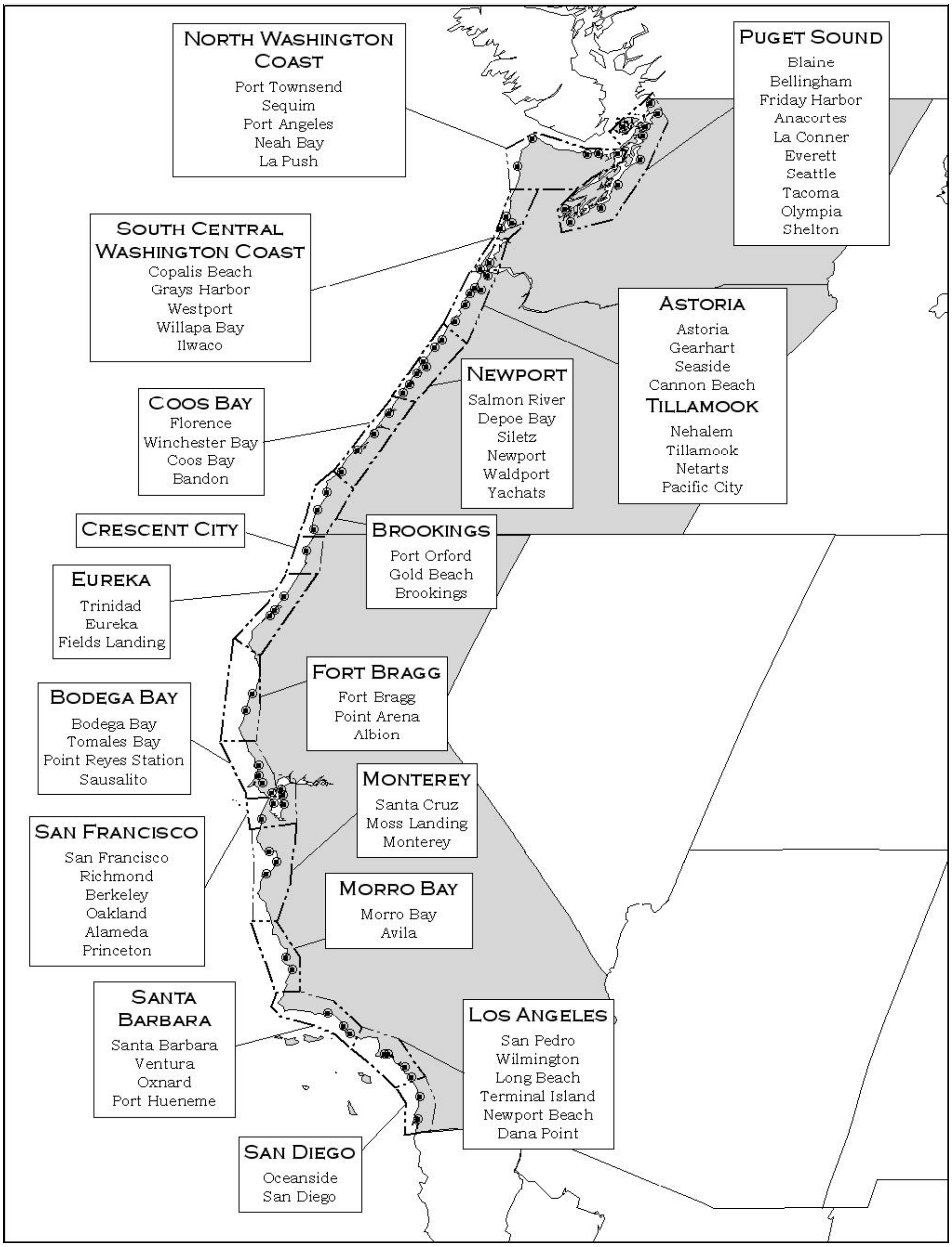

FIGURE 8-1. Port groups and ports.

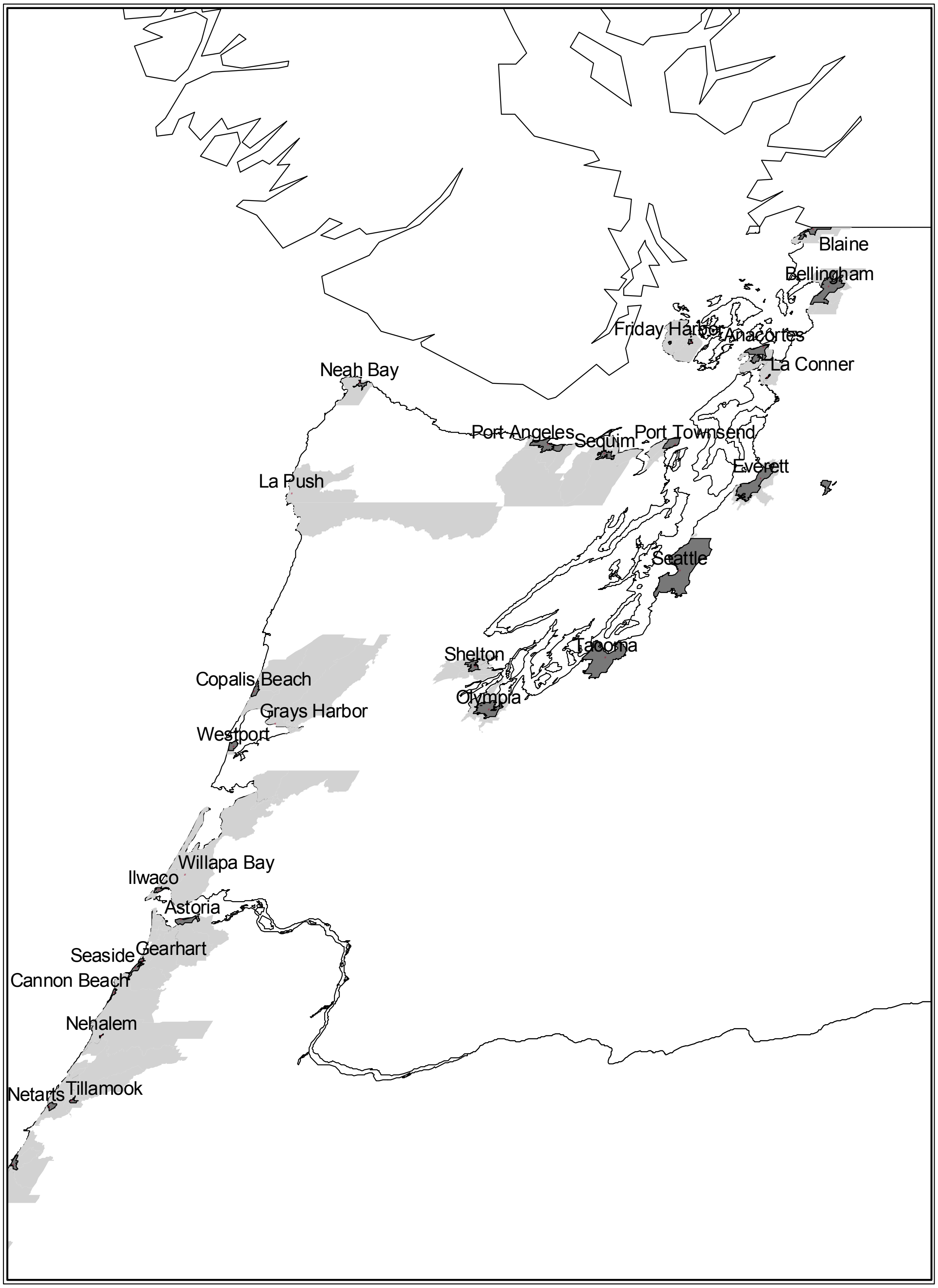

FIGURE 8-2. Census places and block group regions for ports in Washington State.

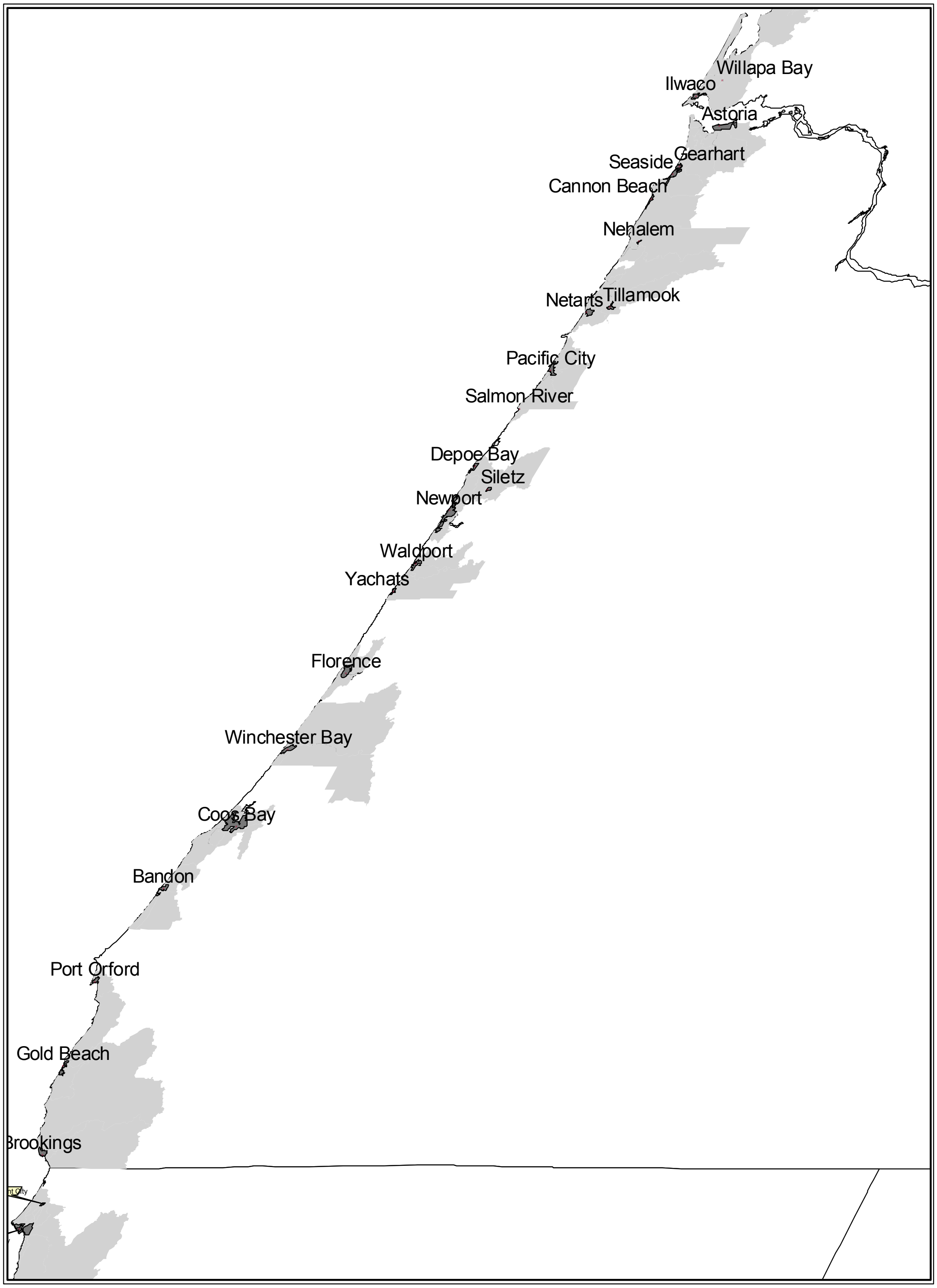

FIGURE 8-3. Census places and block group regions for ports in Oregon.

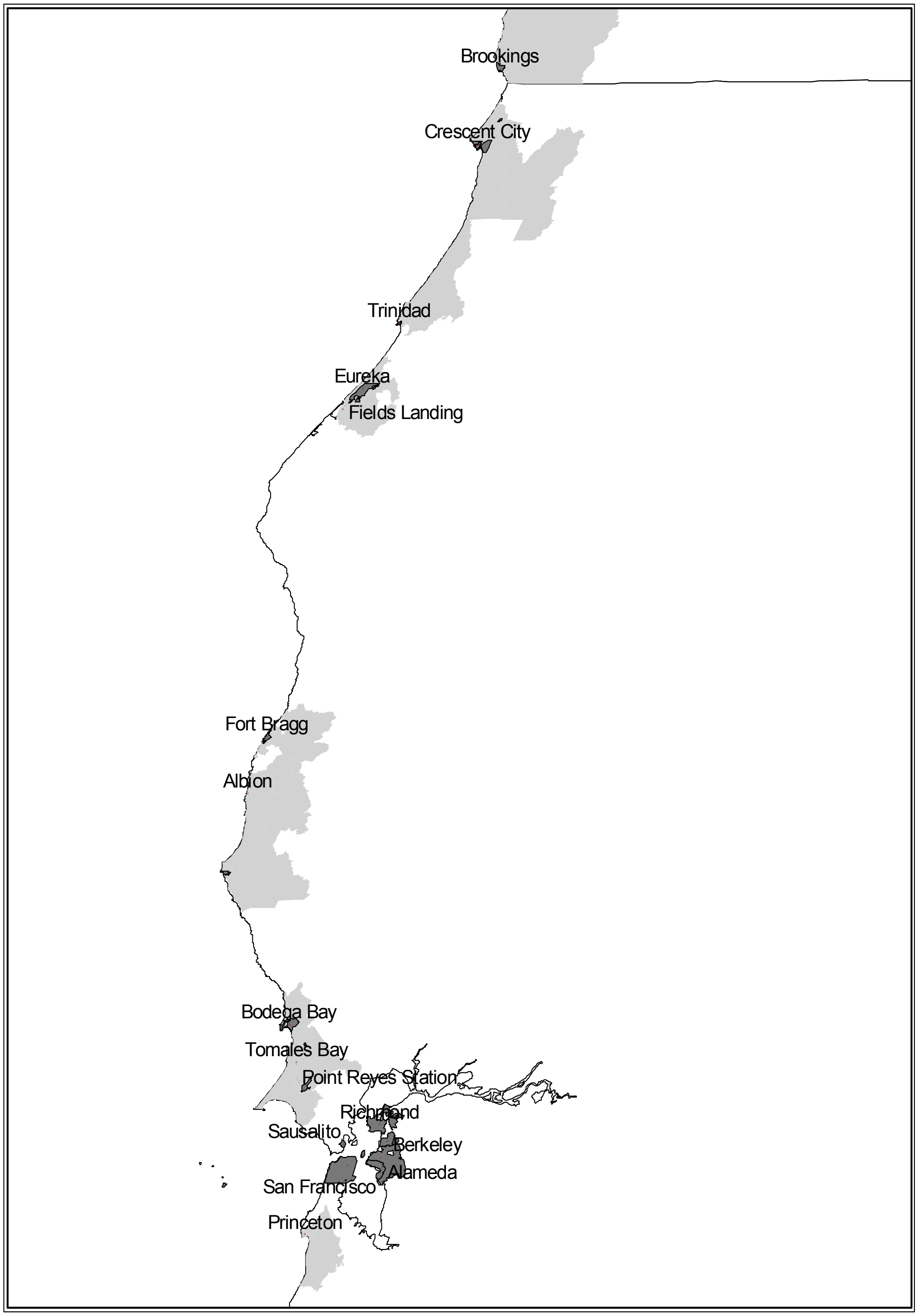

FIGURE 8-4. Census places and block group regions for ports in Northern California.

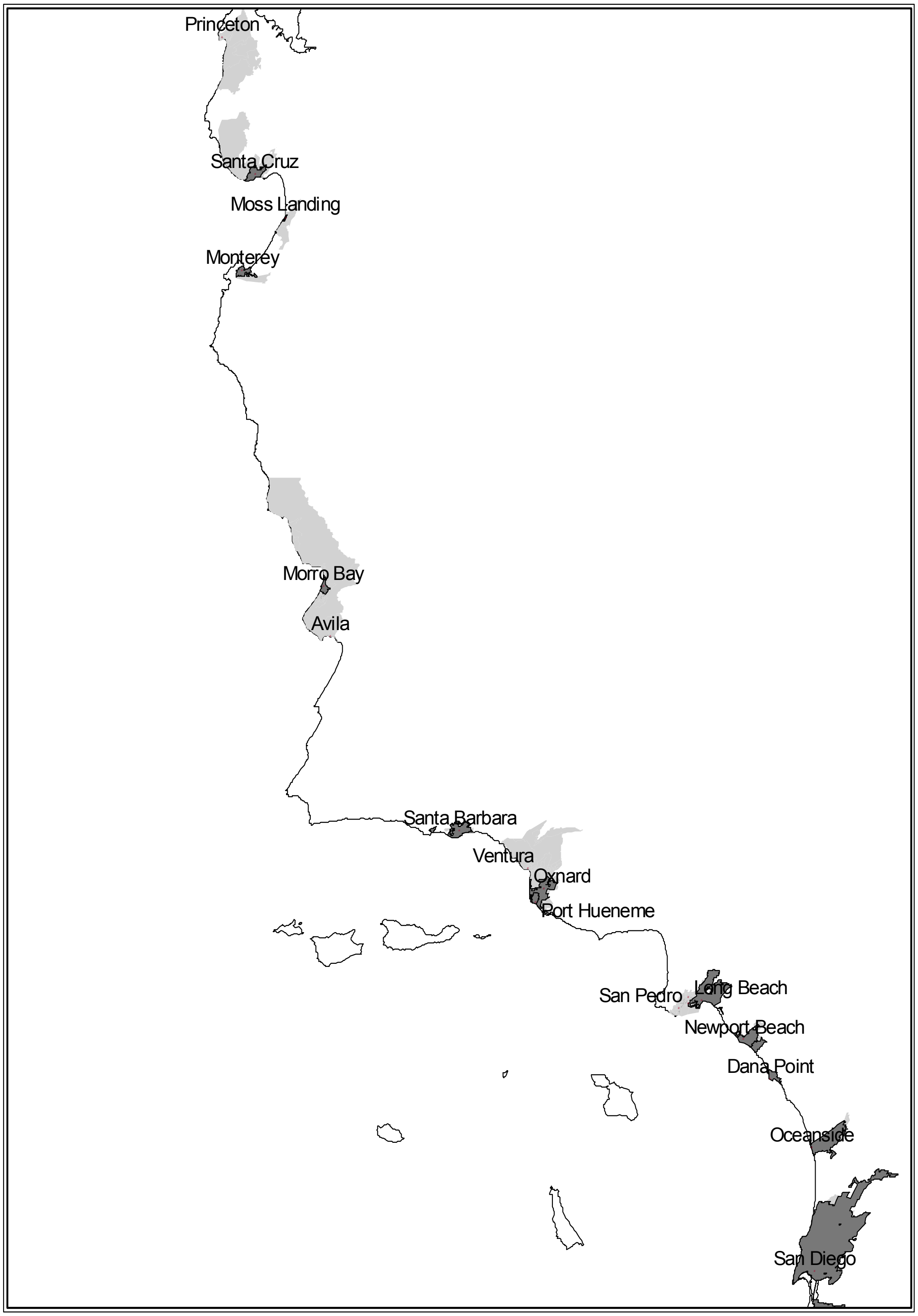

FIGURE 8-5. Census places and block group regions for ports in Southern California.

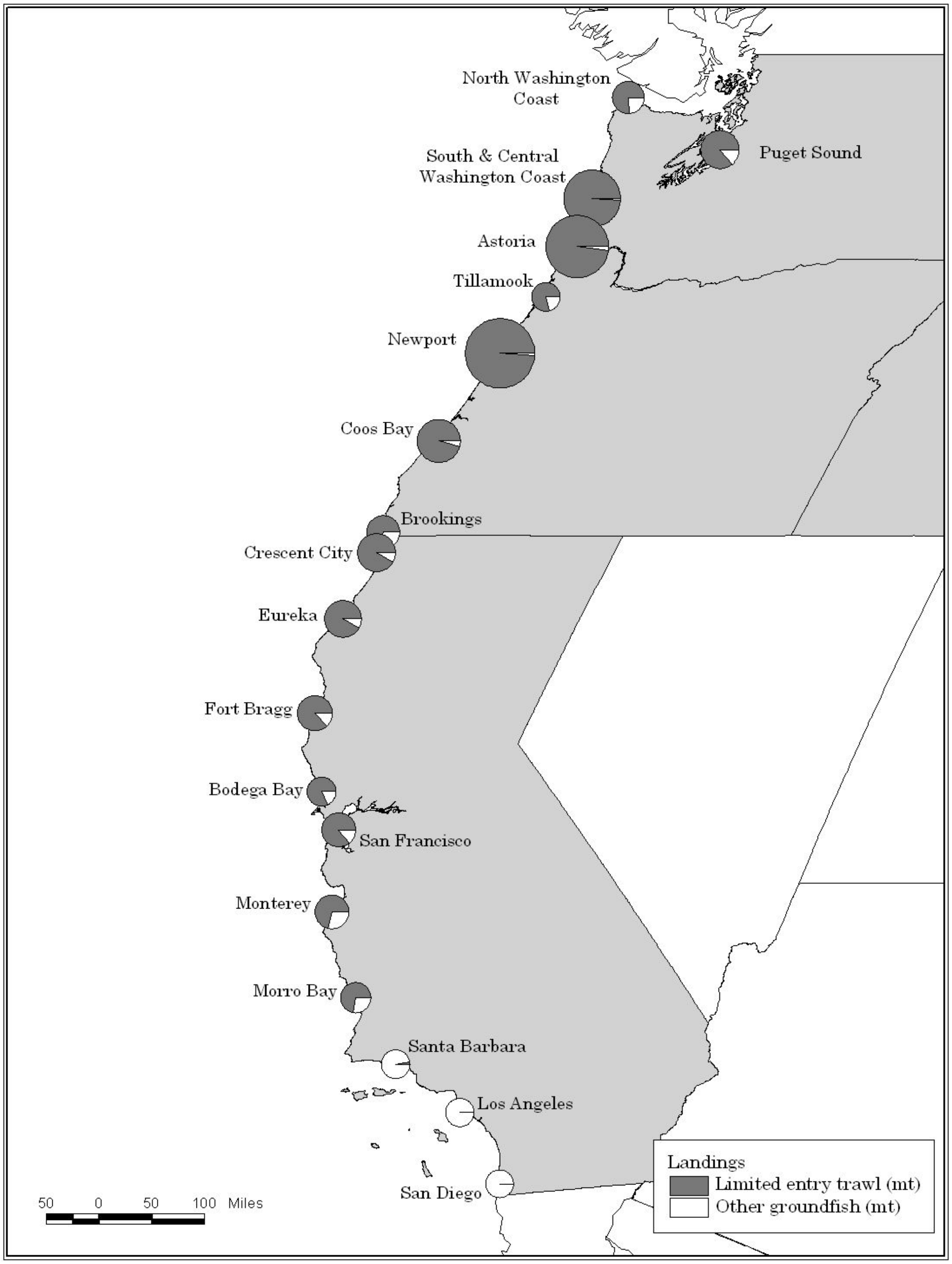

FIGURE 8-6. Distribution of groundfish landings in 2001 by round weight for port groups.

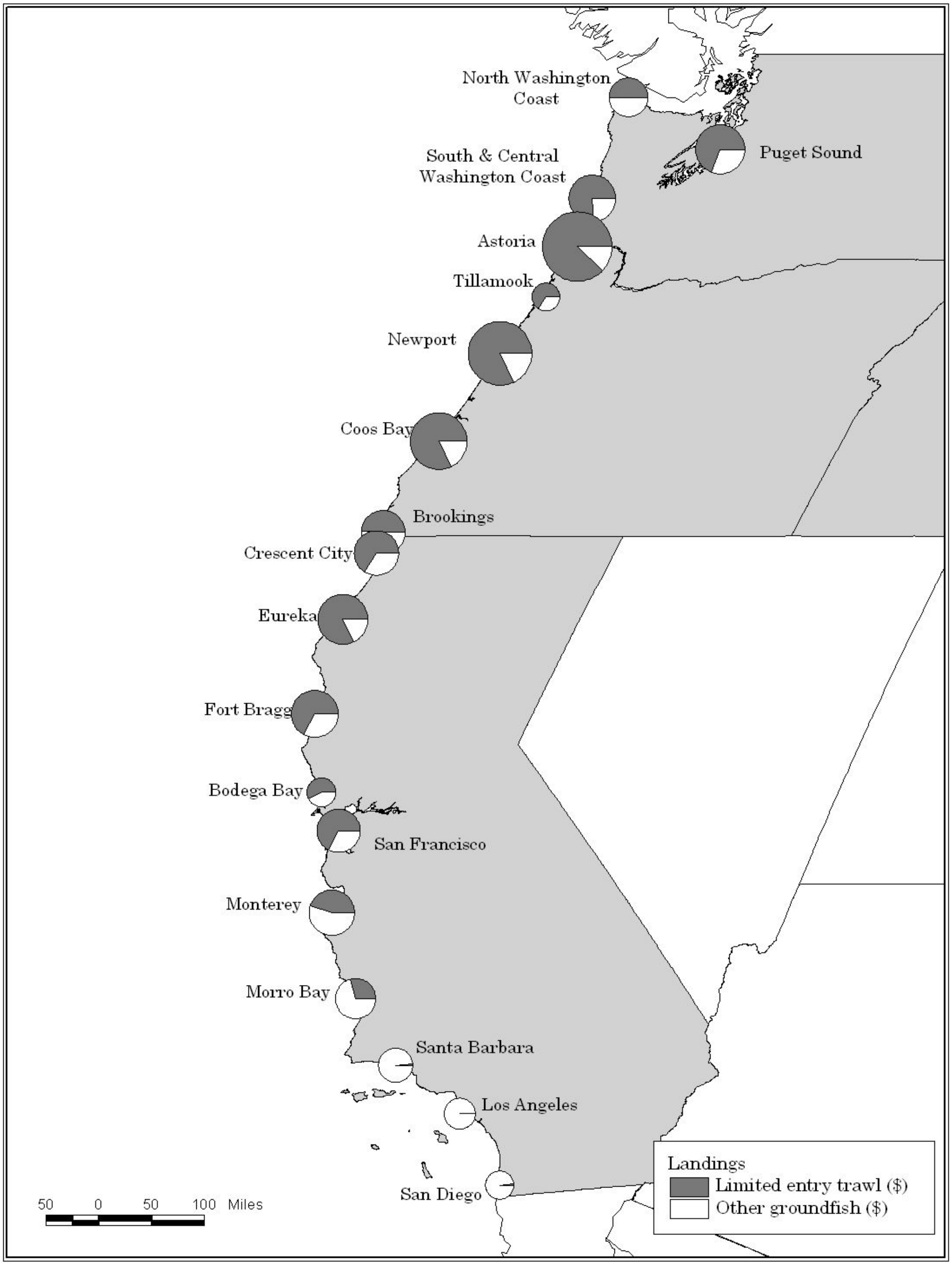

FIGURE 8-7. Distribution of groundfish landings in 2001 by exvessel value for port groups.

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Exhibit C.6.a
Attachment 3
June 2004

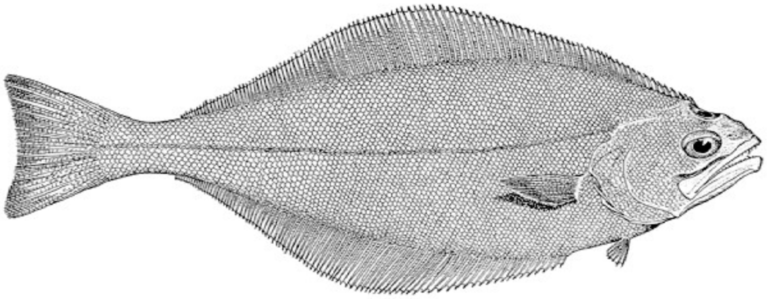
APPENDIX B: Proposed Arrowtooth Flounder - Rockfish Conservation Area (AT-RCA)Trawl Fishing Program

Scoping Document

Washington
Department of
FISH and
WILDLIFE

Proposed Arrowtooth Flounder - Rockfish Conservation Area (AT-RCA) Trawl Fishing Program

Scoping Document



May 2004

Washington Department of Fish and Wildlife
Intergovernmental Resource Management
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TABLE OF CONTENTS

List of Tables

Appendices

Appendix B. Management Costs for Alternative 2 - Budget Summary and Detail 18

WASHINGTON DEPARTMENT OF FISH AND WILDLIFE (WDFW)
PROPOSED
ARROWTOOTH FLOUNDER-ROCKFISH CONSERVATION AREA (AT-RCA)
TRAWL FISHING PROGRAM

SCOPING DOCUMENT

1. BACKGROUND AND PURPOSE

Excluding Pacific whiting, the West Coast groundfish fishery stocks and harvests have been declining since the early 1990s. Since 1993, due to the increasingly severe harvest restrictions, landings of groundfish have fallen. Most of the decline has occurred in recent years with current levels of harvest being less than half of the harvests achieved in 1993. Over the last two decades, an unusually low level of recruitment into the fishery has occurred for many groundfish species.

Changes in the oceanic regime and an abnormally high number of El Nino events are likely to have contributed to the decline in the recruitment of several important long-lived rockfish species. These causes have exacerbated the difficulties in setting harvest quotas that attempted to counteract the decline in these stocks. This has a primary effect on the fishers and their crews, and secondary effects on port communities and fishery-related businesses, such as fish processors. The complex dynamics of managing the groundfish fisheries is further affected by the fact that recovery of these long-lived species will range from 10 years at the minimum to in excess of 50 years.

In recent years, the Pacific Fishery Management Council has been presented with new scientific information which suggests that productivity of West Coast groundfish is unusually low. As a result, more restrictive management measures have been adopted since 1998. During the 1983-1999 period, coastwide non-whiting landings have decreased 65 percent from 107,000 metric tons to 38,000 metric tons. In terms of revenue for the same period, non-whiting revenues have declined by 54 percent from $99.9 million to $46 million. The decline in abundance has been particularly severe for rockfish and flatfishes which account for about half of the non-whiting revenue.

Since 1998, the Pacific Council has initiated rebuilding plans for nine overfished groundfish species. Critical to these rebuilding plans and to the overall improvement of groundfish management is the need for more and better scientific data. There are 82 species covered under the West Coast Groundfish Fishery Management Plan, and at present, there is little or no data on a large number of these species. There is a need for comprehensive, timely and credible data for priority species to aid in the conservation and rebuilding efforts for these stocks.

In January 2000, the Secretary of Commerce declared a commercial fishery failure in the Pacific Coast groundfish fishery. In response to the request for disaster assistance, Congress appropriated $5 million in federal assistance to the affected states. Washington State received $1.5 million of the total appropriation, and a portion of those Disaster Relief funds ($300K) went to WDFW to implement its At-Sea Data Collection Program.

The AT-RCA program has been conducted under an Exempted Fishing Permit (EFP) for four years, as part of the WDFW At-Sea Data Collection Program. This project was initiated in 2001 to allow fishers access to healthier groundfish stocks while meeting the rebuilding targets of overfished stocks, and to collect bycatch data through an at-sea observer program. It was understood that the data collected in these programs would assist with future fishery management by producing valuable and accurate data on the amount, location and species composition of the bycatch of rockfish associated with these fisheries, rather than using calculated bycatch assumptions. It was also thought that these data would allow the Pacific Council to establish trip limits in the future that maximize fishing opportunities on healthy stocks while meeting conservation goals for depleted stocks.

Pacific Coast groundfish are managed by the Pacific Fishery Management Council under a federal fishery management plan (FMP). The management goals of the FMP are to:

1. Prevent overfishing by managing for appropriate harvest levels and prevent any net loss of the habitat of living marine resources.

2. Maximize the value of the groundfish resource as a whole.

3. Achieve the maximum biological yield of the overall groundfish fishery, promote year-round availability of quality seafood to the consumer, and promote recreational fishing opportunities.

In 2000, the Council adopted a Groundfish Fishery Strategic Plan. Strategic plan goals include:

- To adopt understandable, enforceable, and stable regulations that, to the greatest extent possible, meet the FMP's goals and objectives and the requirements of the Magnuson-Stevens Act.

- To establish an allowable level of catch that prevents overfishing while achieving optimum yield based on best available science.

- To quantify the amount and species of fish caught by the various gears in the groundfish fishery and account for total fishery-related removals.

The Groundfish Strategic Plan suggests that observer coverage be prioritized, perhaps focusing on collecting total mortality data for overfished groundfish stocks. As a secondary priority, the plan also states that an observer program should supplement the collection of data for stock assessments. Both of these objectives, along with the goals outlined above, are addressed with the proposed AT-RCA program.

The purpose of the AT-RCA program is to assist the Pacific Fishery Management Council in achieving the goals of the FMP by collecting bycatch data on overfished stocks (e.g., canary rockfish) to allow for informed management decisions, while maximizing safe harvest levels of healthier stocks (e.g., arrowtooth flounder).

Specifically, the objectives of the AT-RCA program are to:

- Use data collected from previous fisheries conducted under Exempted Fishing Permits to provide trawl fishers limited access to the federal trawl rockfish conservation area to target arrowtooth flounder.
- Continue to measure bycatch rates for canary and other rockfish associated with the arrowtooth flounder fishery through an at-sea observer program.
- Require the retention of all rockfish to acquire biological (age and sex) data for stock assessments through state shoreside sampling programs.
- Collect data that could be used to augment the National Marine Fisheries Service (NMFS) groundfish observer program.
- Encourage innovative ideas to develop and test selective gears.

While the AT-RCA program has been implemented through an EFP, NMFS has provided strong guidance that EFPs should have a termination date, and should not be used solely for the economic benefit of the participants. Again, from the initiation of the EFP, NMFS and the Council stressed the importance of using the data collected in these programs on a broader scale to assist with future fishery management. There was also support to apply these data to establish trip limits in the future that maximize fishing opportunities on healthy stocks while meeting conservation goals for depleted stocks.

The requirements of the AT-RCA program have been refined over time; in 2001 and 2002, the program primarily focused on the use of state-sponsored monitors onboard vessels to monitor bycatch, and collect discard data and biological samples. Beginning in 2003, WDFW required participating fishers to use an excluder device in an effort to minimize rockfish bycatch. There were no specific parameters identified; participating fishers were allowed to experiment with different excluder types. All of the participants used one of three types of excluders–these are defined and required as part of the 2004 EFP, and as part of the proposed AT-RCA program. Also for 2004, the participants will not have full access to the trawl rockfish conservation area (RCA), but are required to avoid areas of higher rockfish bycatch within the RCA. These closed areas have been defined through results from the first three years of the EFP, and are part of the provisions of the proposed AT-RCA program.

As the EFP has been refined over time, with more requirements each year, the participating fishers have been adamant in their belief that the majority of the bycatch reduction is a result of having an onboard monitor and hard bycatch caps for overfished rockfish, primarily canary. The presence on an onboard observer or state-sponsored monitor has caused the fishers to change their fishing behavior. They are actively avoiding areas with higher bycatch rates, experimenting with gear modifications to exclude rockfish, and taking a more precautionary approach to fishing practices in general, in order to stay within their bycatch caps while maximizing targeted catch.

WDFW believes that the AT-RCA program has been a success as an EFP and the data collected has been extremely valuable. Aside from the bycatch and biological data, the EFP has demonstrated that certain management tools, such as an at-sea monitoring program, bycatch caps for overfished rockfish, and mandatory rockfish retention, can be successfully implemented and also supported by fishers by providing economic incentives.

Since this management approach has been successfully demonstrated and refined over the four years of the program, there is little value in continuing the AT-RCA program as an EFP and much to be gained by moving the program into federal regulations. Because the EFP has been funded with state Disaster Relief monies, participation in the EFP has been limited to Washington-licensed trawl fishers; having the program defined in federal regulations would provide the opportunity to participate in the AT-RCA program to all West Coast trawl fishers.

2. ALTERNATIVES

Alternative 1. No action alternative (status quo). This alternative reflects no special provision for a conservation area approach to provide targeted trawl fishing opportunity for arrowtooth flounder, either through an EFP or federal regulations. Under this alternative, the EFP would be discontinued and arrowtooth fishers and processors would have to harvest and fill markets with arrowtooth that may be available outside the trawl RCA. It would result in no changes in management costs and no increase in costs for trawl fishers. For those participants in the Washington arrowtooth flounder EFP, there would be significant reductions in revenue. There would also be significant impacts to the facilities that process arrowtooth flounder and to their communities as a result of discontinuing the EFP. The vessels that fished under the EFP would likely fish seaward of the trawl RCA to access higher large footrope limits. As a result, there could be changes in fishing mortality of targeted stocks (arrowtooth flounder and petrale sole), bycatch of overfished rockfish and non-rockfish species, EFH impacts as a result of changing areas fished, and enforcement costs. The expected impacts of this alternative are compared with the expected impacts of Alternative 2 in the analysis of Alternative 2 below.

Alternative 2. Implement the provisions of the previous Washington Arrowtooth Flounder EFP into federal regulations. This alternative would integrate all of the provisions of the Washington arrowtooth flounder EFP into regulations pertaining to limited entry trawl permitted vessels fishing for groundfish within the EEZ. Specifically, this option would allow trawl fishers to access portions of the trawl RCA north of Destruction Island, WA, and have higher limits for arrowtooth flounder and petrale sole for the May-August time period. The provisions of this alternative include: implementation of a full rockfish retention program; 100% observer coverage (either by a state-sponsored monitor or a federal observer); fully funded by the permit holder; bycatch caps for overfished stocks; rockfish excluder requirements; and VMS declaration requirements. A full description of the regulatory provisions for this alternative are contained in Appendix A.

3. ANALYSIS

Management Costs - There is expected to be an increase in management costs as a result of modifying the VMS declaration system and administering the state-sponsored monitoring programs. The intent of this regulation would be to add a declaration code to the existing NMFS VMS declaration system. Fishers who would like to participate in the program would need to declare, through the VMS declaration system, on or before February 15 of each calendar year (i.e., must declare by February 15, 2005, in order to participate in May-August 2005). The estimated cost of adding the declaration code to the NMFS VMS declaration system is a one-time cost of $15,000.

Following receipt of the declaration notice, NMFS staff would provide Groundfish Management Team representatives with the list of participants. State agency representatives would then be responsible for contacting the vessel owners within their respective states, and securing contracts with those individuals for the program. The key elements of this contract include: the provisions of the AT-RCA program (observer coverage, bycatch caps, rockfish retention, area closures, and gear requirements), a payment schedule for the state-sponsored monitoring program, and a designated processing facility (to be completed by the vessel owner). The costs associated with this administrative task will vary, depending on the amount of vessels that declare and, subsequently, the number of contracts that will need to be prepared and issued; however, the estimated cost of this activity is expected to be minimal (< $200 per year).

Once the contracts have been secured with the participating vessels, the state agencies will meet with the representatives from the designated processing facilities that have been specified in the state/vessel contract, to review the provisions of the program as well as secure contracts with them. The key elements of this contract include: Provisions to comply with the rockfish retention provision--processing facilities receiving the fish will need to record the rockfish above trip limits, but required to be retained under this program, on a separate fish ticket–and the requirement to forfeit the value of those rockfish above limits to the state. The costs associated with this administrative task will vary, depending on the amount of processing facilities involved. The initial (first-year) estimated cost of this activity is expected to be about $500; however, this cost should be reduced in subsequent years (< $200 per year).

After the contracts are in place, the state agencies will follow their respective procedures for hiring temporary personnel as state-sponsored monitors. Once staff have been hired, additional time will need to be spent training the at-sea monitors consistent with the NMFS Observer Training Manual. Training activities will need to include: safety training; sampling methodology; rockfish and flatfish identification; equipment training; and familiarity with the provisions of the program (estimated training time is about ten days). The task of hiring and training the state-sponsored monitors is estimated to be about $3,000 per year.

Beyond training, there will be additional costs associated with supervising the monitors and overseeing the program. To the extent that these tasks can be absorbed with existing staff resources, these administrative costs for the duration of the four-month program are estimated to be about $5,000. If additional supervisory staff needs to be hired, the projected costs would be increased to about $12,000. The budget detail for the management cost estimates are contained in Appendix B.

Participant Costs and Revenue

Under Alternative 2, the participating permit holders would be liable for reimbursing the respective state agencies for the costs associated with the state-sponsored monitoring program. The estimated costs for the monitoring program will vary by state, but is estimated to be about $4,000 to $4,500 per month, or $16,000 to $18,000 for the full four-month program. Table 1. describes the average ex-vessel revenue above trip limits for the vessels participating in the Washington arrowtooth flounder EFP in 2002 and 2003. The reason the ex-vessel revenue increased in 2003 is a combination of an increase in effort (one significant vessel only participated for two months in 2002) and a decrease in trip limits for arrowtooth flounder and petrale sole in 2003 (small footrope limits).

Table 1. Average ex-vessel revenue above trip limits for the 2002 and 2003 Washington arrowtooth flounder EFPs.

	Arrowtooth	**Petrale**	**Total**
2002	$36,951	$6,881	$43,832
2003	$42,843	$45,268	$88,111

The trip limits which were in place for May-August for 2002 and 2003, and planned for 2004, are contained in Table 2. Table 3. uses the Fisheries Economic Assessment Model (FEAM) to project the impacts at the processor, vessel, local, and state levels for the value above trip limits in the 2002 and 2003 Washington arrowtooth flounder EFPs.

Table 2. Limited entry trawl trip limits for May-August north of 40°10'N latitude, 2002-2004.

	2002		**2003**		**2004**	
			Per 2 months		Per 2 months	
	Per trip	**Per mo.**	**Lg Foot**	**Sm Foot**	**Lg Foot**	**Sm Foot**
Arrowtooth	7,500	30,000	200,000	5,000	150,000	6,000
Petrale		15,000	30,000	10,000	100,000	25,000

Table 3. Projected impacts using FEAM model for the value above trip limits in the Washington arrowtooth flounder EFP in 2002 and 2003.

	2002			**2003**		
	Arrowtooth	**Petrale**	**Total**	**Arrowtooth**	**Petrale**	**Total**
Processor Impact	$687,287	$11,636	$698,922	$796,875	$76,544	$873,419
Vessel Impact	$368,918	$68,702	$437,620	$427,742	$451,954	$879,696
Total Impact	$1,056,205	$80,338	$1,136,542	$1,224,616	$528,497	$1,753,115
At Local Level	$940,022	$71,501	$1,011,523	$1,089,909	$470,363	$1,560,272
At State Level	$1,160,521	$88,272	$1,248,793	$1,345,566	$580,695	$1,926,261

There are many factors to consider in projecting vessel revenue for participants fishing under this program, including individual effort, individual costs, market limits, and knowledge of the fishery. However, using the average revenue derived from the Washington EFPs, the amount of revenue generated from having access to the trawl RCA and higher trip limits for arrowtooth and petrale outweighs the costs of the state-sponsored monitoring program. Average revenue in 2003 of $88,000 vs. estimated monitoring costs of $18,000 for a net gain of $70,000 (before costs for crew, fuel, ice, etc. are deducted).

Fishing Mortality of Targeted Stocks

Arrowtooth flounder move onto the shelf during the summer months (May-August) (Rickey 1995), so, under Alternative 1, it is unlikely that fishers using large footrope gear and fishing seaward of the trawl RCA during these months would fulfill the large footrope limits for arrowtooth flounder (200,000 lbs/2 mo. in 2003). Further, with the increase in size of the RCA in 2004 (moving from 100 fms to 60 fms for May-June, and from 100 fms to 75 fms in July-August), fishers using small footrope gear may also have difficulty achieving the small footrope limits shoreward of the RCA. Therefore, if Alternative 2 is adopted, there would be an expected increase in the fishing mortality of targeted stocks (arrowtooth flounder and petrale sole) as part of this program. However, this increased mortality probably would be similar to that experienced under the EFP given the average vessel landings of arrowtooth and petrale (within 93% for arrowtooth and 100% for petrale) that occurred with the 2003 limits for large footrope gear (Table 4.). To the extent that the projected catches of targeted stocks modeled preseason assumed that the large footrope limits would be achieved by some vessels, there may not be an increase in fishing mortality of targeted stocks beyond what was projected.

Table 4. Total and average vessel landings of targeted stocks above trip limits in the Washington arrowtooth flounder EFP in 2002 and 2003.

	2002		**2003**	
	Total	**Per Mo.**	**Total**	**Per Mo.**
Arrowtooth	369,509	92,377	428,427	107,107
Petrale	6,256	1,564	41,153	10,288

Community Impacts

There are two processing facilities that consistently participated in the Washington arrowtooth flounder EFP located in Bellingham and Blaine, Washington. Landings of arrowtooth flounder and petrale sole from non-EFP participating vessels to these facilities during the EFP period are minimal. As noted above, successfully catching arrowtooth flounder to fill available markets in the May-August period is likely dependent upon accessing the trawl RCA. If product were not available for these processing facilities to buy, significant reductions in employment and/or plant closures would result.

Bycatch

There is expected to be a full accounting of bycatch of rockfish (*Sebastes and Sebastelobus*) under this program with the 100% observer coverage and full rockfish retention requirements.

Estimates of bycatch of prohibited species will also be collected; however, estimates of non-rockfish bycatch (e.g., flatfish, lingcod) will not be collected. Under the definition of bycatch in the Magnuson-Stevens Act (i.e., discarded fish), rockfish bycatch will be reduced to zero. It is also significant to note that over the first three years of the program, less than one percent (by weight) of the rockfish that were required to be retained were unmarketable. Further, the full rockfish retention provisions of the program were strongly supported by participating processors and fishers. To the extent that rocky areas within the RCA would remain closed, and participating fishers will avoid areas of higher rockfish bycatch, this could likely result in a decrease of rockfish bycatch mortality. It is difficult to project how this program would affect bycatch of non-rockfish species because if Alternative 2 is not adopted, then most of the fishers would likely be fishing seaward of the RCA to access the higher large footrope limits; therefore, the amount of bycatch of non-rockfish species may not change. The species caught and discarded may vary, however, with higher amounts of flatfish within the RCA vs. higher amounts of Dover sole, shortspine and longspine thornyheads, and sablefish seaward of the RCA.

Enforcement

It is difficult to assess the impact to enforcement costs under Alternative 2. Fishers participating in the AT-RCA program would be shifting from the limited entry groundfish trawl fishery which would not represent an increase in overall fishing effort. There could be costs associated with an increase in the number of fishers that can access the trawl RCA. However, with 100% observer coverage under this program, and declaration requirements under the VMS system, enforcement costs might be reduced since landings of arrowtooth flounder and petrale would not need to be tracked against limits under Alternative 2.

Protected Species Interactions

There is not expected to be any increase in protected species interactions as a result of this action.

EFH Impacts

Because the proposed program is area-specific within the RCA and high rocky relief areas favored by rockfish will remain closed, this proposal is not expected to increase impacts to EFH for rockfish. Flat, muddy areas favored by flatfish, however, will be open to fishing and there may be an increase in impacts to those areas.

Data Requirements

There are no additional data requirements beyond what is currently required under state and federal law. Logbooks as required by state regulations must be maintained by the vessel operator, and trips taken under the program must be noted on the logbook sheets.

4. ALTERNATIVES CONSIDERED AND ELIMINATED

An alternative that implemented all of the provisions of Alternative 2 except for the 100% observer coverage requirement was considered. This option was eliminated because the participants in the Washington arrowtooth flounder EFP indicated that the program worked because of the observer coverage requirement. The state-sponsored monitors onboard the vessels helped ensure compliance with the bycatch caps. Having the monitors onboard resulted in positive changes in fishing behavior–skippers avoided known areas of higher abundances of rockfish, canary, in particular. Skippers also changed other fishing practices, such as experimenting with rockfish excluder devices, shortening tow time, and fishing in areas and during times of the day when canary rockfish are less available, in an effort to reduce rockfish catches. Requiring 100% observer coverage for this program, coupled with a hard bycatch cap for overfished rockfish species, helps ensure that vessels fishing in areas which are closed for rockfish conservation (RCA) do not exceed their projected rockfish catches, which could affect other West Coast fisheries that harvest groundfish. Further, data are not available to analyze what the projected impacts to overfished rockfish would be in the absence of observer coverage and bycatch caps as these provisions were required under the EFP and fishery independent data have not been collected.

5. REFERENCES CITED

Rickey, Martha H. 1995. Maturity, spawning, and seasonal movement of arrowtooth flounder, *Atheresthes stomias*, off Washington. Fishery Bulletin 93:127-138.

REGULATORY PROVISIONS FOR ALTERNATIVE 2.

1. FISHING PERIODS

A. The fishing activities described below would be permitted during the months of May, June, July, and August of each year.

2. REPORTING REQUIREMENTS

A. The operator of any vessel registered to a limited entry permit with a trawl endorsement must provide NMFS with a declaration report, as specified below, to identify the intent to fish within the trawl conservation area north of Destruction Island, as defined in the Federal Register.

B. Declaration reports will be submitted to NMFS through the current VMS declaration system.

C. Declaration reports must be received by February 15th of the year when fishing in the conservation area will occur. (For example, to fish for arrowtooth in the trawl conservation area in May 2005, a declaration report must be received by February 15, 2005.)

3. FISHING RESTRICTIONS

A. Discards

1. All fish caught during a tow under the AT-RCA program must be brought onboard the vessel.

2. All rockfish brought on board the vessel while fishing under the AT-RCA program must be retained onboard the fishing vessel and delivered to a designated processor.

B. Groundfish trip limits

1. The targeted species, arrowtooth flounder, is not subject to a monthly trip limit, but is constrained by the incidental catch of canary rockfish which will be applied as follows:

   a. Up to 250 lbs per month of canary rockfish may be landed per vessel in tows conducted under the AT-RCA program, which includes all tows within the federal trawl conservation area. If the vessel has already reached the current small footrope monthly limits for arrowtooth flounder and petrale sole as published in the Federal Register when the 250 lbs of canary rockfish are caught, the vessel cannot prosecute any additional targeted arrowtooth tows for the remainder of the month and cannot retain any additional arrowtooth flounder or petrale sole.

b. If a vessel has **not** already reached the current small footrope monthly limit for arrowtooth flounder as published in the Federal Register when the 250 lbs of canary rockfish are caught, the vessel may target arrowtooth flounder, and/or retain arrowtooth flounder until the small footrope monthly limit is reached. If the vessel has not already reached the current small footrope monthly limit for petrale sole as published in the Federal Register when the 250 lbs of canary rockfish are caught, the vessel may continue to retain petrale sole until the small footrope monthly limit is reached.

c. Once the monthly canary rockfish cap has been reached, the vessel cannot fish within the trawl RCA for the remainder of the calendar month.

d. An individual bycatch cap of 1,000 lbs. of canary rockfish will also apply to each vessel. Once this cap has been reached by an individual vessel in AT-RCA permitted tows, the vessel will not be allowed to continue to fish under the AT-RCA program.

e. All tows conducted within the federal trawl conservation area are considered AT-RCA permitted tows.

f. Petrale sole caught in a directed arrowtooth tow would not be subject to a monthly limit.Current groundfish trip limits for species other than arrowtooth flounder and petrale sole will apply to vessels operating under this program except that retention of rockfish over the limits will not be in violation of 50 CFR 660.323, so long as such overages are surrendered to the state in which the fish were landed.

g. No directed "arrowtooth flounder" tows may be made south of Destruction Island (47°40'30" N. lat.).

h. Specific descriptions of the designated areas within the trawl conservation area that would be open to fishing activities under the AT-RCA program are described in Attachment 1.

4. LANDINGS

A. The AT-RCA program is valid only for landings made a processing plants that have been specifically designated by the state. To ensure that the purposes of the AT-RCA program are implemented, the state is required to have a written agreement, signed by a representative of a processing plant, before that processing plant is accepted as a "designated processor." The state will provide instructions to each participating processing plant specifying the plant's role and responsibilities in relation to this program, including the process for forfeiting overages to the state.

B. The state must require that all fish caught during an AT-RCA permitted fishing trip, with the exception of spiny dogfish (*Squalus acanthias*) be offloaded at only one designated processing plant (i.e., the offloading of catch from one trip cannot be split between processing plants). Once offloading has commenced at a designated processing plant, all fish, except spiny dogfish, onboard the AT-RCA permitted vessel must be offloaded at that plant. Spiny dogfish may be offloaded at another designated plant, providing all of those taken during an individual fishing trip are offloaded at that plant.

5. GEAR RESTRICTIONS

A. The AT-RCA program is valid only for fishing with legal trawl gear, as currently defined in federal regulations.

B. While fishing under the AT-RCA program, an approved rockfish excluder must be used. Approved rockfish excluders are:

1. Diamond Opening - A diamond-shaped opening cut into the top of the body of the net with the rear of the opening 15 meshes forward of the point where the body of the net connects to the intermediate. Each leg of the diamond must be at least 36 inches in length and cut on the bar.

2. Triangle Opening - A triangle-shaped opening cut into the top of the body of the net with the point of the triangle toward the opening of the net and the base of the triangle 15 meshes forward of the point where the body of the net connects to the intermediate. The sides of the triangle must be at least 48 inches in length and cut on the bar. The base of the triangle must be at least 36 inches in length.

3. Large Mesh - Large mesh in the top of the net immediately behind the headrope consisting of meshes at least 10 inches in diameter (between the knots) . This large-mesh panel must be at least the equivalent of 15 meshes of 10-inch mesh (150 inches). This would include, for example, an opening at least 150 inches in length using only jib lines to connect the headrope to the body of the net.

C. Additionally, the fishing circle (widest circumference) of any net used under the AT-RCA program shall be limited to 450 meshes of 5 ½-inch mesh (between the knots), or the equivalent diameter if a different mesh size is used at the widest circumference of the net (for example, 354 meshes of 7-inch mesh).

D. Vessels fishing under the AT-RCA program would be allowed to have more than one type of legal trawl gear onboard the vessel; however large footrope trawl gear can only be used for directed arrowtooth tows on the continental slope where the depth, throughout the tow, is greater than 120 fathoms.

6. DATA REQUIREMENTS

A. Trawl Logs. Trawl logbooks as required by state law must be maintained by the vessel operator. "AT-RCA" shall be written on the log for each trip conducted under the AT-RCA program.

1. Estimated pounds of all retained species caught in each tow must be recorded in the logbooks.
2. Before setting the gear the vessel operators must record the intended target species in the logbook.

B. Other Reports. This program does not relieve the vessel operator from any other state or federal reporting requirements.

7. OBSERVER REQUIREMENTS

A. All vessels fishing under the AT-RCA program must carry a state-sponsored observer or a federal observer the state has agreed to use as a substitute to monitor fishing strategies and bycatch caps, collect data to estimate catch and incidental catch, and observe the retention of all rockfish. Necessary arrangements will be made by the state to ensure that an on board observer is carried on all AT-RCA program trips.

B. State-sponsored observers will remain onboard all of the vessel's trips for the two-month cumulative period in which AT-RCA program fishing occurs (even those trips not targeting arrowtooth flounder).

C. Vessels carrying observers under the AT-RCA program must abide by groundfish observer regulations at 50 CFR 660.360 (d) & (j).

D. All state-sponsored observers carried by vessels fishing under the AT-RCA program must have successfully completed an observer training course that prepares them for collecting data that is compatible with sampling protocols defined in the NMFS Pacific Coast groundfish observer manual.

E. NMFS Observer coverage requirements at 50 CFR 660.360 are independent of AT-RCA program observer requirements. Vessels that carry a state-sponsored observer may also be required to carry a NMFS observer. A state observer is not a substitute for a NMFS observer and a vessel carrying a state observer is not exempt from federal observer requirements.

F. The vessel operator must provide adequate departure and arrival notification to a designated state office including reasonable notice of unexpected changes in fishing plans, to allow for sampling of the catch at offloading and for deployment of at-sea observers.

8. PAYMENT OF OBSERVER FEES

1. AT-RCA program participants are liable for funding of state-sponsored observers for observation duties required under the AT-RCA program.
2. AT-RCA program participants are required to secure a written agreement with the state sponsoring the observers for the AT-RCA program. Written agreements would be valid

for the calendar year issued and will expire each year on August 31st.

3. The written agreement must be signed by the AT-RCA program participant and an official representative of the state and will include, but is not limited to, an agreement to abide by the regulations of the AT-RCA program, including funding for state-sponsored observers. The agreement will specify the applicable fees and a payment schedule for those fees (estimated to be approximately $4,000-4,500 per month).

4. Funding for state-sponsored observers must be received by the designated state office a minimum of 30 days prior to the beginning of the fishing period in which fishing under the AT-RCA program will occur. For example, funding for fishing in Period 3 (May-June) is due by April 1; funding for fishing in Period 4 (July-August) is due by June 1.

9. SANCTIONS

Failure of a vessel owner, operator, or the program participant to comply with the terms and conditions of the AT-RCA program, a notice issued under 50 CFR Part 660, Subpart G, any other applicable provision of 50 CFR Parts 600 and 660 Subpart G, the Magnuson-Stevens Act, or any other regulations promulgated thereunder, may be grounds for revocation, suspension, or modification of this program as well as civil or criminal penalties under the Magnuson-Stevens Act with respect to all persons and vessels conducting activities under the AT-RCA program.

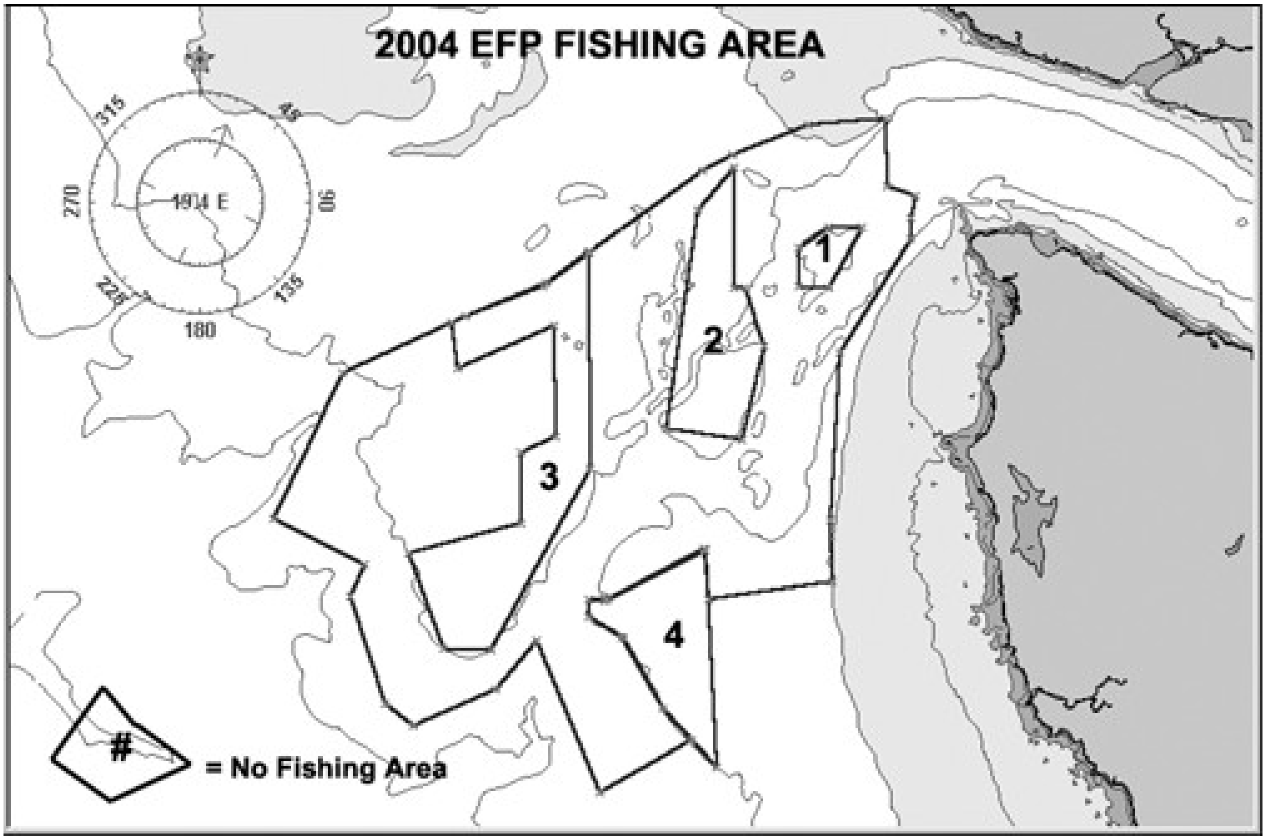
ATTACHMENT 1

Perimeter of 2004 Arrowtooth EFP Fishing Area

1	48	25.60 N	124	49.01 W
2	48	26.21 N	124	51.62 W
3	48	30.36 N	124	51.73 W
4	48	29.98 N	124	58.86 W
5	48	28.17 N	125	5.87 W
6	48	27.17 N	125	8.53 W
7	48	20.13 N	125	23.28 W
8	48	18.29 N	125	30.34 W
9	48	14.77 N	125	41.75 W
10	48	5.82 N	125	48.07 W
11	48	2.97 N	125	39.64 W
12	48	1.05 N	125	41.02 W
13	47	54.43 N	125	37.75 W
14	47	53.01 N	125	35.24 W
15	47	55.28 N	125	27.65 W
16	47	58.29 N	125	23.87 W
17	47	48.93 N	125	18.09 W
18	47	52.11 N	125	9.62 W
19	47	54.06 N	125	12.20 W
20	47	58.48 N	125	15.90 W
21	47	59.75 N	125	19.07 W
22	48	0.83 N	125	18.99 W
23	48	0.85 N	125	17.29 W
24	48	3.92 N	125	8.42 W
25	48	0.85 N	125	8.05 W
26	48	1.92 N	124	56.71 W
27	48	5.70 N	124	56.79 W
28	48	15.98 N	124	55.91 W
29	48	22.99 N	124	49.41 W
30	48	24.25 N	124	49.37 W
31	48	25.60 N	124	49.01 W

No Fishing Zones Within the Perimeter of the Arrowtooth Area

ZONE 1					
	1	48	23.69 N	124	53.84 W
	2	48	23.64 N	124	57.00 W
	3	48	22.43 N	124	59.66 W
	4	48	20.06 N	124	59.66 W
	5	48	20.03 N	124	56.93 W
	6	48	23.69 N	124	53.84 W
ZONE 2					
	1	48	27.34 N	125	5.65 W
	2	48	24.78 N	125	9.07 W
	3	48	11.32 N	125	11.91 W
	4	48	10.69 N	125	4.93 W
	5	48	16.42 N	125	2.89 W
	6	48	19.96 N	125	4.60 W
	7	48	20.03 N	125	5.69 W
	8	48	27.34 N	125	5.65 W
ZONE 3					
	1	48	22.17 N	125	19.07 W
	2	48	8.91 N	125	18.96 W
	3	47	57.70 N	125	28.12 W
	4	47	57.85 N	125	32.48 W
	5	48	3.70 N	125	35.57 W
	6	48	5.55 N	125	25.36 W
	7	48	9.93 N	125	25.28 W
	8	48	10.86 N	125	22.05 W
	9	48	17.63 N	125	22.23 W
	10	48	15.01 N	125	31.17 W
	11	48	17.85 N	125	31.72 W
	12	48	20.25 N	125	22.92 W
	13	48	22.19 N	125	19.07 W
ZONE 4					
	1	48	3.90 N	125	8.27 W
	2	48	0.78 N	125	17.54 W
	3	48	0.87 N	125	19.07 W
	4	47	59.75 N	125	19.07 W
	5	47	58.53 N	125	15.98 W
	6	47	54.09 N	125	12.20 W
	7	47	50.44 N	125	7.22 W
	8	48	3.90 N	125	8.31 W


2004 EFP FISHING AREA
315
45
270
90
19.1 E
225
135
180
1
2
3
4
#
= No Fishing Area

MANAGEMENT COSTS FOR ALTERNATIVE 2.
BUDGET SUMMARY AND DETAIL

Tasks (Responsible Party)

A. Adding declaration code to NMFS VMS declaration system (NMFS)
B. Securing contracts with participating vessel owners (States)
C. Meeting and securing contracts with participating processors (States)
D. Hiring and training state-sponsored monitors (States)
E. Supervising monitors and overseeing program (States)

Costs

A. $15,000
B. < $200
C. $500 (first year); < $200 (subsequent years)
D. $3,000
E. $5,000 (existing staff resources); ~ $12,000 (new staff)

Budget Detail

A. Cost estimate provided from NMFS Northwest Region via e-mail (March 2, 2004)
B. State Biologist/Policy Coordinator - Salary and Benefits @ $4,500 per month (~$25.00 per hour) for < 8 hours
C. State Biologist/Policy Coordinator - Salary and Benefits @ $4,500 per month for 2.5 days
D. State Biologist/Policy Coordinator - Salary and Benefits @ $4,500 per month for 1 week ($1,000) + State Scientific Technician/Biologist - Salary and Benefits @ $3,000 per month for 3 weeks ($2,000)
E. State Scientific Technician/Biologist - Salary and Benefits @ $3,000 per month for 1.6 months (existing staff); or 4 months (new staff)

Exhibit C.6.a
Attachment 4
June 2004

APPENDIX C:

Widow Rockfish Area Management

Potential for Reduction in Widow Rockfish Bycatch in the Pacific Hake Fishery Using Bycatch Avoidance Areas

Brett Wiedoff and Steve Parker
ODFW, Marine Resources Program
Newport, OR

Situation

The bycatch of widow rockfish in all sectors of the Pacific hake fishery has been significant in scale but variable among sectors (Table 1). However, there has also been a dramatic time trend of significant reduction in widow rockfish bycatch since 1999, likely due to a combination of factors including lower hake OYs, lower widow rockfish relative abundance, outreach by managers to inform fishers of rationale for bycatch reduction, and active avoidance of widow rockfish habitat by the fleet. Indeed, each sector has shown dramatic and consecutive reductions to the all-time low catches that occurred in 2003.

Table 1. Summary of the of the US Pacific hake fishery through 2003. Weights are in metric tons.

Year	Hake US optimum yield (mt)	Widow RF US optimum yield (mt)	Mothership Widow RF bycatch (mt)	Catcher/ Processor Widow RF bycatch (mt)	Shoreside Widow RF bycatch (mt)
1999	232,000	4,981	48.00	101.00	191.74
2000	232,000	4,291	151.00	70.00	82.54
2001	190,400	2,260	29.19	139.71	43.60
2002	129,600	853	20.50	115.10	5.32
2003	148,200	832	0.69	11.56	8.97

In spite of these reductions, the overfished status of widow rockfish and associated low OYs have placed the PFMC in the position of restricting the hake harvest in an effort to constrain the potential for high bycatch of widow rockfish for all sectors. Analysis by the Oregon Department of Fish and Wildlife may aid in this discussion by providing an alternative to reducing the hake OY by focusing on minimizing the bycatch of widow rockfish more directly.

We believe that reducing hake OY is an inefficient and ineffective method for reducing widow bycatch for the following reasons. Widow rockfish bycatch is rare, with almost all of the widow rockfish captured occurring in only a handful of tows. These high-bycatch tows are essentially random, so within a season there is no relationship between the amount of hake caught and the amount of widow rockfish encountered. Although the probability of a high-bycatch tow increases as more tows are conducted, only a few high-bycatch tows could easily exceed the expected catches for the fishery. One of the only predictable aspects of widow rockfish bycatch is where it occurs. On a gross scale, it occurs within the RCA, namely along rocky areas of the shelf break. We propose to use this geographic pattern in bycatch to predictably minimize bycatch in the future hake fishery.

Approach

We have taken a GIS approach to identifying locations along the coast in each sector that tend to show high bycatch rates. We used data from 1999-2003 from each sector. For each sector, catch of hake and widow rockfish from each tow plotted as low, med and high bycatch rates using logbook tow locations. Tows with zero bycatch are also shown so that the total distribution of fishing effort is visible. For shoreside sector trips with multiple tows, the bycatch rate was calculated for the trip and then indicated as low, med, and high for every tow of the trip from logbook data. This procedure was conducted for catcher processors (CP), mothership (MS) and shoreside (SS) sectors. Note however that because bycatch has decreased dramatically, most of the high-density areas (areas with yellow and red symbols) are made mainly tows from earlier years. None-the-less, these represent areas that show high bycatch rates through multiple years, and so are useful in defining areas where widow rockfish bycatch is more probable.

Several fishery characteristics are obvious in the GIS plot (Figure 1). First, the SS sector typically fishes shallower than the CP sector, but overlaps well with the MS sector. All sectors overlap almost completely in areas where the shelf or shelf break is especially narrow (*e.g.* Heceta Bank). Secondly, the CP fishery tends to fish the full latitudinal range from 42°N to 48°N, though the focus of their effort was to the north in 99-01 and to the south in 02-03.

We identified areas where widow bycatch was likely regardless of sector, and created boxes surrounding them for each of enforcement and compliance. We identified 4 boxes coastwide (red boxes in Figure 1). We then eliminated the tows within a given box, recalculated the mean annual bycatch rate for each sector and expanded for a simulated hake allocation of 91,350 mt SS, 73,950 mt CP and 52,500 mt MS (based on 2004 allocation). The bycatch rate was determined using the same methodology developed by the GMT in March for the 2004 hake allocation (40%: ’03, 30%: ’02, 20%: ’01, 10%: ’00).

Results show that much of the widow bycatch can be isolated in these areas (Table 2-attached). The locations of high bycatch were different for each sector, but significant reductions could be made with any box. Because little difference in bycatch would be expected if vessels from any sector fished in these areas, we recommend that these areas be considered high bycatch areas for the fishery, not for any specific sector. The resulting decrease in widow rockfish bycatch is shown in Table 3. Of course, closing the entire RCA

Table 3. Estimated bycatch of widow rockfish (mt) in the Pacific hake fishery in 2004 after closure of areas with historically high bycatch rates.

Option	Shoreside	Mothership	Catcher-Processor	Total Estimated Widow	% Reduction
No Closure	25.90	55.07	391.41	472.38	
Box 1 Only	24.96	10.06	130.82	165.84	65%
Box 2 Only	24.21	19.87	74.59	118.67	75%
Box 3 Only	29.60	20.55	62.62	112.77	76%
Box 4 Only	25.81	18.54	148.20	192.55	59%
Entire RCA	6.77	10.20	27.58	44.55	91%

to midwater fishing had the largest impact, similar to the results in the poster presentation by Wiedoff and Parker (2004). Also note the relatively minor differences in hake bycatch rate expected after exclusion of any area. Therefore, the relative effectiveness of the closure areas is due mainly to the avoidance of widow rockfish bycatch, not to changes in the hake catch rate.

Risks

One potential risk for closing some areas to fishing is that of increasing bycatch of some other species as the fishing effort shifts to other areas. Bycatch of other species is also patchy in time and space (Figure 2). Although not analyzed here, bycatch of yellowtail rockfish occurs in similar areas with widow rockfish, so some overall decrease in yellowtail rockfish bycatch would be expected. Bycatch of young sablefish is more dependent on large year classes which analysis suggests is predictable a year in advance and can be addressed in that way.

Our work indicates that the mean rate of hake catch/h is the same inside and outside bycatch avoidance areas and so no increase in fishing time should result from closing any or all bycatch avoidance areas. Aside from changes in where they can fish and changes in travel time, we do not see a pronounced effect of this approach on fishing efficiency.

Of course there is always the risk of encountering high bycatch of widow rockfish even when fishing outside the bycatch avoidance areas. However, this risk is less when fishing outside bycatch avoidance areas than if fishing anywhere with a lower hake OY.

The bycatch rates presented do not incorporate the variation in bycatch for each sector. Therefore, small changes in the rate, or estimated catch should not be viewed as significant. Also, in 2002 the CP sector experienced one large tow that accounts for almost 80 of its bycatch. The presence of this tow dramatically changes the bycatch rates for that year and the corresponding predicted rate. We excluded that tow, but show what the average 2002 rate would have been in the margin with an asterisk.

Recommendations

- Identification and avoidance of bycatch avoidance areas allows the fishery to avoid known areas of high widow bycatch using midwater trawl gear. The resulting decrease in widow rockfish bycatch is fairly predictable and should not be impacted by the scale of the hake OY.
- We recommend that the number of closure areas be the minimal number needed. The number of bycatch avoidance areas chosen is up to the council process, but because of enforcement issues and the likelihood that the time-trend in bycatch is a major factor influencing bycatch.
- Bycatch avoidance areas chosen should apply to all hake sectors because fishing in an identified zone by any sector is likely to produce higher bycatch.

Exhibit C.6.a
Attachment 5
June 2004

APPENDIX D:
COUNCIL FISHERIES INCOME IMPACT MODELING

(Excerpted and adapted from: the Final Report of West Coast Groundfish Fishery Economic Assessment Model Update Project, Cooperative Agreement No. NEPA-0402, The Research Group, September 28, 2003).

Introduction

The Pacific Fishery Management Council (Council) uses economic impact models to assess the income impacts resulting from West Coast commercial and recreational fisheries. Data on reported landings taken from a recent PacFIN vessel summary or estimates of recreational angler trips are combined with regional economic response coefficients generated by the Fishery Economic Assessment Model (FEAM) to estimate local income impacts resulting from observed historical fishing activity and/or activity levels expected under alternative fisheries management scenarios (Jensen 1996).

Regional economic response coefficients are taken from input-output models. These models were constructed using the IMPLAN economic modeling software originally developed by the U.S. Forest Service (MIG 2000). IMPLAN can be used to construct county or multi-county models for any region in the United States. The regional models are based on technical coefficients from a national input-output model, local employment and payroll data and estimated regional trade propensities. IMPLAN adjusts the national level data to fit the economic composition and estimated trade balance of a chosen region. Some valid criticisms have been directed at synthesized input-output as opposed to survey based input-output. First, the synthesized industry spending coefficients are based on average relationships between industries aggregated at a national scale. These generalized relationships may not apply to the specific region under study. However, an input-output model, unlike many other economic models, is constrained and consistent. The model is a double entry book keeping system of accounts. Total sales must equal total purchases in each sector and for the economy as whole, including imports and exports from the study region.

One limitation of this type of regional impact analysis is that it presents a picture of the economy at a single point in time. This picture is based on historical ratios between different sectors of the economy rather than a dynamic structure of changing relationships. When prices or costs change, consumers and producers respond by substituting among final goods, substituting among inputs to production, migrating between regions, and shutting down businesses that are no longer profitable. To evaluate these sorts of changes, economists must first estimate the direct effects and translate these into equivalent changes in final demand that are then used to drive the input-output model. Accurate estimates of regional impact are dependent upon the projections of direct effects on the sectors that drive the input-output model. It has also been suggested that this type of regional analysis tends to overstate actual impacts because it assumes that all possible adjustments to disturbance are instantaneous and permanent, and that behavioral responses to disturbances are limited. For example, people who lose a job are assumed to stay unemployed. In reality people and businesses adjust over time as they try alternative occupations, technologies and locations.

Economic changes triggered by disturbances can be short-run or long-run. Short-run impacts include the initial construction or other temporary changes in spending that typically last for less than a few years. Long-run effects, on the other hand, include the more permanent aspects of economic adjustment as industries, workers and consumers react to emerging economic realities. Examples of long-run adjustments include construction of new facilities, adoption of labor-saving technology and outsourcing of intermediate production steps. Results generated by input-output models are generally considered to be better indicators of impacts in the short-run than over the long-run.

IMPLAN itself includes only a single aggregated commercial fisheries sector and two seafood processing sectors. Data for these sectors is notoriously sparse since much of the employment is informal or part time and so is not covered by state unemployment insurance programs or recorded in county employment data. Consequently it is necessary to construct "custom" expenditure coefficients for commercial fishing and processing industry spending categories. To do this FEAM combines elements of IMPLAN sectoral expenditure functions to better fit the observed spending patterns of vessels and processors for labor, provisioning, repairs and other costs. The custom category coefficients are then entered into a computer program that handles the accounting of vessel harvests and vessel and processor expenditures, and multiplies these by IMPLAN total income coefficients to calculate the income multiplier effects.

Limitations

The regional economic impacts calculated using economic impact models are indicators of the dislocation costs that may occur in the event of reductions in ocean fisheries, but are not indicators of the net loss to the nation from such reductions. If sufficient quantitative information and defensible analytical models are available, net gain or loss to the nation determined through a benefit-cost analysis is the value suggested by Executive Order 12866 and the Regulatory Flexibility Act (5 U.S. C. 601 *et seq.*) for analyzing actions of federally managed fisheries (NMFS 2000).[1/, 2/]

In general, there is no particular relationship between regional economic impacts and changes in NEV derived from a benefit-cost analysis, and regional economic impacts are certainly not additive with NEV. However, both measures are useful for showing the consequences of management actions. Regional income impact estimates provide a measure that is comparable to values often used to describe activities in nonfishing sectors of the economy. If the fishing activity is reduced, personal income would not necessarily be reduced by a proportional amount. The effect on personal income in the local and national economies will depend on alternative activities available and the location of those activities. If there were a reduction in the ocean fisheries, over the long run workers in the commercial and recreational fisheries, vessel and processing plant owners, and food fish consumers would adjust by changing their behavior in observable ways. The types of the alternative activity adopted compared with the fishing activity foregone determines the net effect of the change in ocean fisheries on total income.

For example, if as a result of reduced fishing opportunity a worker on a vessel loses her job and receives government assistance. If no new job or income is created elsewhere in the economy, then the net loss to the nation and local economy with respect to the worker's job is measured by the entire prior wages of that worker. However, if additional income is generated elsewhere in the

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1/ Other laws, such as the Magnuson-Stevens Fishery Conservation and Management Act, the National Environmental Policy Act, and the Endangered Species Act also have economic analysis requirements.

2/ The benefit-cost analysis from management actions includes the sum of changes in: consumer surplus derived from recreational fishing, consumer surplus derived from non-consumptive use, existence value, and consumer and producer surplus from commercial fishing landings, less management costs (administration, monitoring, and enforcement).

economy either through increased harvest in other fisheries or through consumers' redirection of their food expenditures, with the consequent generation of additional income and jobs in another fishery or food producing industry, then the magnitude of the net loss in income should be reduced by some portion of the value of the increased economic activity elsewhere in the economy. The effect on the local economy may differ from the effect on the national economy to the degree the alternative activities occur outside the local community.

FEAM personal income estimates provide an indicator of the magnitude of the possible redirection of money between fishing-dependent and nonfishing-dependent sectors that may result from changes in the fishery. The amount of redirection represents a dislocation that may have economic and social costs that would not be reflected in a typical NEV analysis. However, income impacts should not be used as a substitute for a proper assessment using benefit-cost framework.

Commercial Fishing Economic Impact Model

Landings data and industry (vessels and processors) economic factors are used to develop the commercial fishing economic impact model. FEAM was developed by Hans Radtke and William Jensen for the West Coast Fisheries Development Foundation in 1984, resulting from a need to utilize existing data on fisheries to estimate the economic contribution of the fishing industry to regional economies. The Council first utilized this model in response to a threatened lawsuit by the Small Business Administration that contended the Council had not considered the economic and social impact of their salmon management decisions on small businesses. FEAM combines an IMPLAN input/output model with landings and other local industry information to generate economic analysis relating to fishery resource use. IMPLAN-generated response coefficients are applied to specific business expenditures to calculate the personal income contributions of these expenditures. FEAM results have been useful because much of the commercial fishing industry information is not described in published employment data.

Commercial fishing landings data is a model input and is received from the Pacific Coast Fisheries Information Network (PacFIN) data system. PacFIN contains a standardized compilation of selected information from state fish ticket databases maintained by West Coast states. Landing volume and ex-vessel value data flows through the model from the harvesting sectors (boat and gear type) through the intermediate use (buyers and processors) to final demand (consumers). The contribution of the resulting economic activity to the local economy is measured by the amount of personal income generated. IMPLAN derived response coefficients translate direct business spending into the household personal income.

The FEAM model is a menu driven computer program that allows the analyst to change data and key assumptions about harvesting and processing activities. When subtracted from baseline conditions, the model results show the economic impacts of fishery and fishing industry changes. The personal income estimates can be made for any single or multiple of counties. It is assumed that county boundaries surrounding a port-of-landing define economic regions. To the degree that processing activities, the vessel home port, and the homes of workers and owners in the industry are located in the port of landing, the personal income generated is more likely to occur in the community associated with the port of landing than in other areas of the county. To the degree processing activities, the vessel home port, and the homes of workers and owners in the industry are located outside of the county, the person income estimates likely overestimate income generated in the county. Where landings are made in one port and a vessel is home located in another port or the workers live in another port, or where processors transfer product from one port to another, there are likely some cross-impacts between ports that are not measured or are attributed to the wrong geographic area. Some of the cross impacts may cancel each other out.

For each defined area, the key elements of the commercial FEAM model are:

- Response coefficients (Generated by IMPLAN and applied to expenditures of the firms and income earned by those employed and owning fishing enterprises).
- Inventories of vessels (number of fishing vessels of different types by port).
- Harvester fixed costs.
- Harvester variable costs (expenditures per pound landed).
- Inventories of processors and buyers (number of processors/buyers of different types by port).
- Processor/buyer fixed costs.
- Processor/buyer variable costs, processor margins and recovery rates by product form and species.
- Inventories of the species, weights and value of fish landed.
- Distribution of species among harvesters.
- Distribution of species among processors.

With the exception of the response coefficients, each of these segments requires input by the model user. Inventories and distribution information was derived largely from PacFIN data. Information on processor and buyer inventories (counts of firms by type and community) was augmented by prior knowledge of the industry. The processor margins and harvester and processor budgets were based on interviews and numerous studies.

Three types of income are included in the income impact estimates:

- Direct (earnings of labor and owners in the harvesting and processing sectors).
- Indirect (earnings of labor and owners in firms supplying harvesters and processors, e.g. wages paid by a gear manufacturer).
- Induced (earnings of labor and owners that occur when those earning direct and indirect income spend their income, e.g. income earned by the owner of a grocery store).

IMPLAN response coefficients were based on the 1998 economy and landings data is for year 2000. Modeling results can be extended to other years based on processor and harvester marginal impacts per pound. Per pound processor margins and expenditures are assumed to be constant and harvester impacts are adjusted based on changes in ex-vessel price. Species and port specific ratios per pound are multiplied by the price for a particular year to get an income impact estimate for that year.

The following figure illustrates how a difference in ex-vessel price for troll chinook affects marginal impacts per pound. A concern in using this approach is that the more the ex-vessel price deviates from the range of prices used to develop the estimate in the base year, the more the estimate of harvester related income impacts is likely to be inaccurate and the more likely that processor margins will change.

The FEAM results for average economic impact factors by species/gear categories are then transported to a spreadsheet for convenience in analyzing management alternatives. There is a great level of detail to the spreadsheet model, however there are several major simplifying assumptions:

1. The model relies on response coefficients generalized from IMPLAN. Several studies have evaluated the overall performance of IMPLAN, and although results are inconclusive, IMPLAN's outcomes have been shown to be plausible (Crihfield and Campbell 1991); (Rickman and Schwer 1995). Nevertheless, it is prudent to be aware of several simplifying assumptions concerning the structure and data contained in the model. In addition to the problems generally associated with input-output modeling, IMPLAN implicitly assumes national average production coefficients and margins, and uses a set of econometric equations to predict interregional trade flows at the regional level. Users of IMPLAN must be willing to accept these assumptions and estimation methods or else have the ability to incorporate user-supplied data to improve the accuracy of their impact estimates.

2. The inter-industry dollar flows from 1998 IMPLAN coefficients apply to the analysis year.

3. The marginal economic impacts from harvesters and processors per landed pound at the state level also apply to port areas. This implies that the type of processing and fleet mix is uniform for each port group. However there is some fleet variability captured in the analysis due to species and gear combinations, and the marginal economic impacts are adjusted by port area prices.

4. The amount of processing done within each state and port area equals the amount landed. That is, there is no cross hauling of raw product.

5. The sum of port areas within each state will not equal the state total. This is because a) not all landings reported by PacFIN are associated with a port, and b) the port area price is used to calculate local harvester economic impacts rather than the statewide average price.

6. The three-state economic impacts are a sum of individual state economic impacts, rather than completing a region-wide analysis. This is because many species management regimes that affect landing locations, ex-vessel price, processing product forms, etc. are associated with state boundaries.

7. With three exceptions, there is only one finished product form per species category. The exceptions are Dungeness crab, albacore tuna, and Pacific whiting.

8. Ex-processor sales price is estimated using cost calculation from the FEAM model or using published sales price information for the product form sold in an area.

9. Fish license fees and product taxes/surcharges are constantly changing. The current model was specified to use year 2000 fees.

10. Marginal impacts are a constant percentage of average impacts. To estimate marginal impacts per pound, divide average impacts by 89%.

Recreational Fishing Economic Impact Model

Recreational fishing economic impacts measure the economic activity (business sales, jobs or personal income) generated by the spending of recreational fishing participants. Calculating these impacts is simple when angler effort, expenditures, and economic response coefficients are all known. Trip and equipment related impacts are determined by the following formulas:

1. Total trip-related economic impacts = total trips x spending per trip x economic response coefficients.

2. Total annual angler expenditure economic impacts = total anglers x annual equipment costs x economic response coefficients.

Total trip-related impacts are disaggregated by mode (boat, shore, charter, etc.), residency of the fisher (resident or non-resident), location of the trip, and type of expenditures (bait, lodging, license fees, etc.).

Total annual angler expenditure impacts are disaggregated by type of equipment purchased, and adjusted to reflect effective counts of representative spenders.[3/]

Decision makers need to be aware of the assumptions used to estimate each of the terms in these formulas to correctly reveal how changes in recreational fisheries management may affect the economy.

For each defined area, the key elements of the recreational FEAM model are:

- Response coefficients (Generated by IMPLAN and applied to estimated expenditures by recreational angling businesses and independent recreational anglers).
- Estimated number of angler trips by type of trip (guided, charter, private).
- Businesses fixed and variable costs (guides and charters).
- Independent angler per trip expenditures and annual equipment expenditures.

The outputs of the model are personal income and number of jobs. Jobs are calculated by dividing the personal income estimate by BEA earnings per job.

3/ Survey results usually show "typical" and "representative" spending by anglers. Typical spending occurs when purchases are made for an item. In this case zeros are not included when tabulating average spending per angler). Representative spending occurs when purchases are made for some items but not others. In this case zeros are included when tabulating average spending per angler.

Two alternative information sources were used to calibrate the recreational model. The first alternative used (Gentner 2001) for trips, participants, and annual and per trip spending. The second alternative used (PFMC 2003) for trip estimates, (USFWS 2003) participation estimates, and (Gentner 2001) for spending per trip.

Gentner's publication describes the results of a MRFSS economic add-on survey that was administered on the West Coast in 2000. Gentner’s trips are for saltwater fisheries at the state level for Oregon and Washington and for two regions (northern and southern) in California. Application to smaller sub-state regions thus assumes that local trip expenditures are the same as the state average. However local IMPLAN economic response coefficients that are specific to the sub-state region an be applied.

Gentner divides fishing trips by whether the angler’s residence is located within or outside of the region. However the trips are not categorized by target species. So even though the declared target species for recreational trips is available through RecFIN, the current recreational FEAM model assumes the same average spending patterns no matter what the declared target species.[4/]

Obtaining angler counts and their place of residence is also problematic because available sources of information, such as RecFIN, usually do not provide these tallies directly. Methods for estimating angler counts, such as using a factor based on annual average effort per angler, need to be devised.

Spending per trip is highly dependent on fishing mode, trip duration, and location. Anglers fishing from boats, hiring guides or charters, or staying overnight will obviously spend more money than those who do not. Sometimes the trip occurs in remote locations where there are no businesses. Trip spending may occur elsewhere (resident home or somewhere along the way) than in the destination economy being analyzed. Annual equipment costs are also highly variable, depending on anglers' fishing interest, avidity and ability to afford amenities in fishing pursuits. All of these factors need to be considered to make economic impact analyses sensitive to management alternatives.

Recreational fishing is usually considered a household decision for using discretionary income. If not spent for fishing, other forms of household leisure would likely be substituted. Household income spent for local recreational fishing is derived from jobs in other industries, so fishing by residents is not considered to be bringing new money into the economy. However non-residents traveling to an area are bringing new money into an economy. Regional economic impact analysis typically only considers non-resident angler expenditures made at the destination as contributing to the local economy. Clearly, though, resident spending does support recreational activity. Anglers may choose to travel to other regions to fish. Therefore their expenditures near home represent a type of "import substitution” to a regional economy.

4/ The Recreational Fisheries Information Network (RecFIN) is an online retrieval database sponsored by the Pacific States Marine Fisheries Commission. The database contains results from the Marine Recreational Fisheries Statistics Survey (MRFSS) Program and cooperative angler surveys administered by states.

Economic Valuation

Economic valuation assessments measure the economic welfare that users derive from fish resources. Anglers obtain benefits above and beyond their expenditures, however these benefits are not shown through spending in the market place. Non-market valuation methods must be used, such as the hedonic price approach (Mendelsohn *et al.* 1992); the travel cost method (Smith 1989); and the contingent valuation method (Hoehn 1987).

The hedonic model is limited in its scope of application (Getz and Huang 1978), so the travel cost and contingent valuation methods are more commonly employed. The comparative measurement using any of these methods is to subtract the fishing costs from the assessed benefit for the derivation of net economic value (NEV). This differs from measuring the gross economic value where the assessed benefit is added to the actual expenditures to fish. Calculating the per trip NEV is controversial because, theoretically, a fisheries total prosecution effort, benefits, and costs would have to first be known.

Moreover, this would calculate average value when marginal value should be used for determining incremental changes in fisheries. (Marginal net economic value is what an angler is willing to pay to catch an additional fish less costs for pursuing that fish.)

The project did not have the budget resources to determine original per trip NEV through special surveys. Furthermore, NOAA Fisheries, Southwest Fisheries Science Center is using the MRFSS economic add-on survey to develop an NEV model. Therefore, per trip NEV estimates were borrowed from other studies as placeholders until more recent information from other studies is available. The borrowing of trip related NEV is called the benefit transfer approach. A major problem with this approach is the violation of the assumption that individuals share a common representative utility function. Practically speaking, one individual will place a value on a fishing experience based on a number of variables, including catch rates, size of fish, site characteristics, and their own personal avidity and motives to fish. Intuitively, transferring values from one group fishing in one location to another group at a different location at a different time may introduce large errors in the estimate. Minimizing differences in site and species conditions and angler demographics and motivations when selecting studies to borrow per trip values will help in alleviating the errors. Decision makers should recognize the inherent problems in determining net economic value through the benefit transfer approach when reviewing management alternatives.

There are other use values that data sources for trip and angler counts may omit. Data sources generally only tabulate consumptive trip purposes, but trips can be made for nonconsumptive use of fish resources. Diving to observe fish would be an example. Other examples of non-consumptive use values come from scientific research, indirect benefits from preserving ecological functions, etc. (Bishop 1987).

Non-Use Values

There are other valuations that can be given to fish resources. There are some people who are willing to pay for a resource, even though they never use it. This type of non-use value is called existence value, because people are willing to pay to insure that the resource exists, in case they want to use it in the future or to insure the resource exists for future generations to enjoy. There are extensions of existence value that economists like to discuss, such as option value, amenity value, bequest value, and others. All of these values are useful concepts for trying to understand what it means for measuring the worth of the resources. While the modeling for this project did not calculate non-use values, all types of values to society may be important to decision makers. For example, if a particular fish resource is not threatened with extinction, then the existence value is probably not relevant. If there are vary large changes to fish resources through management actions, then the average use values are important. If there are only incremental changes, then the marginal use value would be a more applicable comparison.

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Exhibit C.6.a
WDFW Report
June 2004

WASHINGTON DEPARTMENT OF FISH AND WILDLIFE
SUMMARY OF GROUNDFISH PUBLIC MEETINGS

The Washington Department of Fish and Wildlife (WDFW) attended and sponsored a series of public meetings to solicit input from and share information with stakeholders primarily regarding proposed 2005-2006 management measures, including regional management, and the status of canary, yelloweye and black rockfish, and lingcod.

Date	Location	Attendees	Discussion Topics
Jan 30	WDFW - Olympia	~ 10 rec fishing interests	• PFMC process • Groundfish and halibut fisheries mgmt • Status of yelloweye rockfish
Feb 26	Forks City Council Meeting	~ 20 rec fishing interests	• PFMC process • Groundfish and halibut fisheries mgmt • Status of yelloweye rockfish
Mar 4	WDFW - Olympia	5 rec fishing interests	• PFMC process • Groundfish fisheries mgmt, including regional mgmt • Status of stocks (canary, yelloweye, and black rockfish, and lingcod) • Proposed 2005-2006 mgmt measures
Mar 29	WDFW - Montesano	3 rec fishing interests	• PFMC process • Groundfish fisheries mgmt, including regional mgmt • Status of stocks • Proposed 2005-2006 mgmt measures
Apr 16	WDFW - Olympia	~ 20 rec fishing interests	• PFMC process • Groundfish and halibut fisheries mgmt
May 20	WDFW - Olympia	2 rec and 4 comm fishing interests	• PFMC process • Groundfish fisheries mgmt, including regional mgmt • Status of stocks • Proposed 2005-2006 mgmt measures

Discussion Summary

One of the key issues of concern among recreational fishers was the status of yelloweye rockfish and its potential impact upon the halibut fishery and other recreational groundfish opportunities. Recreational fishing interests expressed the need for regional management, especially for species with very low optimum yields (OYs) (e.g., canary and yelloweye rockfish), to avoid early closure. Discussion also centered around the differences among OYs, harvest guidelines, and harvest targets and the management response for each of those terms. There was also some discussion on the use of "hotspot" management, including the potential use of halibut "hotspots" (that are canary and yelloweye "coldspots"), which could remain open in the event of large recreational area closures and/or the use of canary "hotspots" which could be closed.

Discussion with commercial fishers focused primarily on the OYs for 2005-2006 and the depth-based management measures being proposed to achieve them. There was also some discussion regarding the implementation of the Oregon Selective Flatfish Trawl into federal regulations, the potential for the conversion of the Arrowtooth Trawl Exempted Fishing Permit (EFP) into regulations, and the draft trip limit alternatives.

PFMC
05/25/04

Exhibit C.6.b
Supplemental Attachment 1
June 2004

DRAFT SUMMARY MINUTES
Ad Hoc Allocation Committee

Pacific Fishery Management Council
Embassy Suites Portland Airport Hotel
Cedar II and III Rooms
7900 NE 82nd Avenue
Portland, OR 97220
(503) 460-3000
May 27, 2004

THURSDAY, MAY 27, 2004 - 8:30 A.M.

Members Present:
Mr. Donald Hansen, Chairman, Pacific Fishery Management Council
Ms. Marija Vojkovich, California Department of Fish and Game
Dr. Patty Burke, Oregon Department of Fish and Wildlife
Mr. Phil Anderson, Washington Department of Fish and Wildlife
Mr. Steve Freese, National Marine Fisheries Service, Northwest Region
Ms. Eileen Cooney, National Oceanic and Atmospheric Administration, General Counsel

Others Present:
Mr. Rod Moore, West Coast Seafood Processors Association, GAP
Mr. Don Bodenmiller, Oregon Department of Fish and Wildlife
Mr. Mark Saelens, Oregon Department of Fish and Wildlife, GMT
Ms. Dorothy Lowman, Consultant, Environmental Defense
Mr. Brian Culver, Washington Department of Fish and Wildlife, GMT
Ms. Michele Robinson, Washington Department of Fish and Wildlife, GMT
Mr. Mark Cedergreen, Pacific Fishery Management Council
Mr. John Holloway, Oregon Anglers
Dr. Vidar Wespestad, Pacific Whiting Conservation Cooperative
Mr. Steve Joner, Makah Indian Tribe
Mr. Brad Pettinger, Oregon Trawl Commission
Mr. Kurt Schultz, Oregon State University, Marine Resource Management Program
Mr. Wesley Shaw, Oregon State University, Marine Resource Management Program
Mr. Mike Anderson, Oregon State University, Marine Resource Management Program
Mr. Dayna Mathews, National Marine Fisheries Service, Office of Law Enforcement
Mr. Jim Lone, Washington Recreational Fishing Industry Association, GAP
Mr. Bob Alverson, Fishing Vessel Owner's Association, Pacific Fishery Management Council
Ms. Yvonne deReynier, National Marine Fisheries Service, Northwest Region
Dr. Donald McIsaac, Executive Director, Pacific Fishery Management Council
Dr. John Coon, Deputy Director, Pacific Fishery Management Council
Mr. Mike Burner, Pacific Fishery Management Council Staff
Mr. John DeVore, Pacific Fishery Management Council Staff

Dr. Kit Dahl, Pacific Fishery Management Council Staff
Dr. Ed Waters, Pacific Fishery Management Council Staff

A. Call to Order

Roll Call, Introductions, Announcements, Approve Agenda, etc.

Ms. Burke introduced marine resource management students from Oregon State University participating in an Oregon Sea Grant program.

Opening Remarks and Agenda Overview

Dr. McIsaac reviewed the 2005-2006 management schedule. He noted that the process is slightly behind schedule. He highlighted changes to the schedule for submission of the NEPA and regulatory documents after the June meeting. These changes were the result of coordination efforts at the April Council meeting.

Dr. McIsaac reviewed the Council process at the June meeting. There will be a three-step process for adopting a preferred alternative (i.e., tentative adoption on Wednesday of the June Council meeting, followed by fine tuning by advisory bodies and final adoption of final management measures on Friday).

Mr. Anderson suggested a review of current definitions of optimum yield (OY), harvest guidelines, etc., as well as a discussion on the process of changing definitions in the fishery management plan (FMP) or in regulations.

B. Management Measure Alternatives for 2005-2006

Review of Alternatives and Analyses in Preliminary DEIS

Mr. DeVore reviewed the various chapters of the preliminary Draft Environmental Impact Statement (DEIS) and highlighted the chapters and sections that were chosen for today's handout.

Ms. Robinson noted that the section on new management lines needs to be revised to include the definitions for Washington Department of Fish and Wildlife (WDFW) management areas currently used in salmon management (Washington Marine Catch Areas 1-4). Specific coordinates for these lines have been submitted to National Marine Fisheries Service (NMFS) and are intended to be incorporated into the groundfish process.

Dr. McIsaac requested clarification on the issues surrounding the selective flatfish trawl issue and whether Scientific and Statistical Committee (SSC) and Groundfish Management Team (GMT) resolution is anticipated before tentative adoption of a preferred alternative in June. Mr. DeVore reviewed the questions regarding the seasonal or annual use of selective flatfish trawl bycatch rates and when the SSC will consider the issue. The SSC will consider the issue prior to Wednesday. Their input, as well as the input from the other advisory bodies, will be part of the report to the Council. Mr. Saelens, Dr. Burke, and Mr. Hansen all hoped questions regarding the use of selective flatfish trawl bycatch rates are answered by the SSC or GMT without the need for Council deliberation.

Mr. Anderson questioned the canary rockfish impact estimates in the tribal whiting fishery (by 2005 OY alternative) and was curious about the differences in proposed management measures for this fishery between the alternatives. Mr. DeVore reported there may be a mistake in the value of 5.2 mt for the Medium OY and High OY alternatives reported on the scorecard as well as in Table 4.3-10. [NOTE: the tribal impact estimates were not incorrect. The tribal whiting sliding scale allocation formula has a maximum tribal allocation which is attained under Medium OY and High OY alternatives.]

There are lower impacts associated with the tribal yellowtail rockfish fishery under the action alternatives than those reported under the No Action alternative, even though the fishery is anticipated to increase in 2005-2006. Mr. Joner reported that this is due to the implementation of lower bycatch rates from tribal research results. The GMT has been provided a summary of this report but has requested the raw data. Mr. Joner stated the bycatch results are based on a threshold process by which vessels avoid areas of high bycatch. Mr. Anderson requested some detail as to the size and location of area closures and some raw data so that everyone can understand how this program works.

Ms. Vojkovich asked about the estimated yelloweye rockfish impacts for California recreational fisheries. Why is the estimate 1.5 mt and not 3.7 mt? Is there a commercial fishery component? Mr. DeVore replied the 1.5 mt impact represents the best estimate of recreational fishery impacts. The California recreational harvest guideline is 3.7 mt and was based on older models and impact estimates from previous years.

Mr. Moore noted the impact tables for the trawl fleet do not show trip limit alternatives for splitnose, will they be the same for slope rockfish? Mr. DeVore replied this is a question for the GMT and will need to be addressed at the June meeting between the GAP and the GMT. Mr. Moore explained there were no selective flatfish trawl options with trip limits for slope rockfish. Presumably, if vessels have to use the same gear through the entire period and although slope rockfish are not the intended target, there needs to be a placeholder for slope rock in the event that the gear is used in that capacity.

Mr. Moore asked about open access trip limit tables under the alternatives. Mr. DeVore said there are some holes in the preliminary DEIS including the lack of open access trip limits. The GMT and GAP will have to get together to address this issue at the June Council meeting.

Dr. Burke requested clarification of the sablefish tier limit error problem. Mr. DeVore and Mr. Moore reviewed the OY trajectory issue (re: the anticipated drop in recruitment), consistent use of bycatch rates, and acceptable biological catch (ABC) versus OY use in calculating the tier limits for 2004. The same model will be used for both inseason decision-making in 2004 and for modeling the 2005-2006 alternatives.

Ms. Vojkovich wondered why there is no difference between the No Action alternative and the action alternatives for Oregon and Washington recreational fisheries? Mr. DeVore stated there may be an error in the scorecards on the use of best estimates versus harvest guidelines. Ms. Vojkovich stated that her question is not about numbers but rather why did the seasons not change when there were some issues of overage in 2003. She wanted to know how 2003 post-season fishery results compared with projections for 2004-2006. Mr. Bodenmiller stated that status quo is 2004, not 2003, and there were no significant overages (2% over on lingcod in 2003). Ms. Robinson and Mr. Culver reported that there were overages in Washington recreational catches of yelloweye rockfish reported in RecFIN, but that is largely due to the average weight values used by RecFIN that are currently under review since they are considerably higher than WDFW sampling results.

Ms. Vojkovich requested that reported catches and landings in the DEIS should be in the same units.

Mr. Anderson reviewed Washington management expectations for 2005-2006.

Dr. Burke requested review of the whiting OYs and the associated canary rockfish bycatch rates. Mr. DeVore reviewed the bycatch analysis and rates used and reminded the group that the rates are applied to a range of OYs. Ms. Robinson reviewed the schedule for incorporating the 2004 bycatch rates before the March meeting. Mr. Moore raised concerns about the canary rockfish rates used in the DEIS and for the June Council meeting. If canary rockfish bycatch rates are inaccurate and too high, there will be implications for all fishery sectors as canary rockfish is the most constraining stock for many fisheries. Council staff will review the rates being used in these analyses with the GMT and provide new information in June if appropriate.

C. Management Response to Recreational Harvest Guidelines for Canary Rockfish, Black Rockfish, and Lingcod

Ms. Cooney reviewed the FMP and regulatory definitions of harvest guidelines (HGs) and quotas. An HG is not a quota and does not require fishery closure if exceeded. There is flexibility in how an HG is managed. This should not require changing the HG definition in regulations, but should be specified in the management response. NMFS would decide whether the HGs are reasonable targets. The management response gives assurance that the management measures will stay within HGs and that OYs will not be exceeded. There needs to be specific responses at both the state and federal levels. NMFS could follow up on inseason actions that are consistent with state actions. The states would/could take the lead on inseason management decision-making for recreational fisheries. The management actions defined as routine in the FMP could be specified in the 2005-2006 management measures. Management measures not defined as routine in the FMP, such as specific area management concepts, need to be defined and fully analyzed in the regulatory package to enable them to be considered for routine inseason action.

Dr. Burke asked why NMFS would need to follow up on a state inseason action? Ms. Cooney explained that consistent federal rulemaking is needed especially if it affects fisheries in the exclusive economic zone (EEZ) outside 3 nautical miles. If state rules are more restrictive than federal rules, there is no difficulty when the state makes such decisions for state-managed fisheries. Dr. McIsaac said the Council can decide the trigger or management response and recommend to NMFS how federal regulations need to conform to intended state actions. Ms. Cooney said this is true, but needs to be specified up front.

Mr. Anderson asked if NMFS considers exceeding the OY for an overfished species more egregious than for non-overfished species? Ms. Cooney explained that rebuilding plans in the FMP are more stringent than OYs in regulations for non-overfished species. While NMFS does not recommend exceeding any OY, those for overfished species are more stringent and should be considered as quotas. Therefore, the Council needs to be especially careful to define a state and collective response for exceeding an HG for any overfished species. Dr. Burke explained the reason this is an issue is states have different requirements for taking inseason management actions and California needs harvest goals specifically defined as HGs. Ms. Cooney said the federal definitions are adequate, but the Council needs to define the response to potentially exceeding an HG. Dr. McIsaac asked about the process for changing a federal definition for any of these harvest targets? Ms. Cooney does not recommend changing the HG definitions in the FMP and in regulations. However, the Council could define new terms in this upcoming regulatory action. Dr. Burke thought changing the definitions is not the answer. The tools available for state managers are different and the focus should be on how the states react to a problem inseason. Mr. Burner asked Ms. Cooney what HGs and management responses need to go into regulations? Ms. Cooney said any new strategies/measures that have not been previously identified as routine in the FMP need to be fully developed analytically before they can be considered routine. For instance, if California needs to close their fishery inseason, what does that mean? Closing the fishery? Prohibiting retention? This is the kind of specificity needed. Mr. Burner said he would provide the federal definitions to the Council in a supplemental report.

California

Ms. Vojkovich explained California Department of Fish and Game's (CDFG's) proposed inseason management response in 2005-2006. They anticipate the season structures recommended will stay within HGs. They do have the authority to close all or part of their fishery (by depth, region, season, etc.), prohibit retention, and do all this by region. They expect to reduce seasons south of 40°10' N. lat. and depths in the north. They will receive recreational catch updates monthly through California Recreational Fisheries Survey (CRFS), which is an improvement over the bimonthly data feed under Marine Recreational Fisheries Statistics Survey (MRFSS). They are considering putting all their inseason responses in federal regulations to reduce confusion. They are trying to reduce inseason action since they have staff capacity limitations. Dr. McIsaac asked what happens if the unexpected happens inseason in 2005-2006. Would CDFG want to see any state inseason action matched in federal regulations? Ms. Vojkovich said yes, for the most part, since many of the constraining species exist in state and federal waters. Also, this reduces public confusion. Ms. Cooney asked if they could do inseason action as an emergency rule? Ms. Vojkovich said they are exploring their authorities. They know they can prohibit retention but may need to go through the California Fish and Game Commission (CFGC) to change bag limits.

Oregon

Dr. Burke said Oregon Department of Fish and Wildlife (ODFW) is proposing no retention of canary and would restrict their recreational fishery to inside 30 fm if that HG is exceeded. Black rockfish HGs would be managed with a total recreational fishery closure. Their lingcod response would be addressed with bag limit changes or non-retention if needed. They will also consider shortening or lengthening the season if needed. Dr. McIsaac asked if these management responses should be in federal regulations. Dr. Burke said that was fine. Ms. Cooney said it would be less confusing for federal regulations to conform to state actions.

Mr. DeVore asked if the 30 fm closure should be considered coastwide or are there regional options on the table? Mr. Bodenmiller replied they originally wrote a coastwide proposal but regional management flexibility is desirable. Ms. deReynier reminded the group that partial closure issues would need to be fully discussed and analyzed at the June Council meeting. Dr. Burke stated that Oregon would go with a statewide approach for 2005-2006 on the implementation of a 30 fm restriction. In state waters, the state may explore area-specific closures.

Washington

Mr. Anderson explained WDFW's proposed response. They are proposing non-retention of canary rockfish in 2005-2006. They plan to restrict all or part of their fishery to inside 30 fm if the canary HG is exceeded. They intend to use their four marine recreational areas to provide regional management flexibility. They may also stratify their response north and south of the Queets River (boundary of marine areas 2 and 3). They also have the alternative to close the fishery outside 3 nautical miles north and south of the Queets River. The Washington recreational fishery predominantly occurs between May and October with June-August being the peak of the fishery. They will receive monthly landings data. Data updates through June and received in July will be the best chance to respond effectively to a problem inseason. They do not anticipate a black rockfish problem, but would address an unlikely problem with a bag limit change. For lingcod, they would increase the size limit, reduce the bag limit, or go to non-retention (similar to Oregon's response).

Dr. McIsaac asked if there should be matching federal regulations. Mr. Anderson was not certain. Ms. Cooney said federal regulations should match, but the state can still act on its own. Anglers licensed in Washington have to conform to state regulations to land regardless of regulations in federal waters. Mr. Matthews highlighted the Columbia River example of having state regulations inside 3 miles that differ in federal waters.

D. Canary Rockfish Commercial Allocation Issues

Mr. Saelens and Mr. DeVore discussed the issue of seasonal use of bycatch rates derived from the West Coast Groundfish Observer Program (WCGOP) vs. the selective flatfish trawl exempted fishing permit (EFP). The difference in non-whiting trawl impacts of canary rockfish is 8.1 mt when using EFP-derived bycatch rates year-round or 10.6 mt when using EFP rates during the summer periods and WCGOP rates during the winter periods (with the rockfish conservation area [RCA] configuration and trip limits under Action Alternative 3 in the preliminary DEIS). The GMT and/or SSC should provide a recommendation in June on the best modeling approach.

GMT Report

Ms. Robinson reviewed the GMT report. She outlined 17 different trawl options without the additional four options for selective flatfish trawl. If the Council could give the GMT guidance on the trawl fishery allocation of canary rockfish, the GMT could then maximize the opportunities for the nontrawl fisheries to use the remaining available canary rockfish OY. This would include a set-aside for the whiting fishery that can be used in March for determining whiting specifications. The GMT could then recommend a whiting OY based on the available canary rockfish, similar to the analysis done in 2004 where the whiting OY was based, in part, on the predicted widow rockfish bycatch.

The group discussed alternative ways to compare the tradeoffs of varying canary rockfish impacts, such as settling the use of selective flatfish trawls or not first, then determining a commercial HG. Mr. Bodenmiller noted there are tradeoffs within the trawl fishery as well as tradeoffs for the other commercial sectors. Mr. Moore explained that the OY varies with the sector allocations, so it is difficult to pick a specific commercial HG. [NOTE: Table 1, which depicts 2005 and 2006 canary rockfish OYs in relation to variable commercial:recreational catch shares, has been appended to these draft summary minutes]. Additionally, we do not know the needs of the whiting fishery as the 2004 bycatch rates are not available. If you fix the non-whiting trawl and whiting sectors at a given HG, then any additional canary rockfish OY would go to other sectors. Mr. DeVore noted the maximum canary rockfish commercial allocation could be 10.6 mt based on existing modeling due to the fishery reaching the allowable take of some of the target species. Therefore, the idea of picking a commercial allocation is bound by factors that do not require SSC review. In the model run that attempted to allocate 12 mt of canary rockfish to the commercial fishery, target species take became limiting at 10.6 mt of canary rockfish. If the SSC recommends the use of selective flatfish trawl rates year-round, the difference between 10.6 mt and 8.1 mt would go to other sectors. Mr. DeVore recommended the Council should first receive SSC advice on the seasonal use of selective flatfish trawl rates and then decide whether the fishery should be managed using selective flatfish trawls exclusively shoreward of the RCA. Ms. Robinson said that would limit GAP input on the use of selective flatfish trawls. Mr. Moore reminded the group of the changing canary rockfish OYs under different sector allocations. The GMT will provide a table or summary of the OYs under various sector allocations. Dr. Burke recommended the exclusive use of selective flatfish trawls shoreward of the RCA in an attempt to limit the array of alternatives. Mr. Anderson noted that some Washington constituents were concerned about selective flatfish trawls. They reported that the increased trip limits from implementation of the selective flatfish trawls were not attainable in northern Washington. He was not willing to back a recommendation for selective flatfish trawls without going through the entire public process.

The GMT could narrow the range presented to the Council on Wednesday at the June Council meeting based on the SSC input on Monday. The Council could then provide guidance on the selective flatfish trawl issue on Wednesday.

E. Recreational Catch Sharing for Yelloweye Rockfish

Discussion of Status Quo, Regional Harvest Guidelines North and South of the Oregon/California Border, and State Harvest Targets

Mr. Anderson said he expected a preseason management intent from each state to manage to recreational yelloweye rockfish HGs specified at the Oregon-California border. He hoped to gain an Allocation Committee recommendation to the Council to manage recreational yelloweye impacts under two separate HGs: 3.7 mt south and 6.7 mt north. California would be expected to take inseason actions (depth closures, etc.) to manage to their HG and the states of Oregon and Washington would be expected to take what actions necessary to stay within the northern HG. The intent is to not exceed the state impact estimates.

Ms. Vojkovich said she was still at the same point as the last Allocation Committee meeting. She preferred no harvest guidelines for yelloweye rockfish. She said exceeding the yelloweye rockfish OY on a coastwide basis was not an issue. Oregon and Washington are not changing management strategies from 2004 and California is proposing widespread fishery restrictions. She was not clear where the need for regional management of yelloweye rockfish is coming from.

Dr. Burke thought this was a process issue. When this issue was first discussed by this committee, the recommendation was to not have a HG. State managers in April seemed to request state by state harvest targets. Oregon is not concerned about exceeding the OY or even having yelloweye rockfish become an inseason issue. No Council recommendation has ever included values for harvest targets, yet values keep coming forward from the GMT and are now in the DEIS. What happens on the Council floor should drive this process, not the desires of the GMT or the states. We have often talked about keeping these types of policy issues out of the GMT. This was voted on the Council floor twice and yet different issues continue to come forward. She strongly supports a coastwide approach at this time.

Mr. Anderson thought the action taken by the Council on Thursday in April was inappropriate as it circumvented public process. He also had trouble with the Allocation Committee making recommendations due to the lack of public process. Small numbers of available yelloweye rockfish and canary rockfish require state management response as the Council meetings are infrequent during the summer months. Implications that individuals were acting outside the process are incorrect and troubling.

Mr. Cedergreen said there are about 18 mt of canary rockfish and 10 mt of yelloweye rockfish available for recreational fisheries coastwide. These yields equate to about the same number of fish when you consider the average size of individuals. Why is there no need for a yelloweye rockfish HG and a need for a canary rockfish HG?

Ms. Robinson said the GMT looked at all of the options that were discussed in April. The GMT tried to determine how to specify HGs for yelloweye rockfish. The GMT reviewed all of the April Council motions. The Council directed the GMT to the Allocation Committee report which specified the use of values in the 2004 scorecard as an allocation alternative for yelloweye rockfish in 2005-2006.

Dr. Burke said the process is the problem, not the numbers. The range of alternatives is broader than the range suggested by the Council. The Council intent was to narrow the range of alternatives the GMT had to review. There needs to be better clarification on exactly what the motions state and, if there are concerns from the GMT, they should bring them back for Council consideration.

Mr. Anderson suggested the Allocation Committee step back and consider why HGs are important for the various species. Black rockfish has separate, area-specific assessments, and canary rockfish and yelloweye rockfish are constraining stocks.

F. *Other Issues*

The Allocation Committee recommended the GMT and GAP focus on alternatives that are structured with the following precepts:

- Non-trawl RCA boundaries for limited entry fixed gear and open access fisheries remain identical and at the lines specified in 2004 (seaward boundary at 150 fm south of 40°10' N. lat. and 100 fm north of 40°10' N. lat.);
- Any residual OY for any overfished species is not to be specified as a buffer;
- Use the 2004 Pacific whiting fishery canary rockfish impacts (7.3 mt) as a placeholder for 2005;
- The Council staff and ODFW will coordinate to ensure timely delivery of pertinent documents for SSC consideration of selective flatfish trawl bycatch rates;
- Use a tentative target for non-whiting trawl canary rockfish impacts of no more than 10 mt.

The meeting was adjourned at 4:00 P.M.

DEFINITIONS AND USAGES
May 27, 2004 Allocation Committee Meeting

Groundfish FMP (CH 2 pages 6 and 7)

"Harvest guideline (HG) is a specified numerical harvest objective which is not a quota. Attainment of a HG does not require closure of a fishery."

[Identical in Federal Regulations 50 CFR Part 660, Subpart G]

"Quota means a specified numerical harvest objective, the attainment (or expected attainment) of which causes closure of the fishery for that species or species group. Groundfish species or species groups under this FMP for which quotas have been achieved shall be treated in the same manner as prohibited species."

[Second sentence not included in Federal Regulations]

"Optimum yield means the amount of fish which will provide the greatest overall benefit to the U.S., particularly with respect to food production and recreational opportunities, and taking into account the protection of marine ecosystems, is prescribed as such on the basis of the maximum sustainable yield from the fishery as reduced by any relevant economic, social, or ecological factor; and in the case of an overfished fishery, provides for rebuilding to a level consistent with producing the maximum sustainable yield in such fishery."

[Federal regulations adds final sentence: "OY may be expressed numerically (as a harvest guideline, quota, or other specification) or non-numerically.]

Salmon FMP (pages 5-7 and 6-3)

"Inseason management actions may be taken by the NMFS Regional Director to assure that the primary objective of the chinook **harvest guidelines** for each of the four recreational subareas north of Cape Falcon are met. Such actions might include: closure from 0 to 3, or 0 to 6, or 3 to 200, or 5-200 nautical miles from shore; closure from a point extending due west from Tatoosh Island for 5 miles, then south to a point due west of Umatilla Reef Buoy, then east to shore; . . .; change species which may be landed; or other actions as prescribed in the annual regulations."

2004 Salmon Regulations

C.5. Inseason Management: Regulatory modifications may become necessary inseason to meet preseason management objectives such as quotas, harvest guidelines and season duration. Actions could include modifications to bag limits or days open to fishing, and extensions or reductions in areas open to fishing. NMFS may transfer coho inseason among recreational subareas north of Cape Falcon to help meet the recreational season duration objectives (for each subarea) after conferring with representatives of the affected ports and the Salmon Advisory Subpanel recreational representatives north of Cape Falcon. NMFS may also transfer fish between the recreational and commercial fisheries north of Cape Falcon if there is agreement among the representatives of the Salmon Advisory Subpanel.

Table 1. Canary rockfish OYs (in mt) in relation to West Coast groundfish commercial and recreational catch shares in 2005 and 2006. Harvest level alternatives are in accordance with the canary rockfish rebuilding plan and due to differential size selectivities of commercial and recreational fishing gears.

Catch Shares		Rebuilding Plan OYs (mt)	
Commercial	Recreational	2005	2006
20%	80%	35.3	37.0
30%	70%	37.9	39.4
40%	60%	40.4	42.0
50%	50%	43.0	45.0
60%	40%	46.8	48.6
70%	30%	50.7	52.6
80%	20%	54.5	57.1

PFMC
06/09/04

Exhibit C.6.b
Supplemental ODFW Report
June 2004

Memorandum

regon Department of Fish and Wildlife
Marine Resources Program
2040 S.E. Marine Science Drive
Newport, OR 97365
(541) 867-4741 FAX (541)867-0311

June 14, 2004

TO: Mike Burner, PFMC

FROM: Patricia Burke

RE: Exhibit C.6.b Supplemental Draft Allocation Committee Minutes

Thank you for the opportunity to review the Allocation Committee Minutes. I would like to offer the following corrections:

Page 5 under Oregon Recreational:
Please add the following at the end of the second sentence: "…fishery closure or possible bag limit changes earlier in the season".
Page 5 on the last line please add after: "…or lengthening the season and/or depth closures."

Page 8 Section D: third line after 8.1 add " (this is corrected to 4.5)."
Page 8 Section D, before the last sentence: …the preliminary DEIS). Recently, a fourth option has been devised which uses selective FFT rates for May-October. For Jan-April, and Nov-December, the selective FFT rates are increased or decreased pending the observed WCGOP data." The GMT….

Page 8, third paragraph:

Dr. Burke thought this was a process issue. When this issue was first discussed by this committee in March, the recommendation was not to have an HG for yelloweye. Public testimony ~~State managers in~~ at the April Council meeting ~~seemed to~~ requested state by state harvest guidelines ~~targets~~. Oregon is not concerned about ~~exceeding the OY or even having yelloweye rockfish become an inseason issue.~~ states being able to respond to any unexpected exceedences of yelloweye, and California is unlikely to confront yelloweye harvest problems. If CA did, we have suggested the HG at the CA border to give the state in-season authority to act. No formal Council recommendation has ever included values for three state harvest guidelines or targets, yet values keep coming forward from the GMT and are now included in the DEIS. What happens on the Council floor, particularly guidance in the form of motions that are voted on by the Council, should drive this process, not the desires of the GMT or ~~the~~ any particular state~~s~~. We have often talked about keeping these types of policy issues out of the GMT. This was voted on the Council floor twice and yet different state by state target numbers ~~issues~~ continue to come forward. ~~She strongly supports a coastwide approach at this time.~~ Because of this lack of consistency, she now can support one coastwide harvest guideline for yelloweye at this time.

Exhibit C.6.c
Supplemental GAP Report
June 2004

GROUNDFISH ADVISORY SUBPANEL STATEMENT ON TENTATIVE ADOPTION OF GROUNDFISH MANAGEMENT MEASURES FOR 2005/2006 FISHERIES

The Groundfish Advisory Subpanel (GAP) met with the Groundfish Management Team (GMT) to develop management measures for the 2005 / 2006 groundfish fishery. The GAP offers the following responses to the recommendations made by the GMT. In addition, we address certain management issues that were not covered by the GMT.

CANARY ROCKFISH OY

The GAP agrees with the GMT recommendation and suggests an additional policy direction for the Council. While we believe that there should be some flexibility to deal with changes in fishing strategy and unexpected occurrences that change the projected impact on overfished species, the majority of the GAP supports a Council policy that would give a priority to using bycatch "savings" in the fishery sector that provided the savings. A minority of the GAP believes that no such priority should be established.

OTHER FLATFISH ABC AND OY

The GAP examined the methodology used by the GMT to recommend an ABC and OY for other flatfish. The GAP agrees that the derivation of the ABC number is reasonable and supports the GMT recommendation. However, the GAP strongly disagrees with the OY recommendation. Flatfish landings have been reasonably constant over the years and the flatfish fishery is not conducted in any area that might be considered a habitat area of particular concern. Under normal Council policy, if these stocks had been assessed, the OY would be set equal to the ABC. The GAP sees no reason to deviate from this policy and recommends that the OY be set at 6,781 mt, equal to the ABC.

OTHER FISH OY

The GAP agrees with the GMT recommendation.

DOVER SOLE ABC

The GAP agrees with the GMT recommendation.

RESEARCH CATCHES

As discussed under Council Agenda item C.1, the GAP is aware that research catches have potentially exceeded the canary rockfish impacts that were identified for 2004. If research fishing *of any kind* does exceed predicted impacts and no excess canary impacts can be identified, the Council will be forced to take management actions affecting commercial and / or recreational fishing, even though the research may contribute little to fisheries conservation and management. This situation exists because neither the Council nor the National Marine Fisheries Service (NMFS) has any regulatory authority over scientific research in federal waters. While states can - and do - exercise some authority over research, the extent of that authority is limited when it involves activities in the exclusive economic zone. In short, our commercial and recreational fisheries may have to pay the price for excesses in scientific "fisheries" over which no one has any control and which may provide few benefits. Sadly, this could serve as a disincentive for the fishing community to support scientific research, especially when it involves species with relatively small OYs.

Although the long term solution will require a change in federal law, the GAP has several interim recommendations to help temporarily resolve this problem.

First, the Council has an option available under section 303(b)(11) of the Magnuson Stevens Act to deduct scientific research catches from the allowable biological catch (ABC), rather than the optimum yield (OY). The GAP has previously recommended that the Council take this approach to accommodating research catch and makes that recommendation again today in regard to all groundfish species and species complexes for which an OY has been established and which are not being managed under formally adopted rebuilding plans.

Second, in the case of rebuilding species, the GAP recommends that the Council immediately begin the plan amendment process so that the rebuilding plans - which are incorporated as fishery management plan amendments - can be reconfigured to allow the option of subtracting research catch from the ABC. The GAP notes that nearly two dozen stock assessments are scheduled for next year, some of which include the mandatory two-year review of rebuilding species, so that now would be a perfect time to make this correction.

Last, the GAP recommends that the Council, as part of any communication to Congress or the executive branch regarding amendments to the Magnuson Stevens Fishery Conservation and Management Act, support a change in the law that will allow control by the Council and / or NMFS over scientific research catches involving overfished species.

CREATION OF NEW MANAGEMENT LINES

The GAP supports the GMT recommendations on creating new management lines.

CATCH SHARING AND HARVEST GUIDELINES

The GAP partially supports the language of the GMT report. The GAP supports the recreational catch sharing options for black rockfish, and lingcod described in section 2.2.1 of Exhibit C.6.a, Attachment 1 (Preliminary Draft Environmental Impact Statement, May 2004). In regard to canary rockfish, the GAP suggests the following change to the option described in that section:

Divide the recreational catch between the north and the south at the Oregon-California border [42° N.]. Under this option, for 2005 and 2006, there would be established a 9.3 mt harvest guideline in California and an 8.5 mt harvest guideline shared by Oregon and Washington.

In regard to yelloweye rockfish, the GAP suggests the following change to the option described in that section:

Divide the recreational catch between the north and the south at the Oregon-California border [42° N.]. Under this option, for 2005 and 2006, there would be established a 3.7 mt harvest guideline in California and a 6.7 mt harvest guideline shared by Oregon and Washington.

By establishing harvest guidelines south of 42° N., the Council will provide California with the authority necessary to make in-season changes in its recreational fishery in response to resource and management needs.

CONVERSION OF EXEMPTED FISHING PROVISIONS TO FEDERAL REGULATIONS
The GAP supports the GMT recommendations.

AREA-SPECIFIC MANAGEMENT MEASURES
The GAP generally supports the GMT recommendations on area-specific management, with one refinement regarding the whiting fishery.

As seen last week in the mothership sector of the whiting fishery, a single unexpected trawl tow can have serious consequences for bycatch avoidance. The Oregon Department of Fish and Wildlife has made a preliminary recommendation that areas with historically high bycatch rates in the whiting fishery be identified and targeted for potential closure if the need arises.

Fishermen have pointed out that identifying discrete areas based on historical data makes little sense, as both concentrations of fishing effort and concentrations of bycatch species vary from year to year. Unfortunately, the most common way to detect a concentration of bycatch species is by catching them.

Rather than identifying specific areas pre-season which could be closed, the GAP recommends that the Council and appropriate state agencies consider some authority for temporary rolling closures in the whiting fishery in the event that a discrete area can be identified during the course of the whiting season where a closure would help avoid bycatch of sensitive species. The GAP would be happy to work with managers to explore options that might be made available for next year's whiting fishery.

COMMERCIAL MANAGEMENT MEASURES
Limited Entry Trawl Whiting
The GAP agrees on establishing a placeholder amount of 7.3 mt of canary rockfish for the whiting fishery. The GAP will defer further discussion of whiting management until the March, 2005, Council meeting.

Limited Entry Trawl Non-Whiting
The majority of the GAP supports trawl trip limit option 3 as shown on Table 3 of the GMT report. Although this option has slightly higher canary impacts, it avoids confusion in the fishery by establishing uniform coast-wide RCA boundary lines all year. This should also facilitate enforcement.

A minority of the GAP supports trawl trip limit option 2 as shown on Table 2 of the GMT report. They expressed concern that the ratio of Dover sole to sablefish in periods 1, 2, and 6 under option 3 would result in higher sablefish discards in the southern portion of the northern management area.

The GAP also requests that the coordinates for the 150 fathom line off Washington be re-examined. Reports from fishermen indicate that the published line coordinates do not match the 150 fathom line available for the winter petrale fishery.

Limited Entry Fixed Gear and Open Access

The GAP supports the GMT recommendation with the following additions:

- for open access north of 40°10', the lingcod fishery will be open from April 1 until October 31 with a monthly limit of 300 lbs.

- for open access south of 40°10', the lingcod fishery will be open from May 1 to October 1 with a monthly limit of 500 lbs.

Incidental take of lingcod in the troll salmon fishery

Although not considered by the GMT, the GAP discussed requests from the troll salmon fishery to obtain access to non-salmonids within the Rockfish Conservation Area (RCA), as it has on two previous occasions. Both times, the GAP re-affirmed its support of the existing exemption for an incidental harvest of yellowtail rockfish, but opposed expanding troll salmon take of groundfish species within the RCA when that opportunity is not available to other open access vessels.

The GAP considered the request made by the Washington Trollers Association for an incidental take of lingcod, along with a similar request made by Oregon trollers. Both proposals, although structured somewhat differently, would allow salmon troll vessels operating in the RCA to retain lingcod based on some ratio of lingcod landings to salmon landings.

Once again, the GAP unanimously opposed the request. GAP members pointed out that a lingcod allowance could lead to targeting lingcod and that the impacts on scarce canary rockfish could be severe. Further, salmon troll vessels already have the right to retain lingcod taken outside the RCA under open access limits. The GAP sees no reason to create a new fishery for an overfished species in an area deliberately established to protect overfished species. Lingcod have an excellent post-hooking survival rate and can easily be discarded if taken incidentally with little harm to the resource. The GAP continues to support the yellowtail rockfish exemption as it does not involve an overfished species, was established prior to the creation of the RCA, and converts dead discards to landed catch.

OREGON NEARSHORE MANAGEMENT

The GAP supports the GMT recommendations.

CALIFORNIA NEARSHORE MANAGEMENT

The GAP supports the GMT recommendations.

RECREATIONAL MANAGEMENT MEASURES

With one exception, the GAP supports the recreational measures recommended by the GMT. In the case of minimum size limits for recreational lingcod in California, the GAP recommends a minimum size of 24". Given the larger number of small lingcod appearing in the fishery, the smaller size limit will effectively put less recreational effort on the water by allowing anglers to reach their limits earlier and with fewer discards.

MISCELLANEOUS ISSUES

The GAP was reminded that actual bycatch caps for EFP fisheries must be set under this agenda item. The GAP repeats the recommendations it made under agenda item C.5:

- set the Oregon and California selective flatfish trawl EFP caps as proposed;
- reduce the Washington arrowtooth EFP cap on canary to 1.5 mt;
- reduce the Washington dogfish longline cap on yelloweye to .5 mt.

GAP response to GMT recommendations

1. Support with the additional GAP recommendation for policy direction.
2. Support
3. Support
4. Support the recommendation on lingcod, see separate GAP recommendation on yelloweye.
5. Adopt the GAP recommendation on canary
6. Support
7. Support
8. Support
9. The GAP provided a separate alternative for temporary closures in the whiting fishery.
10. The GAP provided separate majority and minority views on non-whiting limited entry trawl management measures.
11. The GAP suggested additional open access measures for open access lingcod
12. The GAP made one alternative suggestion for California recreational lingcod size limits.
13. The GAP recommended modified bycatch caps for two EFPs.

PFMC
06/16/04

Exhibit C.6.c
Supplemental GMT Report
June 2004

GROUNDFISH MANAGEMENT TEAM (GMT) REPORT ON 2005-06 GROUNDFISH MANAGEMENT MEASURES

Based on the range of ABCs and OYs that the Council adopted, the GMT developed and discussed management measures for the 2005-06 commercial and recreational groundfish fisheries with the Groundfish Advisory Panel (GAP), and recommends the following:

CANARY ROCKFISH OY

The canary OY calculation will be based upon how harvest is divided between the commercial and recreational fisheries. The GMT anticipates that there will be some small residual amount of the OY that is not assigned to a particular fishery in the bycatch scorecard. An OY cannot be recalculated inseason; however, the GMT anticipates that the Council may need to use this residual amount of canary rockfish OY to account for unexpected changes. If that residual amount is used to account for an overage in the recreational fisheries, the entire amount may not be available to those fisheries because of the greater per pound impact of the recreational fisheries on meeting rebuilding obligations.

OTHER FLATFISH ABC AND OY

The GMT recommends establishing a new ABC for the other flatfish group of 6,781 mt. This is based on the highest 1981-2003 landings of sanddabs (1995) and rex sole (1982) and on the 1994-98 average landings for the remaining species in the group and applying an estimated discard rate (see Table 4.3-3 on p. 123 in the draft EIS). The GMT then applied a 25% data-moderate reduction for sanddabs and rex sole, and a 50% precautionary reduction to the remaining “other flatfish” species (butter sole, curlfin sole, flathead sole, rock sole, sand sole, and starry flounder), for a recommended OY of 4,909 mt.

OTHER FISH OY

The GMT recommends that the Council-preferred ABC and OY for “other fish” be rounded from 14,597 mt to 14,600 mt and 7,298 mt to 7,300 mt, respectively.

DOVER SOLE ABC

The Dover sole ABC as presented in the ABC/OY table is outdated (the OY projection is correct). The GMT is expecting an updated Dover sole ABC from the assessment author and requests the Council provide us the latitude to make that correction when the information becomes available.

RESEARCH CATCHES

The largest expected research removals of most species occur in the major trawl surveys conducted by the Northwest Fisheries Science Center (NWFSC). The principal ongoing survey of this type is the combination shelf-slope survey that was initiated in 2003. From 1977 to 2001, the Alaska Fisheries Science Center conducted a triennial survey of the shelf. In 2004, to provide data for 2005 stock assessments and to help calibrate the new shelf-slope survey with the prior shelf time series, the NWFSC is conducting a "Triennial"-style shelf survey.

The NWFSC is scheduled to conduct the U.S.-Canada whiting survey in 2005, but not in 2006. Additionally in 2005, the NWFSC is scheduled to conduct its combination shelf-slope survey. The "Triennial"-style shelf survey conducted by the NWFSC in 2004 will not be repeated in 2005. Subject to the availability of funding and contract vessels, the NWFSC may conduct this survey again in 2006. The current GMT projections of research catch in 2006 assume that both the "Triennial"-style shelf survey and the NWFSC's combination shelf-slope survey will be conducted in 2006. Other major surveys include the NWFSC U.S.-Canada whiting survey, the NWFSC cooperative whiting pre-recruit survey and the International Pacific Halibut Commission longline survey for Pacific halibut. Projected research catches for all research activities during 2005-06 that have reported to the Northwest Region are provided in Attachment 1, Tables X and Y.

The GMT notes that the ability to produce reliable projections of total research removals is dependent upon the Northwest Region receiving pre-research estimates and post-research summaries of species catch. Currently, the Northwest Region is not provided with catch information for many of the research projects for which it receives notification. All organizations conducting extractive research activities are strongly encouraged to communicate expected and realized catches to the Northwest Region in a timely manner.

CREATION OF NEW MANAGEMENT LINES

The GMT recommends the following management lines be established in federal regulations for groundfish management:

1. A depth management line for the area south of 42° N. latitude (OR/CA border) at 40 fms
2. A latitudinal management line be specified at Pigeon Point (37°11'N. lat.) off California
3. Latitudinal management lines off Washington at: Cape Alava, Queets River, and Leadbetter Point. The coordinates for these latitudinal lines have been provided to NMFS.
4. Latitudinal management lines off Oregon at: Cape Falcon (45°46'00 N. lat.); Cascade Head (45°03'50" N. lat.); Heceta Head (44°08'18" N. lat.); Cape Arago (43°20'50" N. lat.); Humbug Mountain (42°40'30" N. lat.); and Mack Arch (42°13'40" N. lat.).

CATCH SHARING AND HARVEST GUIDELINES

Based on the guidance provided by the Council to date, the GMT has analyzed the following harvest guideline alternatives:

<u>Black Rockfish Sharing Between Oregon and California</u>

As in 2004, the GMT recommends carrying forward the black rockfish catch sharing recommendation of 58% to Oregon and 42% to California within the southern OY, and specifying those values as harvest guidelines in the federal regulations for the respective states.

The states of California and Oregon have factored in precautionary approaches in managing to these black rockfish targets, which are described herein at the sections on nearshore and recreational fisheries management.

Harvest Guidelines for Canary Rockfish

The GMT has analyzed separate harvest guidelines for canary rockfish for the recreational fisheries, by state, which would be divided at the state borders (42° N latitude between CA and OR and at 46°16' N latitude between OR and WA). The harvest guidelines would be:

WA = 1.7 mt
OR = 6.8 mt
CA = 9.3 mt

These values remain constant across all canary rockfish OY alternatives for 2005 and 2006. The understanding would be for the states to manage their respective recreational fisheries to stay within those harvest guidelines specified. The management response expected to be taken when the state recreational canary harvest guideline is projected to be exceeded is described under the recreational fisheries section of this report.

Harvest Guidelines for Lingcod

The GMT recommends that the Council set separate harvest guidelines for lingcod for the state recreational fisheries for 2005-06, by dividing the harvest guidelines into North (OR & WA) and South (CA) areas. These harvest guidelines would be divided at the CA and OR border. The GMT notes that the stock assessment area was divided at Cape Blanco, Oregon (43° N. latitude) and the OR/CA border is at 42° N. latitude. The GMT developed and recommends a formula based on the CPUE data from the Resource Assessment and Conservation Engineering (RACE) survey from 1995-2001 to account for the amount of lingcod that should be transferred from the southern area to the northern area to account for the line shift. The recreational harvest guidelines would be:

2005	2006
North = 206 mt	North = 239 mt
South = 422 mt	South = 422 mt

The understanding is for the states to manage their respective recreational fisheries to stay within those harvest guidelines specified. The remaining amounts from the two areas would then be pooled. The catch projections to accommodate the limited entry trawl, fixed gear, and open access fisheries were then removed from the combined pool and managed on a coastwide basis.

Harvest Guidelines for Yelloweye Rockfish

The GMT recommends that the Council set separate harvest guidelines for yelloweye rockfish for the state recreational fisheries for 2005-06, by dividing the harvest guidelines into North (OR & WA) and South (CA) areas. These harvest guidelines would be divided at the CA and OR border. The harvest guidelines for both 2005 and 2006 would be:

North = 6.7 mt
South = 3.7 mt

CONVERSION OF EXEMPTED FISHING PROVISIONS INTO FEDERAL REGULATIONS

The GMT discussed the conversion of fisheries conducted under past exempted fishing permits (EFPs) into federal regulations that would apply fleetwide. The GMT focused its discussion primarily on the former Oregon Selective Flatfish Trawl EFP and the current Washington Arrowtooth Flounder Trawl EFP. The GMT has received presentations and written reports on the results from both of these EFPs and, because the data demonstrate that use of these gear configurations result in lower bycatch of overfished rockfish (particularly canary), the GMT believes these data should be used for management purposes. The use of Selective Flatfish Trawl gear has been addressed in the draft EIS for 2005 and 2006 management measures for the area north of 40°10' and a detailed analysis is provided in Attachment 2.

For the area south of 40°10', the California Selective Flatfish EFP was conducted in 2003 and is planned for 2004; pending review of the results of the data collected, the GMT recommends that consideration be given to apply the Selective Flatfish Trawl provisions off California south of 40°10' inseason in 2005 or 2006.

The GMT understands that implementation of the Arrowtooth Trawl proposal will require an EA tiered EA from the 2005-06 specifications EIS.

AREA-SPECIFIC MANAGEMENT MEASURES (i.e., "hotspots")

The GMT believes that more refined area-specific management should be considered for 2005-2006. Information collected through the federal observer program, state-sponsored EFPs, and data collected through other fishery dependent and independent sources continue to further define the locations of both target species and species of concern. Focusing fisheries in areas of high abundance of target species with relatively lower incidence of overfished species may provide both better fishing opportunity as well as conservation benefits than coordinates approximating broad depth strata. Additionally, the implementation of VMS provides us with a tool to accurately manage where fishing occurs.

The GMT has included a qualitative discussion of the use of "hotspots" for management in the 2005-06 Specifications Environmental Impact Statement (EIS). This analysis would include current descriptions of conservation areas, such as the Yelloweye Rockfish Conservation Area in Washington and the Cordell Banks and Cowcod Conservation Area in California. The potential use of "hotspots" could also be considered as inseason measures for commercial and/or recreational fisheries during the 2005 and 2006 fishing periods. One inseason implementation of "hotspots" could include closing areas of higher widow rockfish encounters for the whiting fishery during the primary season. The GMT's understanding is that the implementation of "hotspots" may require an EA tiered from the 2005-06 specifications EIS.

COMMERCIAL MANAGEMENT MEASURES

Limited Entry Trawl Whiting Fisheries

The GMT anticipates that the whiting fishery will be constrained by the amount of widow rockfish available to be harvested in 2005 and 2006, and notes that the whiting OY is scheduled to be set annually in March. However, while the Council is scheduled to adopt the whiting OY next spring, the Council should factor in canary bycatch in the whiting fishery when adopting the management measures for the non-whiting groundfish fisheries.to provide estimates of impacts for consideration as part of the overall 2005-06 management package. Based on the guidance provided by the Allocation Committee, the GMT recommends that a placeholder of 7.3 mt of canary rockfish be specified in the scorecard for whiting fisheries. The GMT also recommends that set asides for the whiting fishery for the following species be: sablefish (15 mt); yellowtail (300 mt); widow (residual after all non-whiting fisheries have been accommdated).

The GMT also recommends that a mechanism be established to allow NMFS to implement an inseason closure of the whiting fishery as part of routine management in response to bycatch concerns which may arise inseason.

Limited Entry Trawl Non-Whiting Fisheries

The GMT developed and analyzed a multitude of limited entry trawl trip limit alternatives which required the use of either small footrope or selective flatfish gear shoreward of the RCA, and have narrowed the alternatives down to those described in Attachment 1. The GMT recommends that selective flatfish gear be required shoreward of the trawl RCA with the trawl RCA boundaries and trip limits described in Attachment 3, Table 1. All other trip limits for limited entry trawl for 2004, including the inseason adjustments adopted by the Council yesterday, would remain in effect for 2005 and 2006.

Limited Entry Fixed Gear and Open Access

The GMT recommends status quo non-trawl RCA boundaries (100 fms north of 40°10' and 150 fms south of 40°10') and status quo trip limits and management measures for the limited entry fixed gear and open access fisheries coastwide for 2005 and 2006. Using the Council preferred OY for sablefish approved in April, the sablefish tier limits would be:

	2005	2006
Tier 1	64,000 lbs	63,000 lbs
Tier 2	29,100 lbs	28,600 lbs
Tier 3	16,600 lbs	16,400 lbs

The trip limits for the sablefish daily trip limit (DTL) fishery for limited entry fixed gear and open access would remain at status quo levels (300 lbs/day; 900 lbs/week; not to exceed 3600 lbs/2 mo.) in 2005 and 2006. All other trip limits for limited entry fixed gear and open access for 2004, including the inseason adjustments adopted by the Council yesterday, would remain in effect for 2005 and 2006.

Tribal Fisheries

The GMT recommends that the Council approve the management measures proposed by the Tribes in the tribal statement.

OREGON NEARSHORE MANAGEMENT

During 2005-06, the potential exists for major increases in nearshore commercial lingcod harvest, primarily with hook and line gear. Excessive lingcod harvest in this area could result in localized reef depletions, undesirable sport and commercial fishery conflicts, and undesirable bycatch impacts. Allowing too much harvest too quickly might also jeopardize the currently healthy stock status in the northern portion of the stock. The Oregon Department of Fish and Wildlife proposes the use of open access trip limits, differential lingcod size limits, or both, to limit increases in commercial lingcod harvest in nearshore rocky areas. In addition, ODFW will continue with the nearshore management strategies previously established for black rockfish, blue rockfish, other nearshore rockfish, cabezon and greenling for 2005 and 2006.

CALIFORNIA NEARSHORE MANAGEMENT

To simplify nearshore management and provide for a more stable fishery in 2005, it may be worthwhile to consider combining components of the shallow nearshore, deeper nearshore and CA scorpionfish complexes into a single nearshore rockfish complex. However, black rockfish should be managed and tracked seperately. This would allow the nearshore fisheries to be managed on a finer geographic scale without creating an excessive number of harvest guidelines to track and manage.

Nearshore recreational fisheries in California have proved difficult to forecast in recent years, resulting in emergency inseason actions by both state and federal jurisdictions. This has created a large workload for staff and has resulted in considerable confusion among the angling public. Inseason recreational management changes are difficult to convey to the public, resulting in low compliance with the modified regulations. Consequently, the approach to 2005 recreational management recognizes the high degree of uncertainty in the ability to forecast catches and distribution of effort. Based on the 2005 projections, the draft options were developed recognizing the need to restrict the take of overfished species, including lingcod, cowcod, bocaccio, yelloweye, and canary rockfish, and to keep catches to allowable recreational levels for nearshore rockfish, (including black rockfish), cabezon and greenlings. New authority for a more rapid state regulatory response has been obtained, in the event that the fishery does not behave as expected and catches exceed the expected level. Actions that may be taken with a ten-day notice include closure of specified geographic areas, depths, non-retention of species, and time closures for part or all of the remainder of the season.

Regional management of nearshore fisheries will continue in 2005-06 with primary regional breaks at 40°10' N. lat to Point Conception (34°27' N. lat.) (Central region) and Point Conception to the US/Mexico border (South region). Within the Central region, different regional management divisions are proposed for the commercial and recreational fisheries. Commercial nearshore permits are tied to specific areas, north and south of Año Nuevo (37°04' N. lat.), whereas the recreational split would be at Pigeon Point (37°11' N. lat.). The difference in management lines is not considered to create a problem for inseason tracking and management.

Commercial Nearshore

For the most part, commercial nearshore groundfish fishery options under Council consideration are the same as 2004 (relative to season duration, RCA shallow depth boundaries, Cowcod Conservation Area boundaries, trip limits, and decoupling from recreational seasons), primarily due to continuation of harvest limits for the most constraining shelf species.

However, there may be increased opportunities for higher lingcod trip limits, provided that these do not result in increased targeting of lingcod (increased bycatch of canary). The intent would be to allow retention of catch that occurs during normal nearshore fishing practices on an increasing basis as the stock rebuilds, but only at a level which does not increase any targeting on the species.

A nearly year-round rockfish season with a 2-month closure in the spring is proposed again for 2005-06 with status quo trip limits for the nearshore rockfish fishery south of 40°10'. Constituent input indicates a preference for an alignment of the closed period for nearshore rockfish, cabezon and greenling in the central and south regions in March and April (Wave 2). This represents a departure from the status quo and may reduce enforcement and industry concerns related to vessels crossing between regions to fish when adjacent areas are closed. A compounding issue results from the lower California cabezon OY for 2005-06, which requires lower commercial trip limits. Commercial cabezon trip limits are established by the California Fish and Game Commission and are expected to be adopted in late August 2004. The intent of the revised season structure is to maximize economic returns by setting rockfish trip limits that span the 10-month season even if cabezon limits are set very low during certain less-desirable months to provide for higher limits during more desirable months. The revised cabezon trip limits under consideration are not presented here for Council input and, per consultation with NMFS, federal regulations will refer to state-adopted regulations for specific trip limits in 2005-06.

RECREATIONAL MANAGEMENT MEASURES

As in 2004, the GMT believes that recreational fisheries measures for 2005 and 2006 should be intended to reduce take of overfished species, primarily bocaccio in the southern area, yelloweye rockfish in the northern area, and canary rockfish coastwide. Following advice received from the Council, the GMT recommends prohibiting retention of both canary and yelloweye rockfish. This prohibition is intended to discourage any targeting by recreational fisheries to reduce the potential of additional targeted catch of those species beyond true unavoidable catch, some of which would be expected to survive if encountered in shallow water. These prohibitions are recommended even in light of the fact that they result in creating some limited discard. This unavoidable discard mortality should be weighed against the benefit of removing incentives to target these species. The prohibitions are recommended to address the low and uncertain stock status of those species, the uncertainty in our ability to track actual removals in all fisheries and the disproportionate effects of recreational removals on rebuilding trajectories. Retention prohibitions for cowcod would also continue in 2005 and 2006.

Specific state recreational management measures include:

Washington

The Washington Department of Fish and Wildlife is proposing status quo regulations for its recreational fisheries in 2005 and 2006. These regulations are:

- 15 aggregate bottomfish bag limit
- 10 rockfish sublimit with no retention of canary or yelloweye rockfish
- 2 lingcod sublimit, with a minimum size limit of 24" and a status quo season
- Continuation of “C-Shaped” Yelloweye Rockfish Conservation Area off North Coast

If the harvest guideline for canary or yelloweye specified for Washington are projected to be exceeded, the Washington Department of Fish and Wildlife would take action inseason to close all or portions of the recreational fishery deeper than 30 fms.

Oregon

The Oregon Department of Fish and Wildlife (ODFW) is proposing status quo regulations for its recreational groundfish fisheries in 2005 and 2006, except that Pacific halibut will not be included in the 10 marine fish bag limit. The proposed regulations are:

Season: Open all year at all depths except closed outside of the 40 fathom curve from June 1 through September 30. Possession of groundfish prohibited in waters deeper than the 40 fathom curve during the June through September offshore closure period (consistent with current Oregon state regulations).

Daily Bag Limit: 10 marine fish including rockfish, greenling, cabezon, and other species, not including salmon species, lingcod, Pacific halibut, perch species, sturgeon, sand dabs, striped bass, tuna, and bait fish (herring, smelt, anchovies and sardines). A two fish daily bag limit for lingcod. No retention of yelloweye rockfish and canary rockfish.

Minimum Length Limits:

* Lingcod: 24 inches
* Cabezon: 16 inches
* Greenling species: 10 inches

Potential Inseason Changes: The effect of changes in the structuring of the recreational fishery for the 2004 fishery (offshore closures, harvest guidelines, etc.) will not be known at the time of adopting 2005-06 management measures. The following are suggested management measures that could be implemented inseason if the 2005 (or 2006) fishery does not proceed as expected.

1. Change the length of closure periods outside of 40 fathoms if impacts on overfished species are different than anticipated. Impacts not to exceed harvest guidelines established preseason on overfished species unless authorized by the Council.

2. Implement gear restrictions and/or release techniques to reduce the impact of overfished rockfish species if successful techniques are developed, researched, reviewed, and accepted. Impacts not to exceed harvest guidelines established preseason on overfished species unless authorized by the Council.

3. If information is available, move from large offshore RCA closures to closing hot spots of known canary rockfish and yelloweye concentrations or open cold spots of areas known to have no or low concentrations of canary rockfish and yelloweye rockfish. Impacts not to exceed harvest guidelines established preseason on overfished species unless authorized by the Council.

Management measures: Oregon has a responsive port based monitoring program through their Ocean Sampling Recreational Boat Survey (ORBS) and regulatory processes in place to track harvest and take actions inseason if necessary. Inseason actions include changes to size limits, bag limits (including non retention), seasons, depths and area closures.

Depth management will be the main inseason tool for controlling canary rockfish and yelloweye rockfish harvest as retention is prohibited. Offshore closures may be implemented inseason at 30 and/or 20 fathoms as the presence of these two species is reduced nearshore and release survival increases. Other options include area closures (for federally managed species they would be based on established management lines for salmon and Pacific halibut fisheries). Bag limits (including non-retention) and size restrictions are the likely inseason tool to use for lingcod, cabezon and greenling as release survival is very high. They may also be used to reduce harvest on nearshore species, such as black rockfish. In addition to inseason options, total closure of the groundfish recreational fishery may be implemented to stay within harvest limits.

California

The California Department of Fish and Game is proposing options for the recreational structure for 2005-06 in relation to concerns for staying within harvest targets or harvest guidelines (HGs), particularly for species under rebuilding plans. This includes continued non-retention of canary and yelloweye rockfish statewide. In addition, the following options are proposed:

1. General

(a) Manage recreational fisheries through a regional management approach to address specific management and fishery needs in each of three Rockfish and Lingcod Management Areas (RLMAs) in the north (42° to 40°10’), central (40°10’ to Pt. Conception), and South (Pt. Conception to Mexico border). The Central RLMA may be further subdivided into two or three smaller areas to accommodate regional differences in fisheries and resources.

(b) Recombine the nearshore species groups of shallow NS, deeper NS, and California scorpionfish south of 40° 10’ as follows:
- o Central and Southern RLMA: Black RF; Other minor NS RF

(Shallow + deeper NS RF + CA scorpionfish)

2. Changes to size limits and retention allowances (bag limits)

(a) Lingcod: 26 inch minimum size, 2 fish bag.

(b) Decrease the sub-bag limits for cabezon and greenlings in the Rockfish, Cabezon, and Greenling complex (RCG complex).

(c) Differential RCG Complex bag limits for CPFV and other recreational fishing modes

3. Changes to fishing management areas, seasons and depths

The proposed options provide for the use of closed seasons and depths for rockfish, lingcod and associated species (*i.e.*, cabezon, greenlings, California scorpionfish, California sheephead, and ocean whitefish). The proposed fishing seasons and depths vary by Rockfish and Lingcod Management Area (RLMA) and, in some cases, by species or species group. The currently proposed changes to management areas, seasons and depths are presented below, but may be modified prior to adoption by the Council.

(a) Divide the Central RLMA [40°10’ N. latitude (near Cape Mendocino) to 34°27’ N. latitude (Point Conception)] into two or three areas.

(b) In the Northern RLMA (the Oregon-California border to 40°10’ N. latitude), allow fishing for as few as four months and only in waters less than 40 fathoms in depth.

(c) In the Central RLMAs, allow fishing for as few as five months, with a maximum fishing depth out to 40 fathoms. Opportunities for fishing out to 40 fathoms for multiple months are in combination with closure of more shallow waters.

(d) In the Southern RLMA (34°27’ N. latitude to the California-Mexico border), allow fishing for as few as five months, with a maximum fishing depth out to 60 fathoms in combination with closure of more shallow waters.

(e) Exempt all divers (or shore-based divers only) and shore-based anglers from closures for rockfish, cabezon, greenlings, California scorpionfish, California sheephead, and ocean whitefish (as described in (b), (c), and (d), above), and from any closures for lingcod which may be established from April through October.

(f) In all RLMAs, prohibit the retention of lingcod during the primary spawning and nesting season (possible closed months: January, February, March, November, and December).

(g) Prohibit the retention of lingcod during any rockfish closure due to concerns about bycatch of rockfish in the lingcod fishery.

Specific proposals based on the options listed above are provided in Attachment 4 (to be provided).

GMT Recommendations

1. Approve the GMT recommendation for calculating the canary OY and a range of possible inseason outcomes for the residual amount of canary.
2. Approve the establishment of the proposed management lines.
3. Approve the GMT recommended catch sharing for the southern black rockfish OY of 58% to Oregon and 42% to California and the establishments of harvest guidelines for Oregon and California for those amounts.
4. Approve the GMT recommended recreational harvest guidelines North and South for lingcod and yelloweye, with the division at the Oregon/California border (42° N. lat.).
5. Approve the establishment of state harvest guidelines for canary rockfish, or provide additional guidance to the GMT on alternatives.
6. Approve the GMT recommendation for implementation of the Selective Flatfish Trawl gear.
7. Provide direction to move forward with consideration of converting the Arrowtooth Trawl EFP into federal regulations through a tiered EA process.
8. Approve the GMT recommended placeholder of 7.3 mt of canary rockfish for the whiting fisheries.
9. Approve the GMT recommendation to add an inseason mechanism which would allow NMFS to consider closing the whiting fishery inseason in response to bycatch concerns which may arise.
10. Approve the GMT recommendations for limited entry trawl management measures.
11. Approve the GMT recommendations for the limited entry fixed gear and open access management measures.
12. Approve the GMT recommended state recreational management measures.
13. Specify EFP caps to be set aside for the EFPs which were approved under agenda item C.5.

Attachment 1

Table X.--Predicted Catch from Scientific Fishing per Year in 2005

Scientific Fishing Description	Whiting Catch	Lingcod Catch	POP Catch	Bocaccio Catch	Canary Catch	Widow Catch	Darkblotched Catch	Yelloweye Catch	Cowcod Catch	Sablefish Catch	Dover Sole Catch	Arrowtooth Catch
AFSC - Post Capture and Mortality of Bycatch [1/]	0	87.6	0	0	0	0	0	0	0	0	0	0
NWFSC - Slope and Shelf Survey	68359	9266	7832	494	3700 *	2084	8291	547	28	32310	68326	14111
NWFSC - Cooperative Pre-Recruit Whiting Survey [1/]	85730	131	0	0	0	0	0	0	0	0	41	0
NWFSC - Sablefish Pot Survey	0	0	0	0	0	0	0	0	0	33927	3	0
NWFSC - US/Canada Echo Whiting Integration and Oceanographic Survey	113783	19	28	16	7	9	130	0	0	146	290	228
NWFSC - Fixed Gear Survey in California Bight	0	45	0	435	0	0	0	0	12	0	0	0
NWFSC - Groundfish Acoustic Monitoring [1/]	0	44	0	0	0	0	0	0	0	0	0	0
IPHC - Halibut Survey [1/]	446	394	0	0	20	0	0	1553	0	39851	0	374
ODFW - Flatfish Selective Pot Gear	0	0	0	0	0	0	0	0	0	0	0	0
Total (lb)	268318	9987	7860	945	3727	2093	8421	2100	40	106234	68660	14713
Total (mt)	121.7	4.5	3.6	0.4	1.7	0.9	3.8	1.0	0.0	48.2	31.1	6.7

* Canary projection based on 2003 final catch and preliminary 2004 data.

Table X (cont.).--Predicted Catch from Scientific Fishing per Year in 2005

Scientific Fishing Description	Shortspine Thornyhead Catch	Longspine Thornyhead Catch	Chili-pepper Catch	Short-belly Catch	Yellowtail Catch	English Sole Catch	Petrale Sole Catch	Rex Sole Catch	Rock Sole Catch	Other Rockfish Catch	Spiny Dogfish Catch	Comments
AFSC - Post Capture and Mortality of Bycatch [1/]	0	0	0	0	0	541	0	0	0	0	0	2003 final catch data
NWFSC - Slope and Shelf Survey	**8194**	**24660**	**24314**	**13138**	**8576**	**9074**	**3793**	**16139**	**416**	**38133**	**79991**	2003 final catch data
NWFSC - Cooperative Pre-Recruit Whiting Survey [1/]	0	0	0	0	0	0	0	2	0	1238	0	2003 final catch data
NWFSC - Sablefish Pot Survey	**39**	**1**	**0**	**0**	**0**	**0**	**0**	**0**	**0**	**4**	**0**	2003 final catch data (all catch was released except 10% of sablefish catch)
NWFSC - US/Canada Echo Whiting Integration and Oceanographic Survey	**40**	**0**	**3442**	**20**	**891**	**39**	**27**	**258**	**0**	**1241**	**12088**	2003 final catch data
NWFSC - Fixed Gear Survey in California Bight	**0**	**0**	**5**	**0**	**9**	**0**	**0**	**0**	**0**	**626**	**0**	2003 final catch data
NWFSC - Groundfish Acoustic Monitoring [1/]	0	0	0	0	3	0	0	0	0	4	0	2003 final catch data
IPHC - Halibut Survey [1/]	274	0	0	0	2	0	12	0	0	286	14989	2003 final catch data
ODFW - Flatfish Selective Pot Gear	**0**	**0**	**0**	**0**	**0**	**0**	**0**	**0**	**0**	**0**	**0**	unable to conduct research in 2003
Total (lb)	**8547**	**24661**	**27761**	**13158**	**9481**	**9654**	**3832**	**16399**	**416**	**41532**	**107068**	
Total (mt)	**3.9**	**11.2**	**12.6**	**6.0**	**4.3**	**4.4**	**1.7**	**7.4**	**0.2**	**18.8**	**48.6**	

[1/] Survey reported landings in numbers of fish. An average weight (lbs) was multiplied by the number of fish to estimate catch in weight for each species. The average weight for most species was estimated from RecFIN data (all modes, all areas) over the years 1998-2003. For species not reported in RecFIN (longspine thornyhead, unidentified thornyhead, rex sole, and other rockfish), a best guess estimate was used to estimate weight.

Legend
normal text = pounds of fish converted from number of fish
bold text = pounds of fish

Table Y.--Predicted Catch from Scientific Fishing per Year in 2006

Scientific Fishing Description	Whiting Catch	Lingcod Catch	POP Catch	Bocaccio Catch	Canary Catch	Widow Catch	Darkblotched Catch	Yelloweye Catch	Cowcod Catch	Sablefish Catch	Dover Sole Catch	Arrowtooth Catch
AFSC - Post Capture and Mortality of Bycatch 1/	0	87.6	0	0	0	0	0	0	0	0	0	0
NWFSC - Slope and Shelf Survey	68359	9266	7832	494	3700 *	2084	8291	547	28	32310	68326	14111
NWFSC - Cooperative Pre-Recruit Whiting Survey 1/	85730	131	0	0	0	0	0	0	0	0	41	0
NWFSC - Sablefish Pot Survey	0	0	0	0	0	0	0	0	0	33927	3	0
NWFSC "Triennial"-style shelf survey	237760	5977	2370	285	2250	192	3094			83527	62829	15510
NWFSC - Fixed Gear Survey in California Bight	0	45	0	435	0	0	0	0	12	0	0	0
NWFSC - Groundfish Acoustic Monitoring 1/	0	44	0	0	0	0	0	0	0	0	0	0
IPHC - Halibut Survey 1/	446	394	0	0	20	0	0	1553	0	39851	0	374
ODFW - Flatfish Selective Pot Gear	0	0	0	0	0	0	0	0	0	0	0	0
Total (lb)	392295	15945	10202	1214	5970	2276	11385	2100	40	189615	131199	29995
Total (mt)	177.9	7.2	4.6	0.6	2.7	1.0	5.2	1.0	0.0	86.0	59.5	13.6

* Canary projection based on 2003 final catch and preliminary 2004 data.

Table Y (cont.).--Predicted Catch from Scientific Fishing per Year in 2006

Scientific Fishing Description	Shortspine Thornyhead Catch	Longspine Thornyhead Catch	Chili-pepper Catch	Short-belly Catch	Yellowtail Catch	English Sole Catch	Petrale Sole Catch	Rex Sole Catch	Rock Sole Catch	Other Rockfish Catch	Spiny Dogfish Catch	Comments
AFSC - Post Capture and Mortality of Bycatch [1/]	0	0	0	0	0	541	0	0	0	0	0	2003 final catch data
NWFSC - Slope and Shelf Survey	8194	24660	24314	13138	8576	9074	3793	16139	416	38133	79991	2003 final catch data
NWFSC - Cooperative Pre-Recruit Whiting Survey [1/]	0	0	0	0	0	0	0	2	0	1238	0	2003 final catch data
NWFSC - Sablefish Pot Survey	39	1	0	0	0	0	0	0	0	4	0	catch was released except 10% of sablefish
NWFSC "Triennial"-style shelf survey	6808	659	22899	12181	3122	11871	2649	28501	201	8448	27830	2001 final catch data
NWFSC - Fixed Gear Survey in California Bight	0	0	5	0	9	0	0	0	0	626	0	2003 final catch data
NWFSC - Groundfish Acoustic Monitoring [1/]	0	0	0	0	3	0	0	0	0	4	0	2003 final catch data
IPHC - Halibut Survey [1/]	274	0	0	0	2	0	12	0	0	286	14989	2003 final catch data
ODFW - Flatfish Selective Pot Gear	0	0	0	0	0	0	0	0	0	0	0	unable to conduct research in 2003
Total (lb)	15315	25320	47218	25319	11712	21486	6454	44642	617	48739	122810	
Total (mt)	6.9	11.5	21.4	11.5	5.3	9.7	2.9	20.2	0.3	22.1	55.7	

[1/] Survey reported landings in numbers of fish. An average weight (lbs) was multiplied by the number of fish to estimate catch in weight for each species. The average weight for most species was estimated from RecFIN data (all modes, all areas) over the years 1998-2003. For species not

Legend

normal text = pounds of fish converted

Mark Saelens

Attachment 2.

Implementation of Selective Flatfish Trawl Gear in the West Coast Shelf Flatfish Fishery

Situation

From 2000 through 2003, the Oregon Department of Fish and Wildlife (ODFW), working cooperatively with Oregon State University and the National Marine Fisheries Service, developed and tested a modified flatfish trawl, comparing its performance to a typical west coast sole trawl using an alternate haul sampling design (King et al. 2004). This experiment showed reductions in bycatch for several overfished species of 34 – 97%, despite the selective flatfish trawl being a larger trawl and having increased catches of flatfish. In addition, an Exempted Fishing Permit was utilized in 2003 to evaluate the effectiveness of this type of trawl on a fishery scale covering a broad geographic area during May – October 2003 (Parker, 2004). The EFP was a feasibility test to determine if the idea tested in the research experiment could be scaled up to a fishery level and be useful for management.

Bycatch Rates

Because this trawl gear has different selectivities compared to traditional trawl gear for several important bycatch species, bycatch estimates for any fishery using this type of trawl were specifically incorporated into the bycatch projection and period limits model. The SSC recommended bycatch rates from the EFP test (which occurred May-October) be used to model the fishery. Appropriate bycatch rates for January through April, and November through December needed to be selected. To fully analyze selective flatfish trawl using the bycatch projection model, the GMT developed and discussed four different methods for doing this. The model option #4 was identified as the best approach. Using this model the summer bycatch rates by depth were taken from the results of the selective flatfish trawl EFP. Bycatch rates for winter months were scaled to the seasonal pattern in bycatch rates observed in the West Coast Observer Program (WCGOP). That is, if the WCGOP rates increased by 50% in November-December, then the selective flatfish trawl rates were also increased by 50%. Future information from the observer program from vessels using the selective flatfish trawl will provide more appropriate information to calculate impacts. Therefore the bycatch rates used to model this fishery are considered interim, and will be replaced by WCGOP rates as they become available.

RCA Boundaries and Trip Limit Periods

The objectives for implementing selective flatfish trawl are: 1) to reduce bycatch of overfished groundfish stocks (primarily canary rockfish) 2) utilize some of the reduction in impacts to allow fishing to occur deeper (i.e. out to 100 fathoms), particularly during the spring and fall. This provides access to some stocks that are currently not fully utilized due to restricted access to the RCA, and 3) increase flatfish harvest limits shoreward of the RCA. NOAA NWR has developed several period limit and participation models to determine bycatch impacts with different RCA boundaries, in different periods, and with various trip limits north of 40°10'N (Tables 1 – 3). Periods were opened out to 100 fm using three combinations of periods. Three sub-models describe the impacts of opening out to 100 fathoms during: 1) All year – this model was run only to demonstrate that target species become the constraint on the fishery prior to any bycatch constraints, 2) during March – June and Sept – Oct, and 3) during Mar – Oct (preferred GMT and GAP option). A seaward depth limit of 100 fm was specified due to the inability of the trawl to avoid capture of darkblotched rockfish inhabiting deeper waters. If the trawl performs as expected, additional periods with shoreward boundaries out to 100 fm could be added in the future as WCGOP bycatch rates from the use of the selective flatfish trawl are incorporated into the annual specifications council process.

Trip limits have been developed to take advantage of the species occurring in the open areas. The low bycatch rates of canary rockfish allowed significantly higher catches of target species. In fact, the catch may now be constrained by the "other flatfish" category and a precautionary approach for canary bycatch attainment. The preferred model incorporated the lower bycatch rates, the new RCA boundaries, and the higher flatfish limits with a total canary impact of approximately 5.3 mt. The model also predicts an effort shift from the current level of 30 vessels fishing the summer shelf flatfish fishery, to 50-60 vessels (likely to be an overestimate in 2005-2006). However, the majority of deep-water vessels are predicted to remain in deep water because the value of that catch is significantly greater than in the shelf flatfish fishery. Substantial uncertainty remains in predicting how much effort shift will actually occur. In addition, it is difficult to predict how many vessels will attain these new trip limits. The model currently assumes that vessels that have access to those depths will attain period limits to the same degree they had done historically.

Bycatch savings

The model runs by NOAA show that even with four periods open to 100 fathoms, at medium OY levels, the total trawl catch of canary approaches about 5.3 mt. This is substantially lower than the low, medium and high canary impact scenarios modeled in the DEIS (8,10, and 12 mt, respectively). Under the preferred selective flatfish trawl model and the low impact model 2.7 mt of canary impact would be avoided. Based on current guidance to analyze impacts for a maximum of 10 mt of canary for non-whiting trawl fishery impacts on canary. In this situation 4.7 mt of canary rockfish are available. The GMT recommends retaining at least a portion of this savings for any incorrect or imprecise assumptions of bycatch rates or shifts in participation into the shelf flatfish fishery, especially in this first year of implementation. Additional precautionary tools such as in-season trip limit adjustments or adjustments to the RCA boundaries are also available to correct for inaccuracies in model projections, if needed.

Economic Impacts

With much higher trip limits afforded by use of the selective flatfish trawl, substantial increases in gross revenues are anticipated for 2005-2006 for vessels typically making less than $100,000 (a category representative of small footrope trawl vessels) (See below). These increases are compared to what vessel revenues would be if the selective flatfish trawl were not implemented. Costs of converting to a selective flatfish trawl range from a negligible cost (for a fisherman to convert a two-seam trawl with existing materials) to approximately $8,000 to buy a new trawl. The maximum cost of converting the trawl should be easily offset through the higher trip limits.

	Selective Flatfish Trawl	No Selective Flatfish Trawl
Avg. Gain in 2005	$109,766	$95,450
Max Gain in 2005	$111,449	$99,597
Min Gain in 2005	$108,331	$84,001
Avg. No. of Vessels Gaining	41	39

Regulation Development

The selective flatfish trawl is proposed to be implemented as the only trawl gear allowed for fishing on the shelf (shoreward of the RCA) and north of 40°10'N. As part of the EFP process, Oregon developed measurable net design criteria, because different vessels require trawls of different sizes and with other vessel-specific design specifications. These criteria allowed fishermen to modify or build trawls for their vessels that still had the functional components of the selective flatfish trawl, yet were able to be objectively enforced by federal and state enforcement agencies both in port and at sea. Some training has already occurred with Oregon State Police, Washington Department of Fish and Wildlife, and Coast Guard enforcement agents. The design criteria were that the trawl must have a headrope at least 30% longer than the footrope, ~~that the expected rise of the net could not exceed 3 ft,~~ that the headrope must not have any floats along the center 33% of its length, and that it must be a two-seam trawl. Otherwise, the trawl must conform to the legal small-footrope trawl definition in current federal regulations. The Council's Enforcement Consultants (EC) have begun to review this suggested regulatory language in their overall effort to develop guidance and rule language for the implementation of selective flatfish trawl.

Mark said there is not specifi parameter for that. replace with phrase - "3-foot wing-typed height."

Attachment 3

Table 1. 4 Summer Periods with 100 fm inline, Med OY on Target Species & Different North/South Limits

		Predicted Mortality (MT)		
		North	South	Total
Rebuilding Species	Lingcod	96.6	29.4	126.0
	Canary	4.7	0.6	5.3
	POP	88.3	0.0	88.3
	Darkblotche	63.5	12.4	75.9
	Widow	1.8	0.1	1.9
	Bocaccio	0.0	50.9	50.9
	Y'eye	0.3	0.1	0.4
	Cowcod	0.0	0.5	0.5
Target Species	Sablefish	2,835	771	3,605
	Longspine	544	285	829
	Shortspine	596	275	871
	Dover	5,247	2,106	7,353
	Arrowt'th	2,504	210	2,714
	Petrale	2,398	263	2,661
	Othr Flat + Eng. Sole	4,725	1,370	6,095
	Slope Rock	203	388	592

		RCA Configuration		Bimonthly Limits							
SUBAREA	Period	INLINE	OUTLINE	Sablefish	Longspine	Shortspine	Dover	Othr Flat & Eng	Petrale sublimit	Arrowtooth	Slope Rock
N. 40 10	1	75	150	11,000	15,000	3,500	70,000	120,000	No Limit	No Limit	8,000
	2	100	150	11,000	15,000	3,500	70,000	120,000	42,000	150,000	8,000
	3	100	150	18,000	23,000	4,900	30,000	120,000	42,000	150,000	8,000
	4	100	150	18,000	23,000	4,900	30,000	120,000	42,000	150,000	8,000
	5	100	150	18,000	23,000	4,900	30,000	120,000	42,000	150,000	8,000
	6	75	150	11,000	15,000	3,500	70,000	120,000	No Limit	No Limit	8,000
North Selective Trawl Limit	1	75	150	1,500	1,000	1,000	20,000	100,000	25,000	70,000	8,000
	2	100	150	10,000	1,000	1,000	50,000	100,000	35,000	70,000	8,000
	3	100	150	10,000	1,000	3,000	50,000	100,000	35,000	70,000	8,000
	4	100	150	10,000	1,000	3,000	50,000	100,000	35,000	70,000	8,000
	5	100	150	10,000	1,000	3,000	50,000	100,000	35,000	70,000	8,000
	6	75	150	1,500	1,000	1,000	20,000	100,000	25,000	70,000	8,000
38 - 40 10	1	75	150	14,500	19,000	4,200	50,000	120,000	No Limit	No Limit	40,000
	2	100	150	14,500	19,000	4,200	50,000	120,000	42,000	10,000	40,000
	3	100	150	14,500	19,000	4,200	50,000	120,000	42,000	10,000	40,000
	4	100	150	14,500	19,000	4,200	50,000	120,000	42,000	10,000	40,000
	5	100	150	14,500	19,000	4,200	50,000	120,000	42,000	10,000	40,000
	6	75	150	14,500	19,000	4,200	50,000	120,000	No Limit	No Limit	40,000
S. 38	1	75	150	14,500	19,000	4,200	50,000	120,000	No Limit	No Limit	40,000
	2	100	150	14,500	19,000	4,200	50,000	120,000	42,000	10,000	40,000
	3	100	150	14,500	19,000	4,200	50,000	120,000	42,000	10,000	40,000
	4	100	150	14,500	19,000	4,200	50,000	120,000	42,000	10,000	40,000
	5	100	150	14,500	19,000	4,200	50,000	120,000	42,000	10,000	40,000
	6	75	150	14,500	19,000	4,200	50,000	120,000	No Limit	No Limit	40,000

Table 2. 3 Summer Periods with 100 fm Inline, Med OY on Target Species, Equal North/South Limits & Smaller Select Gear Limits

		Predicted Mortality (MT)		
		North	South	Total
Rebuilding Species	Lingcod	104.9	29.3	134.3
	Canary	5.0	0.6	5.6
	POP	86.3	0.0	86.3
	Darkblotche	62.5	12.3	74.8
	Widow	1.7	0.1	1.8
	Bocaccio	0.0	50.8	50.8
	Y'eye	0.3	0.1	0.4
	Cowcod	0.0	0.5	0.5
Target Species	Sablefish	2,860	787	3,647
	Longspine	545	285	829
	Shortspine	597	282	879
	Dover	5,432	2,043	7,475
	Arrowt'th	2,504	210	2,714
	Petrale	2,421	263	2,685
	Othr Flat + Eng. Sole	4,723	1,370	6,093
	Slope Rock	203	388	592

		RCA Configutation		Bimonthly Limits							
SUBAREA	Period	INLINE	OUTLINE	Sablefish	Longspine	Shortspine	Dover	Othr Flat & Eng	Petrale sublimit	Arrowtooth	Slope Rock
N. 40 10	1	75	150	14,800	19,000	4,300	48,500	120,000	No Limit	No Limit	8,000
	2	100	150	14,800	19,000	4,300	48,500	120,000	46,000	150,000	8,000
	3	100	150	14,800	19,000	4,300	48,500	120,000	46,000	150,000	8,000
	4	75	150	14,800	19,000	4,300	48,500	120,000	46,000	150,000	8,000
	5	100	150	14,800	19,000	4,300	48,500	120,000	46,000	150,000	8,000
	6	75	150	14,800	19,000	4,300	48,500	120,000	No Limit	No Limit	8,000
North Selective Trawl Limit	1	75	150	1,500	1,000	1,000	20,000	100,000	30,000	70,000	8,000
	2	100	150	10,000	1,000	1,000	50,000	100,000	37,000	70,000	8,000
	3	100	150	10,000	1,000	3,000	50,000	100,000	37,000	70,000	8,000
	4	75	150	10,000	1,000	3,000	50,000	100,000	37,000	70,000	8,000
	5	100	150	10,000	1,000	3,000	50,000	100,000	37,000	70,000	8,000
	6	75	150	1,500	1,000	1,000	20,000	100,000	30,000	70,000	8,000
38 - 40 10	1	75	150	14,800	19,000	4,300	48,500	120,000	No Limit	No Limit	40,000
	2	100	150	14,800	19,000	4,300	48,500	120,000	46,000	10,000	40,000
	3	100	150	14,800	19,000	4,300	48,500	120,000	46,000	10,000	40,000
	4	75	150	14,800	19,000	4,300	48,500	120,000	46,000	10,000	40,000
	5	100	150	14,800	19,000	4,300	48,500	120,000	46,000	10,000	40,000
	6	75	150	14,800	19,000	4,300	48,500	120,000	No Limit	No Limit	40,000
S. 38	1	75	150	14,800	19,000	4,300	48,500	120,000	No Limit	No Limit	40,000
	2	100	150	14,800	19,000	4,300	48,500	120,000	46,000	10,000	40,000
	3	100	150	14,800	19,000	4,300	48,500	120,000	46,000	10,000	40,000
	4	75	150	14,800	19,000	4,300	48,500	120,000	46,000	10,000	40,000
	5	100	150	14,800	19,000	4,300	48,500	120,000	46,000	10,000	40,000
	6	75	150	14,800	19,000	4,300	48,500	120,000	No Limit	No Limit	40,000

Table 3. 100 fm inline All Year, Med OY on Target Species, and Different North/South Limits

		Predicted Mortality (MT)		
		North	South	Total
Rebuilding Species	Lingcod	100.0	31.0	131.0
	Canary	5.3	0.6	5.9
	POP	88.8	0.0	88.8
	Darkblotched	64.4	12.3	76.7
	Widow	1.8	0.1	1.9
	Bocaccio	0.0	54.1	54.1
	Y'eye	0.4	0.1	0.5
	Cowcod	0.0	0.5	0.5
Target Species	Sablefish	2,827	785	3,612
	Longspine	545	285	830
	Shortspine	597	276	872
	Dover	5,294	1,982	7,277
	Arrowt'th	2,541	210	2,751
	Petrale	2,407	276	2,683
	Othr Flat + Eng. Sole	4,808	1,391	6,200
	Slope Rock	203	388	592

		RCA Configuration		Bimonthly Limits							
SUBAREA	Period	INLINE	OUTLINE	Sablefish	Longspine	Shortspine	Dover	Othr Flat & Eng	Petrale sublimit	Arrowtooth	Slope Rock
N. 40 10	1	100	150	11,000	15,000	3,500	70,000	120,000	No Limit	No Limit	8,000
	2	100	150	11,000	15,000	3,500	70,000	120,000	42,000	150,000	8,000
	3	100	150	18,000	23,000	4,900	30,000	120,000	42,000	150,000	8,000
	4	100	150	18,000	23,000	4,900	30,000	120,000	42,000	150,000	8,000
	5	100	150	18,000	23,000	4,900	30,000	120,000	42,000	150,000	8,000
	6	100	150	11,000	15,000	3,500	70,000	120,000	No Limit	No Limit	8,000
North Selective Trawl Limit	1	100	150	1,500	1,000	1,000	20,000	100,000	25,000	70,000	8,000
	2	100	150	10,000	1,000	1,000	50,000	100,000	35,000	70,000	8,000
	3	100	150	10,000	1,000	3,000	50,000	100,000	35,000	70,000	8,000
	4	100	150	10,000	1,000	3,000	50,000	100,000	35,000	70,000	8,000
	5	100	150	10,000	1,000	3,000	50,000	100,000	35,000	70,000	8,000
	6	100	150	1,500	1,000	1,000	20,000	100,000	25,000	70,000	8,000
38 - 40 10	1	100	150	14,500	19,000	4,200	50,000	120,000	No Limit	No Limit	40,000
	2	100	150	14,500	19,000	4,200	50,000	120,000	42,000	10,000	40,000
	3	100	150	14,500	19,000	4,200	50,000	120,000	42,000	10,000	40,000
	4	100	150	14,500	19,000	4,200	50,000	120,000	42,000	10,000	40,000
	5	100	150	14,500	19,000	4,200	50,000	120,000	42,000	10,000	40,000
	6	100	150	14,500	19,000	4,200	50,000	120,000	No Limit	No Limit	40,000
S. 38	1	100	150	14,500	19,000	4,200	50,000	120,000	No Limit	No Limit	40,000
	2	100	150	14,500	19,000	4,200	50,000	120,000	42,000	10,000	40,000
	3	100	150	14,500	19,000	4,200	50,000	120,000	42,000	10,000	40,000
	4	100	150	14,500	19,000	4,200	50,000	120,000	42,000	10,000	40,000
	5	100	150	14,500	19,000	4,200	50,000	120,000	42,000	10,000	40,000
	6	100	150	14,500	19,000	4,200	50,000	120,000	No Limit	No Limit	40,000

Table 4. No Selective Trawl Gear. Adopted OYs - 12 mt of canary bycatch

		Mortality (mt)		
		North	South	Total
Rebuilding Species	Lingcod	71.3	32.3	103.6
	Canary	11.4	0.7	12.1
	POP	99.4	0.0	99.4
	Darkblotch	66.5	13.1	79.6
	Widow	2.5	0.1	2.6
	Bocaccio	0.0	48.6	48.6
	Y'eye	0.2	0.1	0.3
	Cowcod	0.0	0.4	0.4
Target Species	Sablefish	2,522	643	3,165
	Longspine	592	285	877
	Shortspine	629	282	910
	Dover	5,056	2,141	7,197
	Arrowtooth	1,843	211	2,054
	Petrale	2,232	237	2,469
	Other Flat	3,908	1,873	5,781
	Slope Rock	203	388	592

		RCA Boundaries		Bimonthly Cumulative Limits							
Subarea	Period	Inline	Outline	Sablefish	Longspine	Shortspine	Dover	Other Flat	Petrale sublimit	Arrowtth	Slope Rock
N. 40o10	1	75	150	10,000	15,000	3,600	62,000	100,000	No Limit	No Limit	8,000
	2	75	150	10,000	15,000	3,600	62,000	100,000	100,000	150,000	8,000
	3	75	150	18,000	23,000	5,000	39,000	100,000	100,000	150,000	8,000
	4	75	150	18,000	23,000	5,000	39,000	100,000	100,000	150,000	8,000
	5	60	150	18,000	23,000	5,000	39,000	100,000	100,000	150,000	8,000
	6	100	150	10,000	15,000	3,600	62,000	100,000	No Limit	No Limit	8,000
North Small Footrope Limit	1	75	150	4,000	1,000	1,000	10,000	50,000	15,000	4,000	8,000
	2	75	150	4,000	1,000	1,000	10,000	70,000	15,000	4,000	8,000
	3	75	150	6,500	1,000	3,000	27,000	65,000	20,000	6,000	8,000
	4	75	150	6,500	1,000	3,000	27,000	65,000	20,000	6,000	8,000
	5	60	150	6,500	1,000	3,000	27,000	70,000	15,000	6,000	8,000
	6	100	150	4,000	1,000	1,000	10,000	50,000	15,000	4,000	8,000
S. of 40o10	1	75	150	14,000	19,000	4,300	62,000	100,000	No Limit	No Limit	40,000
	2	75	150	14,000	19,000	4,300	62,000	100,000	20,000	10,000	40,000
	3	100	150	14,000	19,000	4,300	45,000	100,000	20,000	10,000	40,000
	4	100	150	14,000	19,000	4,300	45,000	100,000	20,000	10,000	40,000
	5	75	150	14,000	19,000	4,300	45,000	100,000	20,000	10,000	40,000
	6	75	150	14,000	19,000	4,300	45,000	100,000	No Limit	No Limit	40,000

Table 5. No Selective Trawl Gear. Adopted OYs - 8 mt of canary bycatch

		Mortality (mt)		
		North	South	Total
Rebuilding Species	Lingcod	56.1	32.3	88.4
	Canary	7.4	0.7	8.0
	POP	95.5	0.0	95.5
	Darkblotch	63.0	13.1	76.1
	Widow	2.3	0.1	2.4
	Bocaccio	0.0	48.6	48.6
	Y'eye	0.1	0.1	0.2
	Cowcod	0.0	0.4	0.4
Target Species	Sablefish	2,477	643	3,120
	Longspine	590	285	875
	Shortspine	626	282	908
	Dover	4,944	2,141	7,085
	Arrowtooth	1,604	211	1,816
	Petrale	2,032	237	2,268
	Other Flat	3,518	1,873	5,391
	Slope Rock	203	388	592

		RCA Boundaries		Bimonthly Cumulative Limits							
Subarea	Period	Inline	Outline	Sablefish	Longspine	Shortspine	Dover	Other Flat	Petrale sublimit	Arrowtth	Slope Rock
N. 40o10	1	75	150	10,000	15,000	3,600	62,000	100,000	No Limit	No Limit	8,000
	2	60	150	10,000	15,000	3,600	62,000	100,000	100,000	150,000	8,000
	3	60	150	18,000	23,000	5,000	39,000	100,000	100,000	150,000	8,000
	4	75	150	18,000	23,000	5,000	39,000	100,000	100,000	150,000	8,000
	5	75	150	18,000	23,000	5,000	39,000	100,000	100,000	150,000	8,000
	6	75	150	10,000	15,000	3,600	62,000	100,000	No Limit	No Limit	8,000
North Small Footrope Limit	1	75	150	4,000	1,000	1,000	10,000	50,000	15,000	4,000	8,000
	2	60	150	4,000	1,000	1,000	10,000	70,000	15,000	4,000	8,000
	3	60	150	6,500	1,000	3,000	27,000	70,000	20,000	6,000	8,000
	4	75	150	5,000	1,000	3,000	15,000	35,000	10,000	3,000	8,000
	5	75	150	5,000	1,000	3,000	15,000	35,000	10,000	3,000	8,000
	6	75	150	4,000	1,000	1,000	10,000	50,000	15,000	4,000	8,000
S. of 40o10	1	75	150	14,000	19,000	4,300	62,000	100,000	No Limit	No Limit	40,000
	2	75	150	14,000	19,000	4,300	62,000	100,000	20,000	10,000	40,000
	3	100	150	14,000	19,000	4,300	45,000	100,000	20,000	10,000	40,000
	4	100	150	14,000	19,000	4,300	45,000	100,000	20,000	10,000	40,000
	5	75	150	14,000	19,000	4,300	45,000	100,000	20,000	10,000	40,000
	6	75	150	14,000	19,000	4,300	45,000	100,000	No Limit	No Limit	40,000

Exhibit C.6.c
Supplemental GMT Report 2
June 2004

ATTACHMENT 4

Summary of California 2005-2006 Recreational Options

Draft Prepared for PFMC meeting 6/16/20

Proposed CA Recreational Options With the Harvest Targets for Minor Nearshore Rockfish, Canary RF, Lingcod, and Bocaccio RF Without Shore Impacts

(Includes impacts from SHORE Exemption when fishing is allowed 20-40 or 30-60 fms)

OPTION FOR THE NORTH

Option 1B=Option 3C	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
North	▨	▨	▨	▨	▨	▨	<40	<40	<40	<40	▨	▨
Central	▨	▨	▨	▨	▨	<40	▨	<20	<20	<20	<30	▨
South	▨	▨	▨	▨	<40	<40	<40	<40	<40	▨	▨	▨
South Scorpionfish	▨	▨	<40	<40	▨	▨	<40	<40	<40	▨	▨	▨

Without Shore Impacts

Region	BLK	MNR[2]	CAN	LNG	BOC
North	87.2		0.5	34.4	0.0
Central	86.0	391.0	8.6	264.3	0.4
South	0.0	76.4	0.0	35.7	9.0
Total	173.3	467.4	9.1	334.4	9.4
HG/HT[1]	**184**	**471**	**9.3**	**422**	**77.0**
Difference	-6%	-1%	-2%	-21%	-88%

OPTIONS FOR THE CENTRAL (NORTH AND SOUTH HELD CONSTANT)

(North =Option 1b; South=Option 1b)

Option 1B- 2	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
North	▨	▨	▨	▨	▨	▨	<40	<40	<40	<40	▨	▨
Central	▨	▨	▨	▨	▨	**<40**	▨	**<20**	**<20**	**<20**	**<20**	▨
South	▨	▨	▨	▨	<40	<40	<40	<40	<40	▨	▨	▨
South Scorpionfish	▨	▨	<40	<40	▨	▨	<40	<40	<40	▨	▨	▨

Region	BLK	MN R	CAN	LNG	BOC
North	87.2		0.5	34.4	0.0
Central	83.9	381.3	8.2	260.7	0.4
South	0.0	76.4	0.0	35.7	9.0
Total	171.2	457.7	8.7	330.8	9.4
HG/HT	**184**	**471**	**9.3**	**422**	**77.0**
Difference	-7%	-3%	-6%	-22%	-88%

OPTIONS FOR THE SOUTH (NORTH AND CENTRAL HELD CONSTANT)

(North =Option 1b; Central=Option 1b)

Option 4C	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
North	▨	▨	▨	▨	▨	▨	<40	<40	<40	<40	▨	▨
Central	▨	▨	▨	▨	▨	<40	▨	<20	<20	<20	<30	▨
South	▨	▨	▨	<40	<40	<40	<40	<40	▨	▨	▨	▨
South Scorpionfish	▨	▨	<40	<40	▨	▨	<40	<40	<40	▨	▨	▨

Region	BLK	MN R	CAN	LNG	BOC
North	87.2		0.5	34.4	0.0
Central	86.0	391.0	8.6	264.3	0.4
South	0.0	79.1	0.0	31.7	11.6
Total	173.3	470.1	9.1	330.4	12.0
HG/HT	**184**	**471**	**9.3**	**422**	**77.0**
Difference	-6%	0%	-2%	-22%	-84%

Option 4D	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
North	▨	▨	▨	▨	▨	▨	<40	<40	<40	<40	▨	▨
Central	▨	▨	▨	▨	▨	<40	▨	<20	<20	<20	<30	▨
South	▨	▨	▨	<40	<40	<40	<40	<40	▨	▨	▨	▨
South Scorpionfish	▨	▨	▨	<40	<40	<40	<40	<40	▨	▨	▨	▨

Region	BLK	MN R	CAN	LNG	BOC
North	87.2		0.5	34.4	0.0
Central	86.0	391.0	8.6	264.3	0.4
South	0.0	65.9	0.0	31.7	11.6
Total	173.3	456.9	9.1	330.4	12.0
HG/HT	**184**	**471**	**9.3**	**422**	**77.0**
Difference	-6%	-3%	-2%	-22%	-84%

Summary of California 2005-2006 Recreational Options

Draft Prepared for PFMC meeting 6/16/20

Option 4E	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
North							<40	<40	<40	<40		
Central						<40		<20	<20	<20	<30	
South					**<40**	<40	**<40**	<40	<40			
South Scorpionfish					**<40**	<40	**<40**	<40	**<40**			

Region	BLK	MNR	CAN	LNG	BOC
North	87.2		0.5	34.4	0.0
Central	86.0	391.0	8.6	264.3	0.4
South	0.0	67.2	0.0	35.7	9.0
Total	173.3	458.2	9.1	334.4	9.4
HG/HT	**184**	**471**	**9.3**	**422**	**77.0**
Difference	-6%	-3%	-2%	-21%	-88%

(North =Option 1b; Central=Option 1b-2)

Option 4K[3]	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
North							<40	<40	<40	<40		
Central						<40		<20	<20	<20	<20	
South			**30-60**	**30-60**	**30-60**	**30-60**	**<40**	<40	<40			
South Scorpionfish							**<40**	<40	**<40**	**<40**		

Region	BLK	MNR	CAN	LNG	BOC
North	87.2		0.5	34.4	0.0
Central	86.0	391.0	8.3	264.3	0.4
South	0.0	74.4	0.5	36.2	45.2
Total	173.3	465.4	9.3	334.9	45.6
HG/HT	**184**	**471**	**9.3**	**422**	**77.0**
Difference	-6%	-1%	0%	-21%	-41%

1. Proposed Statewide Recreational HG or CA Harvest Target (mt)
2. Minor nearshore rockfish (MNR) recreational Harvest Target for south of 40°10'
3. Estimated take for shore-based fishing included for those months with 30-60 fishing

Proposed CA Recreational Options With the Harvest Targets for Minor Nearshore Rockfish, Canary RF, Lingcod, and Bocaccio RF

(Includes impacts from SHORE Exemption during closed periods and when fishing is allowed 20-40 or 30-60 fms)

OPTION FOR THE NORTH

Option 1B=Option 3C	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
North							<40	<40	<40	<40		
Central						<40		<20	<20	<20	<30	
South					<40	<40	<40	<40	<40			
South Scorpionfish			<40	<40			<40	<40	<40			

With Shore Impacts

Region	BLK	MNR[2]	CAN	LNG	BOC
North	87.5		0.5	36.1	0.0
Central	88.7	403.4	8.6	273.2	0.6
South	0.2	78.8	0.0	35.9	9.5
Total	176.4	482.2	9.1	345.2	10.2
HG/HT[1]	**184**	**471**	**9.3**	**422**	**77.0**
Difference	-4%	2%	-2%	-18%	-87%

OPTIONS FOR THE CENTRAL (NORTH AND SOUTH HELD CONSTANT)

(North =Option 1b; South=Option 1b)

Option 1B- 2	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
North							<40	<40	<40	<40		
Central						<40		<20	<20	<20	<20	
South					<40	<40	<40	<40	<40			
South Scorpionfish			<40	<40			<40	<40	<40			

Region	BLK	MNR	CAN	LNG	BOC
North	87.5		0.5	36.1	0.0
Central	86.6	393.7	8.2	269.6	0.7
South	0.2	78.8	0.0	35.9	9.5
Total	174.3	472.5	8.7	341.6	10.2
HG/HT	**184**	**471**	**9.3**	**422**	**77.0**
Difference	-5%	0%	-6%	-19%	-87%

OPTIONS FOR THE SOUTH (NORTH AND CENTRAL HELD CONSTANT)

(North =Option 1b; Central=Option 1b)

Option 4C	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
North							<40	<40	<40	<40		
Central						<40		<20	<20	<20	<30	
South				<40	<40	<40	<40	<40				
South Scorpionfish			<40	<40			<40	<40	<40			

Region	BLK	MNR	CAN	LNG	BOC
North	87.5		0.5	36.1	0.0
Central	88.7	403.4	8.6	273.2	0.6
South	0.2	82.0	0.0	31.9	12.1
Total	176.5	485.4	9.1	341.2	12.8
HG/HT	**184**	**471**	**9.3**	**422**	**77.0**
Difference	-4%	3%	-2%	-19%	-83%

Option 4D	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
North							<40	<40	<40	<40		
Central						<40		<20	<20	<20	<30	
South				<40	<40	<40	<40	<40				
South Scorpionfish				<40	<40	<40	<40	<40				

Region	BLK	MNR	CAN	LNG	BOC
North	87.5		0.5	36.1	0.0
Central	88.7	403.4	8.6	273.2	0.6
South	0.2	69.0	0.0	31.9	12.1
Total	176.5	472.4	9.1	341.2	12.8
HG/HT	**184**	**471**	**9.3**	**422**	**77.0**
Difference	-4%	0%	-2%	-19%	-83%

Summary of California 2005-2006 Recreational Options

Draft Prepared for PFMC meeting 6/16/200

Option 4E	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
North	▨	▨	▨	▨	▨	▨	<40	<40	<40	<40	▨	▨
Central	▨	▨	▨	▨	▨	<40	▨	<20	<20	<20	<30	▨
South	▨	▨	▨	▨	**<40**	**<40**	**<40**	**<40**	**<40**	▨	▨	▨
South Scorpionfish	▨	▨	▨	▨	<40	<40	<40	<40	<40	▨	▨	▨

Region	BLK	MNR	CAN	LNG	BOC
North	87.5		0.5	36.1	0.0
Central	88.7	403.4	8.6	273.2	0.6
South	0.2	70.4	0.0	35.9	9.5
Total	176.5	473.7	9.1	345.2	10.2
HG/HT	**184**	**471**	**9.3**	**422**	**77.0**
Difference	-4%	1%	-2%	-18%	-87%

(North =Option 1b; Central=Option 1b-2)

Option 4K[3]	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
North	▨	▨	▨	▨	▨	▨	<40	<40	<40	<40	▨	▨
Central	▨	▨	▨	▨	▨	<40	▨	<20	<20	<20	<20	▨
South	▨	▨	**30-60**	**30-60**	**30-60**	**30-60**	<40	<40	<40	▨	▨	▨
South Scorpionfish	▨	▨	▨	▨	▨	▨	<40	<40	<40	<40	▨	▨

Region	BLK	MNR	CAN	LNG	BOC
North	87.5		0.5	36.1	0.0
Central	88.7	403.4	8.3	273.2	0.6
South	0.2	76.3	0.5	36.4	45.6
Total	176.4	479.6	9.3	345.7	46.2
HG/HT	**184**	**471**	**9.3**	**422**	**77.0**
Difference	-4%	2%	0%	-18%	-40%

1. Proposed Statewide Recreational HG or CA Harvest Target (mt)
2. Minor nearshore rockfish (MNR) recreational Harvest Target for south of 40°10'
3. Estimated take for shore-based fishing still needs to be added to these figures for those months with 30-60 fishing

Estimates of the take for all of the above options use primiarily the results of the 0.7 decay model and then consider additional factors including: hooking mortality for California scorpionfish and lingcod for months when rockfish is open but California scorpionfish or lingcod are closed; changes in sub-bag and bag limits not accounted for in the model's base data; changes from retention to non-retention of constraining rockfish species not accounted for in the model's base data; expected changes in north coast catch estimates; and greater opportunity for taking shelf rockfish species as fishing is moved out to 30 fms.

Proposed CA Recreational Combined Options With Harvest Targets for Minor Nearshore Rockfish, Canary RF, Lingcod, and Bocaccio RF; Central Regions Split

Option 1	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
North							< 40fm	< 40fm	< 40fm	< 40fm		
N-Central							< 20fm	< 20fm	< 20fm	< 20fm	< 30 fm	
S Central - North							< 20fm	< 20fm	< 20fm	< 20fm	< 30 fm	
S Central - South	20-40	20-40	20-40	20-40	20-40	20-40	20-40					
South			30-60fm	30-60fm	30-60fm	30-60fm	< 40fm	< 40fm	< 40fm			
South Scorpionfish[1]			30-60fm	30-60fm						< 40fm	< 40fm	

Without Shore Impacts

Region	BLK	MNR[2]	CAN	LNG	BOC
North	87.2		0.5	34.4	0.0
N-Central	42.9	194.9	4.6	179.2	0.0
S Central - North	32.2	146.2	2.0	85.5	0.1
S Central - South	10.7	48.7	1.1	5.7	0.2
South	0.0	64.3	0.5	35.7	43.1
Total	173.0	454.1	8.7	340.5	43.5
HG/HT[1]	**184**	**471**	**9.3**	**422**	**77.0**
Difference	-6%	-4%	-7%	-19%	-43%

OK

Option 2	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
North							< 40fm	< 40fm	< 40fm	< 40fm		
N-Central						< 20fm		< 20fm	< 20fm	< 30fm	< 30 fm	
S Central - North						< 20fm		< 20fm	< 20fm	< 30fm	< 30 fm	
S Central - South	20-40	20-40	20-40	20-40	20-40	20-40	20-40					
South			30-60fm	30-60fm	30-60fm	30-60fm	< 40fm	< 40fm	< 40fm			
South Scorpionfish[1]			30-60fm	30-60fm						< 40fm	< 40fm	

Without Shore Impacts

Region	BLK	MNR[2]	CAN	LNG	BOC
North	87.2		0.5	34.4	0.0
N-Central	41.9	190.4	4.6	179.2	0.1
S Central - North	31.4	142.8	2.0	85.5	0.2
S Central - South	7.1	47.6	1.1	5.7	0.2
South	0.0	64.0	0.5	35.7	43.1
Total	167.7	444.8	8.7	340.5	43.8
HG/HT[1]	**184**	**471**	**9.3**	**422**	**77.0**
Difference	-9%	-6%	-7%	-19%	-43%

<20 <20

Option 3	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
North							< 40fm	< 40fm	< 40fm	< 40fm		
N-Central						< 20fm		< 20fm	< 20fm	< 30fm	< 30 fm	
S Central - North						< 20fm		< 20fm	< 20fm	< 30fm	< 30 fm	
S Central - South	20-40	20-40	20-40	20-40	20-40	20-40	20-40					
South			30-60fm	30-60fm	30-60fm	< 40fm	< 40fm	< 40fm	< 40fm	< 40fm		
South Scorpionfish[1]			30-60fm	30-60fm						< 40fm	< 40fm	

Without Shore Impacts

Region	BLK	MNR[2]	CAN	LNG	BOC
North	87.2		0.5	34.4	0.0
N-Central	46.7	194.9	4.6	179.2	0.0
S Central - North	37.1	146.2	2.0	85.5	0.1
S Central - South	7.1	48.7	1.1	5.7	0.2
South	0.0	72.4	1.2	41.1	43.4
Total	178.1	462.2	9.3	345.9	43.8
HG/HT[1]	**184**	**471**	**9.3**	**422**	**77.0**
Difference	-3%	-2%	1%	-18%	-43%

Exhibit C.6.c
Supplemental Proposed Treaty Indian Management Measures
June 2004

Tribal Motion Regarding Groundfish Fisheries for 2005 and 2006

Black Rockfish - The 2005 and 2006 tribal harvest guidelines will be set at 20,000 pounds for the management area between the US/Canada border and Cape Alava, and 10,000 pounds for the management area located between Destruction Island and Leadbetter Point. No tribal harvest restrictions are proposed for the management area between Cape Alava and Destruction Island.

Sablefish - The 2005 and 2006 tribal set asides for sablefish will be set at 10 percent of the Monterey through Vancouver area OY minus 2.3 percent to account for expected discard mortality. Allocations among tribes and among gear types, if any, will be determined by the tribes.

Lingcod - For 2005 and 2006 the tribes propose an overall harvest guideline of between 50 and 100 mt for all tribal fisheries. Tribal fisheries will be restricted to 600 pound per day and 1,800 pound per week limits for all tribal fisheries except for the treaty troll fishery which would be limited to 1,000 pounds per day and 4,000 pounds per week. Increased landings of lingcod in the treaty troll fishery in 2005 and 2006 would be dependent on successful targeting in 2004 while staying within current estimates of impacts on overfished species. These limits may be adjusted inseason to stay within the overall harvest guideline.

For all other tribal groundfish fisheries the following trip limits will apply:

Thornyhead rockfish - Tribal fisheries will be restricted to a 300 pound per trip limit. This trip limit will be for short and longspine thornyheads combined.

Canary rockfish - Tribal fisheries will be restricted to a 300 pound per trip limit.

Other Minor Nearshore, Shelf and Slope Rockfish - Tribal fisheries will be restricted to a 300 pound per trip limit for each species group, or the limited entry trip limits if they are less restrictive than the 300 pound per trip limit.

Yelloweye Rockfish – The tribes will continue developing depth, area, and time restrictions in their directed Pacific halibut fishery to minimize impacts on yelloweye rockfish. Tribal fisheries will be restricted to 100 pounds per trip except during open competition fisheries for Pacific halibut.

Full Retention- The tribes will require full retention of all rockfish species during open competition fisheries for Pacific halibut.

Tribal Proposals Regarding
Makah Trawl fisheries for 2005 and 2006

Pacific Whiting - For the 2005 and 2006 Pacific whiting fisheries, the tribal set aside will be as provided in the Makah Tribe's proposed allocation framework.

Midwater Trawl Fishery- Treaty midwater trawl fishermen will be restricted to a cumulative limit of yellowtail rockfish, based on the number of vessels participating, not to exceed 180,000 pounds per two month period for the entire fleet. Their landings of widow rockfish must not exceed 10 percent of the poundage of yellowtail rockfish landed in any given period. The tribe may adjust the cumulative limit for any two-month period to minimize the incidental catch of canary and widow rockfish, provided the average cumulative limit does not exceed 180,000 pounds for the fleet.

Bottom Trawl Fishery - Treaty fishermen using bottom trawl gear will be subject to the trip limits applicable to the limited entry fishery for Pacific cod, English sole, rex sole, arrowtooth flounder, and other flatfish. For petrale sole, fishermen would be restricted to 50,000 pounds per two month period for the entire year. Because of the relatively small expected harvest, the trip limits for the tribal fishery will be those in place at the beginning of the season in the limited entry fishery and will not be adjusted downward, nor will time restrictions or closures be imposed, unless in-season catch statistics demonstrate that the tribes have taken ½ of the harvest in the tribal area. Fishermen will be restricted to small footrope trawl gear. Exploration of the use of selective flatfish trawl gear will be conducted in 2005 - 2006.

Pollock Test Fishery - The Makah Tribe will be examining the catch of pollock as part of their directed midwater whiting fishery in 2004. If successful targeting is achieved in 2004, the tribe would propose expanding to a directed fishery in 2005 concurrent with the setting of whiting harvest levels in March 2005. The tribe will coordinate the possible development of this fishery with NMFS, WDFW, and Canada's DFO.

Observer Program – The Makah tribe has an observer program in place to monitor and enforce the limits proposed above.

TABLE 8-20. Projected groundfish landings by Tribal fleet under the 2005 and 2006 alternatives, displayed against 1998, 2002, 2003 and estimated 2004 landings. (round-weight lbs). (Page 1 of 1)

					2005 Projections			2006 Projections		
Species	1998	2002	2003	2004 est.	Alt 1	Alt 2	Alt 3	Alt 1	Alt 2	Alt 3
Arrowtooth Flounder	255	7,137	49,745							
Dover Sole	4,509	35,417	72,527							
English Sole	1,847	88,684	149,277							
Petrale Sole	3,249	45,479	185,732							
Rex Sole		6,632	10,886							
Rock Sole	2,396	5,833	5,160							
Unsp. Flatfish	38	8,406	6,380							
Unspecified Sanddab		19,655	1,725							
Sand Sole		2,748	62							
Starry Flounder		301								
Butter Sole		605	0							
Flatfish Total	12,294	220,897	481,494	601,868	601,868	601,868	601,868	601,868	601,868	601,868
Canary Rockfish	886	7,071	4,712	6,850	6,850	6,850	6,850	6,850	6,850	6,850
Darkblotched Rockfish	0	3,273	81	0	0	0	0	0	0	0
Pacific Ocean Perch	0	472	2,601	0	0	0	0	0	0	0
Redstripe Rockfish	1		2,333	2,916	2,916	2,916	2,916	2,916	2,916	2,916
Sharpchin Rockfish	1		2,332	2,915	2,915	2,915	2,915	2,915	2,915	2,915
Unspecified Rockfish	65,245									
Widow Rockfish	54	27,969	24,670	88,200	88,200	88,200	88,200	88,200	88,200	88,200
Yelloweye Rockfish		0	594	5,250	5,250	5,250	5,250	5,250	5,250	5,250
Yellowtail Rockfish	13,711	572,996	677,073	1,115,600	1,115,600	1,115,600	1,115,600	1,115,600	1,115,600	1,115,600
Unsp. Shelf Rockfish		23,629	2,354	2,942	2,943	2,942	2,942	2,942	2,942	2,942
Unsp. Near-shore Rockfish		116	45	56	56	56	56	56	56	56
Unsp. Slope Rockfish		32,941	41,458	51,822	51,822	51,822	51,822	51,822	51,822	51,822
Rockfish Total	79,903	668,467	758,341	1,276,561	1,276,552	1,276,552	1,276,552	1,276,552	1,276,552	1,276,552
Spiny Dogfish		2,607	10,760	13,450	13,450	13,450	13,450	13,450	13,450	13,450
Lingcod	5,247	24,264	49,276	55,200	55,200	110,200	220,200	55,200	110,200	220,200
Pacific Cod	4,873	128,530	471,655	589,569	589,569	589,569	589,569	589,569	589,569	589,569
Sablefish	980,719	959,982	1,328,253	1,606,051	1,612,444	1,612,444	1,612,444	1,585,912	1,585,912	1,585,912
Unspecified Skate	2,031	18,635	47,158	58,948	58,948	58,948	58,948	58,948	58,948	58,948
Shortspine Thornyhead	8,105	10,173	12,703	17,137	14,774	14,774	14,774	14,532	14,532	14,532
Other Groundfish Total	1,000,975	1,144,191	1,919,805	2,352,480	2,337,983	2,392,983	2,502,983	2,311,357	2,366,357	2,476,357
Pacific Whiting[1/]	53,984,582	45,867,384	51,673,540	55,066,079	77,161,000	77,161,000	77,161,000			
All Groundfish Species Total	55,077,754	48,372,507	54,833,180	59,296,988	81,377,403	81,432,403	81,542,403	4,189,777	4,244,777	4,354,777

1/ Assuming "medium" Pacific whiting OY under the alternatives for 2005.

Phil - 8:32a, 6/17/04

motion #14 (Phil_motion.wpd) Harp
moved Phil / 2nd by

Brown-problem w/ sandab & rex sole. mesh retention
study. not a chance w/ legal mesh that we will be
hurting those stocks. doesn't show any common
sense. what Dave Sampson found in ~~sex~~ eng sole, if
we caught the entire -
ask make of motion to add rex/sandab
and reconsider in these 2 species,
felt strongly.

Anderson did not accept friendly amendment.
from Mr Brown. Anderson then said maybe there was confusion
on his part. spoke about harvest policies (25% reduction in ABC to
set 04). This motion is consistent w/ our harvest policy (hp). we
are setting 04 consistent w/ our hp.
Mr. Brown moved to amend. #1 I to motion 14
request GMT to reexamine the 25%
for rex and sandabs.
Brown/Warrens

Anderson asked if that was course of next day?
~~and~~ Brown said yes. PA and what is the sense of workload?
Michele - the flatfish ABC/04 - GMT has reviewed the issue, but in terms of
sending them back and will say the same thing.
Rod Moore - if the motion were to remove .... already calculated out.
Patty Burke - ask GMT to quick relook? GMT - did not have mesh size study.
Brown - the 25% is nothing magical policy. English is not a concern. Rex sole
and sandabs.
Brown withdrew the motion.

~~california~~ ca_options 6/17/04
WORD

Exhibit C.6.e
Supplemental Public Comment 2
June 2004

Washington Trollers Association
PO Box 7431
Bellevue WA 98008
(425)747-9287; Fax (425)747-2568
Doug Fricke, President

Washington Trollers Association

May 29, 2004

Dr. Donald McIsaac, Executive Director
Pacific Fisheries Management Council
7700 NE Ambassador Place, Suite 200
Portland, OR. 97220

Subject: Incidental Ling Cod Allowance

Dear Don and Council Members:

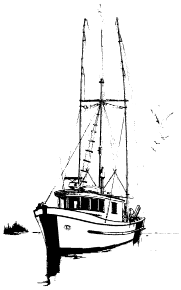
It has come to the attention of the Washington Trollers Association that the coastal ling cod resource is recovering to a status that will allow increasing the total allowable catch (TAC) of ling cod in the EEZ along the Washington coast. It is well documented that the salmon Trollers, while targeting salmon, will incidentally encounter ling cod. We believe that the scientific information shows that, in fact, the ling cod specie has a good survival rate when released from incidental encounters with salmon fishing gear. However, we also understand that one of the intents of the 1996 Sustainable Fisheries Act is to reduce by-catch whenever possible.

The Washington Trollers Association is requesting that the Council review the ratio of ling cod that was landed with salmon in the years prior to the ling cod landing restrictions. Based on that information, with the idea of reducing by-catch, we request that the Council consider an incidental landing allowance of ling cod that is tied to a ratio of the salmon landed similar to the landing allowance that is currently allowed for the yellow tail rock fish. The WTA thinks this historic ratio would be in the range of one ling cod allowance to ten salmon on the vessel. By tying the ling cod landing allowance as a ratio of the salmon landed, this will help insure that the salmon fisherman does not become a directed ground fish fisher.

The Trollers do not know for sure until the historic analysis is completed, but in relationship to the anticipated harvestable biomass of ling cod, we think this allowed landing allowance of ling cod while targeting salmon will be very small. Thank you in advance for your consideration.

Sincerely,

Douglas H. Fricke
Doug Fricke, President



Cc: WDFW – Phil Anderson
WDFW – Michael Robinson
Mark Cedergreen
Bob Alverson
Jim Harp

Quality Troll Caught
Salmon for Consumers

Exhibit C.6.e
Written Public Comments
June 2004

Subject: [Fwd: bottom fishing ban]
From: "PFMC Comments" <pfmc.comments@noaa.gov>
Date: Tue, 25 May 2004 08:47:23 -0700
To: John DeVore <John.DeVore@noaa.gov>
CC: Mike Burner <Mike.Burner@noaa.gov>
X-Mozilla-Status: 0001
X-Mozilla-Status2: 00000000
Return-Path: <pfmc.comments@noaa.gov>
Received: from noaa.gov ([65.106.153.163]) by mercury.akctr.noaa.gov (Netscape Messaging Server 4.15 mercury Jun 21 2001 23:53:48) with ESMTP id HYA1EQ00.GCV; Tue, 25 May 2004 08:52:02 -0700
Message-ID: <40B36A8B.3010606@noaa.gov>
User-Agent: Mozilla/5.0 (Windows; U; Windows NT 5.1; en-US; rv:1.4) Gecko/20030624 Netscape/7.1 (ax)
X-Accept-Language: en-us, en
MIME-Version: 1.0
Content-Type: multipart/alternative; boundary="------------050607030506070901000303"

-------- Original Message --------
Subject:bottom fishing ban
Date: Mon, 24 May 2004 18:55:49 -0700
From: Chris George <georgewat@sbcglobal.net>
To:<pfmc.comments@noaa.gov>

November 7, 2003

To Whom It May Concern:
I am just reading about your bottom fishing ban in the Monterey Herald this morning. As a seafood consumer, friend of the ocean and those who make their livelihood from the ocean waters, I am compelled to write and express my disdain for your policies. I believe you are completely wrong in recommending the closure of the bottom fishing season with all the implications for people who depend on the sea for their food and income. To close, even for a short time, such an important resource to our nation is profoundly foolish and shortsighted. When you close the seasons as you often recommend, it puts an extreme hardship on businesses and their employees. I for one will recommend to the National Marine Fisheries Service that they deny your request for the ban. I pray that many other citizens will join in recommending to the NMFS that they overrule your foolish ideas.

Sincerely Yours,

Christopher A. George

INTERNATIONAL PACIFIC HALIBUT COMMISSION

ESTABLISHED BY A CONVENTION BETWEEN CANADA

AND THE UNITED STATES OF AMERICA

DIRECTOR
BRUCE M. LEAMAN

P.O. BOX 95009
SEATTLE, WA 98145-2009

TELEPHONE
(206) 634-1838

FAX:
(206) 632-2983

March 26, 2004

RECEIVED
APR 12 2004
PFMC

Dr. Don McIssac, Executive Director
Pacific Fishery Management Council
7700 NE Ambassador Place, Suite 200
Portland, Oregon 972220-1384

Re: Agenda item C.10

Dear Don:

The staff of the International Pacific Halibut Commission (IPHC) would like to offer its support for the adoption and use of selective flatfish trawls. These types of trawls have been designed to reduce the bycatch of certain rockfish species during flatfish fishing, but have also shown promising results in reducing halibut bycatch. Research by the Oregon Department of Fish and Wildlife on selective flatfish trawls has demonstrated significant reductions in bycatch of Pacific halibut: 29% lower on the shelf and 46% on the slope, while having only small impact on the target catch. Reductions in halibut bycatch will result in higher catch limits for treaty and no-treaty commercial halibut fishermen, and recreational halibut anglers. For these reasons, we encourage the Council to consider this type of trawl as it refines management measures for 2005 and beyond.

Thank you for this opportunity to comment.

Sincerely,

Bruce

Bruce M. Leaman
Executive Director

cc: IPHC Commissioners

To: Fish & Game Commission Date: April 4,2004
Subject: Rock Cod closure on the Central Coast, and Shoreline fisherman

RECEIVED
APR 14 2004
PFMC

While living in California for the past twenty-nine years, I have been a sport fisherman along the California central coast shoreline. I am having a hard time believing that your judgment is clear and that you understand this type of fishing. Closing Rock Cod fishing from the shore should have not been included in the new rules.

First let me say, the only time a person can safely fish along the Pacific Ocean shoreline (off the rocks) is when the swell permits it. For me, this means a four-foot swell or smaller, and this only occurs occasionally in the year. Anything bigger makes fishing difficult and unsafe. The swell size dictates fishing along the shoreline. During the winter months like December, January, February, plus the other weeks, and days of the year when the swells are to big making it too rough for fishing should be counted as the **only** closure time for shoreline fishing persons.

Working five days a week limits my fishing to weekends; that is, if the swell permits it, there can't be very many of us doing this kind of fishing so there is little impact on fish.

My true experience as a shoreline fishing person gets only one or two fish, if they're lucky in a few hours of fishing, and many times goes home without any fish at all. There are miles and miles of inaccessible shoreline by foot. In spring commercial fishermen in skiffs using long lines, and drop lines take all the adult fish in these areas by the summer.

As we know the commercial sport fishing boat owners lobby at F&G Commission meetings. They dictate to the F&G Department, and influence the months of closure that best suit them because of their business of sport fishing, and whale watching trips. When Party boats fish they catch their limits, and unfortunately kill unwanted small fish.

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Respectfully, J Lambert April 5, 04
Jim Lambert, 2098 Paralta Ave., Seaside Ca. 93955, Phone # 831-656-7745

Pacific Fishery Management Council
700 NE Ambassador Place, Suite 200
Portland, OR 97220

Phone: 503) 820-2280 fax:(503) 820-2299
Toll-free: 1-866-806-7204

RECEIVED
APR 14 2004
PFMC

To: Pacific Fishery Management Council
Subject: Rock Cod closure on the Central Coast, and Shoreline fishing person.

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Respectfully, Name: Mike Cowan Date: 4/10/04
Address: 2070 MILITARY AVE, SEASIDE, CA

Pacific Fishery Management Council   Phone: 503) 820-2280 fax:(503) 820-2299
700 NE Ambassador Place, Suite 200   Toll-free: 1-866-806-7204
Portland, OR 97220

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Respectfully, Name: ______ Date: 4-7-04
Address: 269 Reservation Rd, #207, Marina Ca
93933

RECEIVED
APR 15 2004
PFMC

California Fish and Game Commission
1416 Ninth Street
P.O. Box 944209
Sacramento, CA 94244-2090

To: Fish & Game Commission
Subject: Rock Cod closure on the Central Coast, and Shoreline fishing person.

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Respectfully, Name: Bill [illegible] Date: 4-6-04
Address: 2075 Military, CA, 93955

Pacific Fishery Management Council
700 NE Ambassador Place, Suite 200
Portland, OR 97220
Phone: 503) 820-2280 fax:(503) 820-2299
Toll-free: 1-866-806-7204

RECEIVED
APR 19 2004
PFMC

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Respectfully, Name: Richard C Peters Date: 4/16/04
Address: 2055 Military S.S. Ca 93955

Pacific Fishery Management Council
700 NE Ambassador Place, Suite 200
Portland, OR 97220
Phone: 503) 820-2280 fax:(503) 820-2299
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Respectfully, Name: KURT BURGHARDT Date: 4/19/04
Address: 1022 FUNSTON AVE PG CA 93950

Exhibit C.7
Situation Summary
June 2004

MONITORING PROGRAM ALTERNATIVES FOR THE SHORE-BASED PACIFIC WHITING FISHERY

Situation: A permanent monitoring program for the shore-based Pacific whiting fleet needs to be developed and implemented, because of the specification in the Pacific Coast salmon and groundfish fishery management plans (FMPs) and the 1992 Biological Opinion analyzing the effects of the groundfish fishery on salmon stocks listed under the Endangered Species Act (ESA). The issue of salmon retention in the groundfish trawl fisheries was brought before the Council in 1996 in the form of Amendment 10 to the Pacific Coast Groundfish FMP and Amendment 12 to the Pacific Coast Salmon FMP. Based on an Environmental Assessment drafted to analyze these amendments, the Council recommended the exempted fishery permit (EFP) process be used temporarily until a permanent monitoring program could be developed and implemented in the shore-based Pacific whiting fishery. EFPs are intended to provide for limited testing of a fishing strategy, gear type, or monitoring program that may eventually be implemented on a larger fleet-wide scale and are not a permanent solution to the monitoring needs of the shore-based Pacific whiting fishery. Results of the shore-based Pacific whiting EFPs indicate that it is feasible to retain and appropriately monitor the incidental take of salmon and groundfish other than Pacific whiting in the shore-based Pacific whiting fishery.

The Council last considered this matter in September 2003 when the National Marine Fisheries Service (NMFS) presented a preliminary draft Environmental Assessment which included a range of alternative monitoring systems for the shore-based Pacific whiting fishery. The Council appreciated the initial efforts of the NMFS Northwest Regional Office, but recommended postponing adoption of a preliminary range of alternatives until more public input could be garnered.

In keeping with the Council's recommendation that the range of alternatives be further developed prior to public review, NMFS held a public scoping meeting on December 8, 2003, in Newport, Oregon to further engage federal and state personnel and to involve industry in the development of alternatives. NMFS Northwest Region staff met with the three West Coast state agencies as well as individuals from the shore-based whiting industry and Archipelago Marine Research Ltd. (a world leader in the field of fisheries monitoring and marine environmental assessment) to discuss full retention and monitoring in the shore-based Pacific whiting fishery. In an effort to evaluate if electronic monitoring is an appropriate tool for full retention monitoring in the shore-based whiting fishery, NMFS recently awarded Archipelago a contract to provide electronic monitoring services for the shore-based whiting fleet during the 2004 Pacific whiting EFP. Additionally, NMFS and Archipelago Marine Research staff have been attending Oregon Department of Fish and Wildlife's mandatory meetings for participants in the 2004 shore-based whiting EFP to further discuss the range of alternatives with state personnel and the shore-based whiting industry. These meetings generated fruitful discussion on the range of alternatives and have helped shape the range of alternatives presented and analyzed in the Preliminary Draft Environmental Assessment.

The alternatives currently focus on the following major issues: 1) establishing retention and monitoring requirements; 2) verifying full retention of catch; 3) sampling prohibited and overfished species; 4) tracking disposition of overage or donation fish, and; 5) funding of the monitoring program.

The Council needs to consider and adopt for public review the preliminary range of alternatives for a monitoring program for the shore-based Pacific whiting fishery. Final Council action on this matter is scheduled for September, when the Council identifies a preferred alternative. NMFS will then prepare a proposed rule for public comment followed by a final rule implementing a monitoring program before the start of the 2005 primary Pacific whiting season.

Council Action:

1. Adopt Alternatives for Public Review.

Reference Materials:

1. Exhibit C.7.a, Attachment 1: Preliminary Draft Environmental Assessment, Establishing a Full Retention and Monitoring Program in the Shore-based Pacific Whiting Fishery, NMFS, Northwest Region.

Agenda Order:

a.	Agendum Overview	Mike Burner
b.	NMFS Recommendations and Environmental Assessment	Carrie Nordeen
c.	Reports and Comments of Advisory Bodies	
d.	Public Comment	
e.	**Council Action:** Adopt Monitoring Program Alternatives for Public Review	

PFMC
05/25/04

Exhibit C.7.a
Attachment 1
June 2004

ESTABLISHING A FULL RETENTION AND MONITORING PROGRAM IN THE SHORE-BASED PACIFIC WHITING FISHERY

IMPLEMENTING AMENDMENT 10 TO THE PACIFIC COAST GROUNDFISH FISHERY MANAGEMENT PLAN

PRELIMINARY DRAFT ENVIRONMENTAL ASSESSMENT

Lead Agency	National Oceanic and Atmospheric Administration National Marine Fisheries Service Northwest Regional Office Seattle, Washington
Responsible Official	D. Robert Lohn Regional Administrator Northwest Regional Office
For Further Information Contact	Carrie Nordeen National Marine Fisheries Service 7600 Sand Point Way, NE Seattle, WA 98115 (206) 526-6144

Abstract: This preliminary Environmental Assessment (EA) provides an analysis of the effects of establishing a full retention and monitoring program in the Pacific whiting fishery off the coasts of Washington, Oregon, and California. A full retention program reduces discards in the Pacific Coast groundfish fishery by enabling the shore-based whiting fleet to land prohibited species as well as groundfish species taken in excess of cumulative trip limits. By allowing vessels to land unsorted catch at processing plants, a full retention program helps ensure quality whiting products by enabling catch to be placed in refrigerated seawater tanks immediately after capture. Additionally, full retention and monitoring will improve the ability of fishery management agencies to track the incidental catch of prohibited species (e.g., Pacific salmon) and overfished groundfish species (i.e., widow rockfish, darkblotched rockfish, Pacific ocean perch, canary rockfish, bocaccio, lingcod), as well as track the forfeiture and/or donation of groundfish caught in excess of Pacific Coast groundfish trip limits by the shore-based whiting fleet. This EA analyzes establishing a full retention and monitoring program in Federal regulation versus issuing exempted fishing permits (EFPs) and the effects of different types of monitoring programs on the socioeconomic, biological, and physical environment of the Pacific Coast groundfish fishery.

The purpose of this document is to discuss establishing a full retention and monitoring program in the Pacific Coast shore-based whiting fishery. At its September 8 - 12, 2003, meeting in Seattle, Washington, the Pacific Fishery Management Council (Pacific Council) reviewed a range of alternatives and recommended to NMFS that the range of alternatives be further developed before being made available for public review. In order to further engage Federal and State personnel and to involve industry in the development of alternatives, a meeting was held on December 8, 2003, in Newport, Oregon to further develop the range of alternatives. At its June 13-18, 2004, meeting in Foster City, California the Pacific Fishery Management Council (Pacific Council) will review this EA and, if appropriate, adopt a range of alternatives for public review. The Pacific Council is scheduled to select a preferred alternative at their September 12-17, 2004, meeting in San Diego, California. After the Pacific Council's September meeting, a proposed rule describing the proposed regulations and requesting public comment will be published in the Federal Register. After receiving public comment on the proposed rule, a final rule would establish a full retention and monitoring program prior to the April start of the 2005 primary whiting season. Establishing full retention and monitoring requirements in the shore-based whiting fleet will aid in sustainable management of Pacific Coast salmon and groundfish stocks while providing an important economic opportunity to those associated with the harvest, processing, and selling of whiting taken by the shore-based whiting fleet.

JUNE 2004

TABLE OF CONTENTS

2004 Whiting Exempted Fishing Permit

1.0 PURPOSE OF AND NEED FOR ACTION

1.1 Introduction

The groundfish fishery in the Exclusive Economic Zone (EEZ), offshore waters between 3 and 200 miles, off the coasts of Washington, Oregon, and California (WOC) is managed under the Pacific Coast Groundfish Fishery Management Plan (FMP). The Pacific Coast Groundfish FMP was prepared by the Pacific Fishery Management Council (Pacific Council) under the authority of the Magnuson Fishery Conservation and Management Act (subsequently amended and renamed the Magnuson-Stevens Fishery Conservation and Management Act). The Pacific Coast Groundfish FMP has been in effect since 1982.

Actions taken to amend FMPs or to implement regulations to govern the groundfish fishery must meet the requirements of several Federal laws, regulations, and executive orders . In addition to the Magnuson-Stevens Fishery Conservation and Management Act (Magnuson-Stevens Act), these Federal laws, regulations, and executive orders include: National Environmental Policy Act (NEPA), Regulatory Flexibility Act (RFA), Endangered Species Act (ESA), Marine Mammal Protection Act (MMPA), Coastal Zone Management Act (CZMA), Paperwork Reduction Act (PRA), Executive Orders (E.O.) 12866, 12898, 13132, and 13175, and the Migratory Bird Treaty Act.

The regulations that implement NEPA allow NEPA documents to be combined with other agency documents to reduce duplication and paperwork (40 CFR§§1506.4). Therefore, this EA will ultimately become a combined regulatory document to be used for compliance with not only NEPA but also E.O. 12866, RFA, and other applicable laws. NEPA, E.O. 12866, and the RFA require a description of the purpose and need for the proposed action as well as a description of alternative actions that may address the problem.

- Chapter One describes the purpose and need and general background of the proposed action.
- Chapter Two describes a reasonable range of alternative management actions that may be taken under the proposed action.
- Chapter Three contains a description of the socioeconomic, biological, and physical characteristics of the affected environment.
- Chapter Four examines the socioeconomic, biological, and physical impacts of the management options.
- Chapter Five provides a list of references for this document.
- An appendix with the 2004 shore-based whiting EFP and a pilot study of electronic monitoring in the shore-based whiting fishery is found in Chapter Six.

1.2 Summary of Proposed Action

The proposed action is to establish a full retention and monitoring program in the shore-based Pacific whiting (whiting) fishery in the EEZ off the coasts of Washington, Oregon, and California.

1.3 Purpose of and Need for Action

The need for establishing full retention and monitoring requirements in the shore-based whiting fishery is to meet requirements of and guidance from the Magnuson-Stevens Act, the Endangered Species Act, and Pacific Coast groundfish FMP.

The needs for the proposed action are as follows:

- ➢ Establish a standardized reporting methodology to assess the type and amount of bycatch occurring in the shore-based whiting fishery.
- ➢ Meet the terms and conditions of the "Section 7 Consultation - Biological Opinion: Fishing conducted under the Pacific Coast Groundfish Fishery Management Plan for California, Oregon, and Washington Groundfish Fishery" by accurately tracking salmon species incidentally taken in the shore-based whiting fishery and collecting morphological information from salmon species.
- ➢ Maintain the integrity of Pacific Coast groundfish rebuilding plans for overfished species by accurately tracking overfished species taken in the shore-based whiting fishery to manage the total mortality of overfished species.

The purpose of the proposed action is to manage the Pacific Coast groundfish fishery sustainably while providing an important economic opportunity to those associated with the harvest, processing, and selling of whiting taken by the shore-based whiting fleet.

The purposes of the proposed action are as follows:

- ➢ Establish a full retention program in the Pacific Coast groundfish fishery off the coasts of Washington, Oregon, and California by providing for the catching, retaining, and landing of all catch harvested by catcher vessels in the shore-based fishery for Pacific whiting.
- ➢ Reduce discard by allowing for the landing of prohibited species and groundfish taken in excess of cumulative trip limits and accurately tracking the forfeiture and/or donation of these fish to state or charitable donation agencies.
- ➢ Develop a monitoring program to achieve an adequate level of sampling for a full retention shore-based whiting fishery. This monitoring program will also serve as a template for monitoring in future potential Pacific Coast multi-species full or increased retention groundfish fisheries.

1.4 Background to the Purpose and Need

To provide for the conservation and management of fisheries, the Magnuson-Stevens Act specifies requirements for fishery management plans. One of the required provisions for fishery management plans is to establish a standardized reporting methodology to assess the type and amount of bycatch occurring in the fishery, and include conservation and management measures that, to the extent practicable, minimize bycatch (Section 303(a)(11)). Establishing a full retention program in the Pacific Coast groundfish fishery as well as an associated monitoring program would satisfy the Magnuson-Steven Act standardized reporting methodology requirement for the shore-based whiting fishery. Additionally, a full retention program would reduce discard in the shore-based whiting fishery by allowing for the landing of prohibited species and groundfish taken in excess of cumulative trip limits and accurately tracking the forfeiture and/or donation of these fish to state or charitable donation agencies.

The need for full retention and monitoring in the shore-based whiting fishery is also linked to the FMP and Federal regulatory requirements surrounding the treatment and disposition of prohibited species and groundfish taken in excess of cumulative trip limits by Pacific Coast trawl fisheries.

- In section 6.5.2.2 "Catch Restrictions" of the groundfish FMP, it specifies that salmon caught in trawl nets are classified as a prohibited species. As specified under Federal regulation at 50 CFR 660.306 and in section 6.5.5.4 "Prohibited Species" of the groundfish FMP, salmon captured in trawl nets and brought aboard must be returned to the sea as soon as practicable, after allowing for sampling by an observer, with a minimum of injury (PFMC 2002). [Note: Because of the high mortality rate for trawl caught salmon, all salmon discards are presumed dead.]

- In section 6.6.2 "Net Prohibition" of the salmon FMP, it specifies that the use of nets to capture salmon, with the exception of a hand-held net used to lift hooked salmon on board a vessel, is prohibited (PFMC 2003).

- Under Federal regulation at 50 CFR 660.306, the taking, retaining, possessing, or landing of groundfish in excess of cumulative trip limits is prohibited without an exempted fishing permit.

Trawl fisheries regulated by the Pacific Coast groundfish FMP include those using either bottom trawl gear, a type of gear routinely fished with the footrope in contact with the ocean floor, or those using midwater trawl gear, a type of gear that is routinely fished above the ocean floor. In general, bottom trawl gear is used to harvest flatfish, rockfish, and some roundfish species while midwater trawl gear is primarily used to capture whiting or pelagic rockfish.

Relatively low numbers of salmon are incidentally taken during trawl fishing operations for groundfish. Between September 2001 and August 2002, 9,413 lbs of salmon were incidentally taken by the limited entry groundfish trawl fleet with observer coverage during that period (about 10% of landings) off the Pacific Coast (NMFS 2003). The incidental capture of salmon is generally a rare event with most tows containing no salmon and a few tows containing many salmon. Variation in the incidental take of salmon appears to be influenced by the time of year, area, depth of fishing, and general salmon abundance. Knowledge of these variations shared between fishers can sometimes be used to help limit the incidental take of salmon in the groundfish fishery, especially in the whiting fishery. Because of the timing and location of the whiting fishery, the salmon species predominantly taken in the fishery is chinook. Pink, chum, and coho salmon may also contribute to a significant proportion of the catch in the midwater trawl fishery, depending on the year and location of the fishery. In 2003, 2,872 individual salmon were incidentally taken in the non-tribal whiting fishery (at-sea and shore-based sectors combined).

The 1992 Biological Opinion analyzing the effects of the Pacific Coast groundfish fishery on salmon stocks listed under the ESA, requires the Pacific Council to provide for monitoring of the salmon incidentally taken in the midwater trawl whiting fishery but not in the bottom trawl fishery (NMFS 1992). Gear is fished within the water column in the midwater trawl whiting fishery and it is fished near and/or on the ocean floor in the bottom trawl fishery. Because salmon are most often present in the water column, as opposed to being associated with the ocean floor, and because there is a spatial/temporal overlap between the whiting fishery and salmon distribution, there is an opportunity to incidentally take more salmon in the whiting fishery than in the bottom trawl fishery. For the bottom trawl fishery, the Pacific Council must provide an annual summary that characterizes that fishery and which can be used to assess any changing trends in that fishery that may jeopardize a listed salmon stock. Currently, the need for monitoring in the whiting fishery is based on not jeopardizing the existence several salmon species listed under the ESA, including the Snake River fall chinook, lower Columbia River chinook, upper Willamette River chinook, and Puget Sound chinook (NMFS 2002). Monitoring needs could change if additional salmon species are listed or additional incidental take data are needed for other management purposes.

The whiting stock is the most abundant of any managed fishery resource off the coasts of Washington, Oregon, and California. Whiting landings in 2002 represented approximately 84% of the total groundfish landings by weight for the year (PacFIN 2003). The primary value of whiting lies in its conversion to a protein paste known as "surimi" which is used as the base for many analog products such as imitation crab, shrimp, and scallops. The conversion of fish flesh to an acceptable quality of surimi is highly dependent on the freshness of the raw product and demands careful handling and immediate cooling or processing to be economically feasible. Processing of whiting into surimi is more critical than with some other fish species because whiting contains a parasite that releases an enzyme that begins to soften the flesh of the fish soon after it dies. Rapid cooling of the whiting catch can retard this deterioration should whiting need to be stored for any duration prior to processing (PFMC 1996).

At present, the whiting fishery consists of at-sea and shore-based components. In the at-sea fishery, the trawl nets are emptied on the deck of either a mothership or catcher-processor, the catch is sorted, and the whiting are quickly processed to retain freshness and prevent loss of quality. During this time, incidentally caught salmon can be removed from the catch by an observer, either on deck or during processing of the catch, counted, and thrown overboard.

Therefore, owing to vessel configuration and 100 % observer coverage aboard motherships and catcher-processors, disposition of the salmon incidentally taken with midwater trawl gear by the at-sea whiting fleet satisfies the requirements of both the salmon and groundfish FMPs. In the shore-based fishery, catcher vessels must store the whiting, for up to several hours as they transit from the fishing grounds to shore-based plants where the fish are processed. In this situation, it is imperative for the catch to be cooled as rapidly as possible, often by immediately emptying the contents of the trawl net into refrigerated seawater holds below deck, to retain product freshness and quality. The shore-based fleet's rapid dumping of catch into refrigerated seawater holds below deck precludes immediate sorting, sampling, and removing prohibited species from the catch. Consequently, this handling of salmon species and groundfish species taken in excess of cumulative trip limits by the shore-based whiting fleet is not in accordance with the Pacific Coast salmon or groundfish FMPs or under Federal regulation at 50 CFR 660.306.

The sorting, sampling, and immediate release of salmon incidentally taken in the whiting fishery is possible for the at-sea component of the fishery, but it is not practical for the shore-based component of the whiting fishery because of their need to rapidly cool the fish in refrigerated seawater holds to preserve freshness and quality. As a temporary means to meet the monitoring requirements of the 1992 Biological Opinion and allow for efficient utilization of the whiting resource, the Pacific Council implemented an exempted fishing permit (EFP) process for the shore-based component. Through the initial use of on-board observers and the continued use of dock-side monitors, this EFP process authorized the retention of incidentally caught salmon in the shore-based whiting fishery until the catch is sorted at the processing plant. At the plants, incidentally taken salmon are counted, sampled, and either forfeited to the state or donated to charitable institutions. As defined at 50 CFR 679.6, EFPs authorize fishing for groundfish in a manner that would otherwise be prohibited for limited, experimental purposes. Thus, EFPs are intended to provide for limited testing of a fishing strategy, gear type, or monitoring program that may eventually be implemented on a larger fleet-wide scale and are not a permanent solution to the monitoring needs of the shore-based whiting fishery. Because of the success of the shore-based whiting EFP, indicating that it is feasible to retain and monitor the incidental take of salmon in the shore-based whiting fishery, it is now appropriate to establish full retention and monitoring requirements for salmon and other non-target species incidentally taken in the shore-based whiting fishery in Federal regulations.

The harvest of Pacific Coast groundfish species is managed under a cumulative trip limit system. Trip limits are the specified quantity of groundfish that can be taken, retained, possessed, or landed on either a daily, weekly, monthly, or two month schedule. Because non-whiting species are sometimes captured during directed fishing for whiting and because sorting catch at sea is difficult for the shore-based whiting fleet, adherence to a trip limit management regime is not practical for the shore-based whiting fleet. In the fall of 2001, the West Coast Groundfish Observer Program (Observer Program) was implemented in the Pacific Coast groundfish fishery. The purpose of the Observer Program is to provide accurate accounts of total catch, bycatch, and discard under the cumulative trip limit management system. Vessels with limited entry permits carry observers on a random schedule and the Observer Program's initial goal was to provide coverage so that fishing was observed for approximately 10% of the limited entry trawl fleet's coastwide landings (NMFS 2003). Because of the shore-based whiting fleet's difficulty with sorting catch at sea, vessels have been allowed to take, retain, possess, and land groundfish species taken in excess of groundfish cumulative trip limits through the EFP process. Without an EFP, shore-based whiting vessels would be prohibited from retaining and landing groundfish in excess of trip limits under Federal regulation at 50 CFR 660.306. These vessels would be required to sort their catch at sea, risking deteriorating the flesh quality of their targeted catch, whiting. Through the EFP process, the shore-based whiting fishery has been acting as a full retention fishery. Because the Observer Program is not designed to provide coverage for a full retention fishery, the shore-based whiting fishery needs a monitoring program designed to provide the higher level of coverage necessary to monitor compliance with full retention requirements.

In addition to tracking salmon incidentally taken in the shore-based whiting fishery, NMFS's obligations to rebuild overfished groundfish species require accurate tracking of catch in the shore-based whiting fishery. There are currently eight overfished groundfish species along the Pacific Coast and at least six of these species (widow rockfish, darkblotched rockfish, Pacific ocean perch, canary rockfish, bocaccio, and lingcod) are incidentally taken in the shore-based whiting fishery. In 2003, the incidental catch of overfished species was as follows: 8,970 kg of widow rockfish, 110 kg of canary rockfish, 300 kg of Pacific ocean perch, 400 kg of lingcod, and 260 kg of darkblotched rockfish (Wiedoff et al. 2003). The take of these species by the shore-based whiting fleet should be closely tracked for two reasons. Underestimating the total mortality of overfished species could result in harvest levels exceeding the rebuilding optimum yields (OYs) for those species, potentially slowing the rebuilding of those stocks. Conversely, overestimating the catch of overfished species by the shore-based whiting fleet could result in other sectors of the Pacific Coast groundfish fishery being unnecessarily constrained in order to limit the total catch of overfished species.

Currently, there is no at-sea monitoring of shore-based whiting vessels to verify whether all catch is retained and/or to document the frequency of catch being dumped at sea. In addition to tracking the salmon taken in the whiting fishery, it is NMFS' responsibility to assure, with a reasonable degree of confidence, that our management actions are consistent with overfished species rebuilding plans. Incidental catch of widow rockfish, canary rockfish, darkblotched rockfish and Pacific ocean perch is of particular concern with the shore-based whiting fishery. Both NMFS and State agency personnel have heard reports that trawl nets containing higher than average quantities of non-whiting species are sometimes discarded at sea. While NMFS has classified these reports as "anecdotal", the incentive to discard non-whiting catch certainly exists. In individual fishing quota (IFQ) managed fisheries, if catch of one or more species reaches its limit before the limits of other jointly harvested species are achieved, there is incentive to discard at sea (Squires et al. 1998). Similarly, this discarding behavior has been observed in other full retention, limited catch fisheries (Annala 1996, Dewees 1992 (as referenced by Squires et al. 1998)). Because rockfish spines damage whiting product (Clucas 1997) as well as the tubing used by processing plants to offload shore-based catcher vessels (S. Parker, ODFW Biologist, personal communication, February 2004), there are additional incentives to not place rockfish in the refrigerated seawater tanks with whiting. There are thus strong economic incentives to discard catch of non-whiting species, especially overfished rockfish species, at sea. NMFS believes there is cause to document whether this behavior is occurring in the shore-based whiting fishery and to encourage vessels to more carefully target whiting with a full retention requirement.

Additionally, as both state and Federal agencies are experiencing budget reductions that affect the presence of enforcement personnel and dock-side samplers in and around processing plants, it is important to closely monitor what becomes of groundfish taken in excess of cumulative trip limits. Because of the shore-based whiting fleet's difficulty with sorting catch at sea, they have been able to take, retain, and land groundfish species taken in excess of groundfish cumulative trip limits through the EFP process. Groundfish taken in excess of trip limits are either forfeited to state agencies or donated to charitable agencies. Whether these fish are forfeited to the state or surrendered as charitable donations, a monitoring system is necessary to track these activities. The proposed action is to implement a permanent monitoring program that provides for a full retention opportunity in the shore-based whiting fishery. The different monitoring programs for the shore-based whiting fishery analyzed in this EA are based on the existing monitoring program for shore-based whiting EFP. The programs analyzed are intended to meet the coverage needs of a full retention fishery and will aid in the sustainable management of Pacific Coast salmon and groundfish stocks.

1.5 Environmental Review Process

The purpose of the environmental review process is to determine the range of issues that the NEPA document (in this case the EA) needs to address. The environmental review process is intended to ensure that problems are identified early and properly reviewed, that issues of little significance do not consume time and effort, and that the draft NEPA document is thorough and balanced. The environmental review process should: identify the public and agency concerns; clearly define the environmental issues and alternatives to be examined in the NEPA document; eliminate non-significant issues; identify related issues; and identify state and local agency requirements that must be addressed.

1.5.1 Public Scoping

To address the treatment and disposition of salmon in the groundfish trawl fisheries, specifically the shore-based component of the whiting fishery, an EA to amend both the groundfish and salmon FMPs was drafted in 1996 by Pacific Fishery Management Council (PFMC) staff. These FMP amendments were respectively numbered 10 for groundfish and 12 for salmon. The 1996 EA analyzed two management measures (alternatives) regarding the retention of salmon taken with groundfish trawl gear. The first alternative (status quo) was to maintain the then current salmon and groundfish FMPs, under which, retention of salmon in the groundfish trawl fisheries would not have been permitted and the practice of retaining salmon in the shore-based whiting fishery was only authorized as a temporary experimental measure under the authority of the EFP process. The second alternative (preferred alternative) maintained salmon as a prohibited species in the groundfish FMP. However, it added trawl gear to the list of gears that may retain salmon if allowed under other pertinent regulations (such as salmon fishing regulations at 50 CFR Part 660, Subpart H). Under the second alternative, the salmon FMP would be amended to allow retention of salmonids in the trawl fishery, when a Pacific Council approved monitoring program, one that meets certain minimum guidelines, was established in the shore-based whiting fishery (PFMC 1996). At their October 21 - 25, 1996, meeting in San Francisco, California, the Pacific Council discussed the retention of salmon in groundfish trawl fisheries, specifically the shore-based whiting fishery, and took final action implementing the preferred alternative to maintain a viable shore-based whiting fishery while using EFPs to temporarily monitor the incidental take of salmon until a permanent monitoring program could be implemented. Interested members of the public had the opportunity to comment on the retention of salmon in groundfish trawl fisheries at that same meeting in San Francisco, California.

In keeping with the Pacific Council's recommendation, to maintain a viable shore-based whiting fishery using EFPs to temporarily monitor the incidental take of salmon until a Pacific Council approved monitoring and disposition program is established, NMFS is proceeding with establishing a full retention and monitoring program in the shore-based whiting fishery.

On April 18, 2003, NMFS Northwest Region staff met with Northwest Fisheries Science Center (NWFSC) and West Coast Observer Program (Observer Program) staff to discuss establishing full retention and monitoring in the shore-based whiting fishery. Meeting discussion focused on what types of monitoring would be appropriate for the shore-based whiting fishery, what NWFSC and Observer Program resources, if any, would be available for monitoring the shore-based whiting fishery, and identifying an Observer Program staff member available to serve as a contact individual for the development and implementation of a shore-based whiting monitoring program.

On May 22, 2003, NMFS Northwest Region staff met with staff from Washington Department of Fish and Wildlife (WDFW), Oregon Department of Fish and Wildlife (ODFW), and California Department of Fish and Game (CDFG) to discuss implementing a monitoring program for the shore-based whiting fishery. The meeting discussion focused on identifying state issues and concerns associated with different types of full retention monitoring systems and identifying a contact individual from each state for the development and implementation of a monitoring system in shore-based whiting fishery.

NMFS brought a preliminary EA before the Pacific Council at their September 8 - 12, 2003, meeting in Seattle, Washington. At that time, the Pacific Council recommended that the range of alternatives be further developed. In keeping with the Pacific Council's recommendation that the range of alternative be further developed prior to public review, NMFS held a public scoping meeting on December 8, 2003, in Newport, Oregon to further engage Federal and State personnel and to involve industry in the development of alternatives. NMFS Northwest Region staff met with staff from WDWF, ODFW, and CDFG as well as individuals from Archipelago Marine Research Ltd and the shore-based whiting industry to discuss full retention and monitoring in the shore-based whiting fishery. Archipelago Marine Research Ltd is a world leader in the field of fisheries monitoring and marine environmental assessment. Based in Victoria, British Columbia, Archipelago has been providing marine biological services since 1978. Additionally, NMFS and Archipelago staff have been attending ODFW's mandatory meetings for participants in the 2004 shore-based whiting EFP (May 6, 2004 in Charleston, Oregon; May 10, 2004 in

Newport, Oregon; May 18, 2004 in Astoria, Oregon) to further discuss the range of alternatives with state personnel and the shore-based whiting industry. These meetings generated fruitful discussion on the range of alternatives and have helped shape the range of alternatives presented and analyzed in this EA.

At its June 13-18, 2004, meeting in Foster City, California, the Pacific Fishery Management Council (Pacific Council) will review this EA and, if appropriate, adopt a range of alternatives for public review. The Pacific Council is scheduled to select a preferred alternative at its September 12-17, 2004, meeting in San Diego, California.

1.5.2 Issues and Concerns Raised Through Scoping

While the initial purpose of the proposed action was to develop and implement a monitoring program for the treatment and disposition of incidentally taken salmon in the shore-based whiting fishery, the importance of establishing full retention and monitoring options to reduce bycatch and to track multiple aspects of the shore-based whiting fishery became apparent through the scoping process.

Issues and concerns identified by staff from the NWFSC and Observer Program staff on April 18, 2003, include the following:

- the merits of a full retention program;
- allowing discard at sea would require observers/monitors to be aboard shore-based vessels;
- placing Federal observers aboard shore-based delivery vessels is an inefficient use of resources;
- perhaps this shore-based fishery is a candidate for testing hard bycatch caps;
- video cameras may have insurance/liability concerns for industry;
- and valuable data could be collected dock-side but logistics of port sampling is difficult for the Observer Program.

Issues and concerns identified by staff from state (Washington, Oregon, and California) agencies on May 22, 2003, include the following:

- the relative economic importance of the shore-based whiting fishery varies by state;
- the resources available to implement a monitoring program differ by state;
- the monitoring program should be relatively consistent across states and build on the existing EFP monitoring infrastructure;
- currently monitoring is funded by industry, NMFS, and the states;
- there should be port specific market values for overage fish;
- the monitoring program could use a "penalty box" concept (required withdrawl from the fishery for excessive bycatch); and
- the monitoring program could implement individual vessel bycatch caps.

Issues and concerns identified by staff from state agencies, individuals involved in the shore-based whiting industry, and staff from Archipelago Marine Research Ltd. during the December 8, 2003, meeting include the following:

- identifying the need for discontinuing the annual issuing of EFPs for this fishery;
- the importance of having industry support any type of monitoring program;
- identifying the need for verifying full retention of catch taken by shore-based whiting fleet;
- identifying appropriate monitoring levels;
- analyzing the shore-based whiting fleet's ability to fund a monitoring program;
- implementing a monitoring program that would be appropriate for IFQs;
- including a provision that allows shore-based whiting fleet to sort their catch at sea;
- including the option of Federal, State, and/or Industry funding for the full range of alternatives; and
- improving cost estimates for the range of alternatives.

Issues and concerns identified by industry during ODFW's mandatory meetings for participants in the 2004 shore-based whiting EFP include:

- what is the definition of full retention;
- are vessels responsible to ensure that money for overages are handled appropriately;
- data confidentiality and privacy rights concerning electronic monitoring need to be clear and designed to protect vessel owner/operators;
- vessel owner/operators should have access to electronic monitoring images collected aboard their vessels; and
- the cost of full retention monitoring programs are expensive for the shore-based whiting fishery.

1.6 Decision to be Made

From the information in this EA, the Regional Administrator of NMFS, Northwest Region must decide how best to establish a full retention and monitoring program in the shore-based whiting fishery. The Regional Administrator must also determine if the proposed action and/or preferred alternative would or would not be a major Federal action, significantly affecting the quality of the human environment. If the Regional Administrator determines that the proposed action would not significantly affect the quality of the human environment, then a Finding of No Significant Impact (FONSI) may be prepared and a full retention and monitoring program may be implemented in the shore-based whiting fishery. If the Regional Administrator determines that the action would significantly affect the Pacific Coast groundfish fishery, then preparation of an Environmental Impact Statement will be required.

1.7 Applicable Federal Permits, Licences, or Authorizations Needed in Conjunction with Implementing this Proposal

No additional Federal permits, licences, or authorizations are needed to implement a monitoring program in the shore-based whiting fishery.

2.0 ALTERNATIVES INCLUDING THE PROPOSED ACTION

2.1 Introduction

This chapter describes the different full retention and monitoring programs or alternatives that may be established in the shore-based whiting fishery to meet the purpose and need of the proposed action. When deciding what type of a monitoring system is appropriate for the shore-based whiting fishery, the advantages and disadvantages associated with four different components of a full retention monitoring program in the shore-based whiting fishery and four different full retention monitoring options for the shore-based whiting fishery should be considered.

The four different components of a monitoring program for shore-based whiting fishery that should be considered are:

- establishing full retention and monitoring;
- verifying full retention of catch,
- sampling for prohibited and overfished species at the processing plants where catch is delivered, and
- tracking the overage/donation fish and the money paid for these fish.

These four different components of the shore-based whiting fishery are termed "issues" in this EA.

The four different monitoring options to provide for a full retention and monitoring are:

- no full retention and monitoring,
- the EFP process,
- a Federal monitoring program, and
- a combination monitoring program.

These four different monitoring options are referred to as the "alternatives" in this EA. The relationship between the issues and alternatives is explored in this EA.

2.2 Development of Alternatives and How the Alternatives are Structured

As discussed in Chapter One, because of Magnuson-Stevens Act requirements, the 1992 Biological Opinion analyzing the effects of the groundfish fishery on salmon stocks listed under the ESA, and requirements of the Pacific Coast groundfish FMP, a full retention and monitoring program is needed in the shore-based whiting fishery (NMFS 1992; PFMC 2002).

The issue of salmon retention in the groundfish trawl fisheries has already been brought before the Pacific Council in 1996 in the form of Amendment 10 to the Pacific Coast Groundfish FMP. Based on the EA drafted to analyze Amendment 10, the Pacific Council recommended that the EFP process be used temporarily until a permanent monitoring program could be developed and implemented in the shore-based whiting fishery. The Pacific Council also recommended that both the groundfish and salmon FMPs be amended to allow the retention of salmon in certain groundfish trawl fisheries if accompanied by an approved monitoring program (PFMC 1996). Analysis of the alternatives will weigh the effects of establishing full retention and monitoring requirements on the human environment. For the purpose of this analysis, the human environment is defined as the Pacific Coast groundfish fishery. To meet the requirements of the Federal law and the Groundfish and Salmon FMPs, the preferred alternative should establish full retention and monitoring requirements while adequately providing for full retention catch verification, sampling of prohibited and overfished species at the processing plants where catch is delivered, and tracking of overage/donation fish and the money paid for these fish.

2.3 Alternatives Eliminated from Detailed Study

There is an issue relevant to the retention of salmon in groundfish trawl fisheries and the shore-based whiting fleet that was not analyzed in this EA that relates to the treatment and disposition of salmon in groundfish trawl fisheries. Currently, the salmon FMP prohibits the use of nets to capture salmon, and the groundfish FMP classifies salmon caught in trawl nets as a prohibited species (NMFS 2003; NMFS 2002). Therefore, salmon taken in trawl nets and brought aboard must be returned to the sea as soon as practicable, after allowing for sampling by an observer, with a minimum of injury. Both FMPs could be amended to allow retention of salmon with groundfish trawl gear without developing and implementing a monitoring program for the shore-based whiting fleet. However, based on the analysis in the 1996 Amendment 10 EA, the Pacific Council recommended revising both FMPs only after a Pacific Council approved monitoring program was developed and implemented in the shore-based whiting fishery (PFMC 1996). Allowing salmon retention without a monitoring program would make it difficult to track the amount of salmon incidentally taken in the shore-based whiting fishery. Additionally, allowing retention of salmon in groundfish trawl fisheries would likely create incentives for groundfish fishers to target salmon, making it increasingly difficult for NMFS to manage for sustainable fisheries. Therefore, this action will not consider further revisions to either the salmon and groundfish FMPs without first implementing a monitoring program in the shore-based whiting fishery because doing so would not be in accordance with the need of the proposed action. This need includes establishing a standardized reporting methodology to assess the type and amount of bycatch occurring in the shore-based whiting fishery, accurately tracking the amount of salmon and overfished groundfish species incidentally taken in the shore-based whiting fishery.

Once a range of alternatives that met the purpose and need of the proposed action was developed through public scoping, one option under those alternatives was dismissed as not being viable. The option dismissed as not being viable, and, therefore, not analyzed in this EA, was exploring a range of monitoring levels for verifying full retention of catch in the shore-based whiting fishery. After discussions with staff from the West Coast Groundfish Observer Program and NMFS National Observer Program, NMFS decided that a level of 100% monitoring (i.e., all shore-based whiting vessels would be monitored for compliance with full retention requirements throughout their trips) was the only monitoring level that was appropriate for accurately documenting compliance with full retention. Additionally, the catch of prohibited species and overfished species are rare and intermittent in the shore-based whiting fishery, therefore, any discarding at sea of these species would also be rare and intermittent. As only high levels of monitoring are appropriate for documenting rare and intermittent events, NMFS's decision to only consider a level of 100% monitoring for verification of full retention is further supported.

2.4 No Action Alternative

Alternative 1 (No Action Alternative): There would be no provisions for full retention in the shore-based whiting fishery. Therefore, the vessels would be subject to the groundfish trawl cumulative trip limits and would be required to sort their catch at sea. Monitoring for the shore-based whiting fleet would be specified in the Observer Program's coverage plan for the groundfish trawl fleet and would be Federally funded. Vessels would be randomly selected to carry a groundfish observer. Once a vessel was selected, the vessel would be required to carry a groundfish observer to collect data on total catch, bycatch, and discard under the cumulative trip limit management system. Requiring the shore-based fleet to discard all incidentally taken salmon as well as all groundfish taken in excess of trip limits would increase discard in the shore-based fishery and would eliminate the opportunity for prohibited species and overages to be donated to charitable food banks. Sorting catch on deck would likely compromise the freshness and quality of the whiting, due to the enzyme released by a whiting parasite that softens the flesh soon after death, diminishing the market value of the fish and, perhaps, rendering the catch valueless. Eliminating donations to local food banks and diminishing the value of whiting may have economic impacts for those who participate in the fishery and for coastal communities and business that rely on the shore-based whiting harvest.

2.5 Alternatives

Alternative 2 (Status Quo): The annual process of issuing EFPs to participants in the shore-based whiting fleet to would continue as it has for over a decade. The EFPs would specify the full retention and monitoring requirements and participating vessels would to land incidentally taken prohibited species and groundfish taken in excess of cumulative trip limits. However, EFPs are intended to provide for limited testing of a fishing strategy, gear type, or monitoring program that may eventually be implemented on a larger, fleet-wide scale and not for the long-term purpose of providing a harvest opportunity which may otherwise be prohibited. Terms and conditions of the EFPs would be similar to the terms and conditions of years past, but they may be modified to reflect new issues or concerns in the shore-based whiting fishery. [See appendix for a 2004 shore-based whiting EFP.] The EFP process would continue to be funded by the shore-based whiting industry along with state and federal management agencies.

Alternative 3 (Federal Monitoring): Full retention and monitoring requirements for the shore-based whiting fishery would be specified in Federal regulation, and monitoring would be conducted by the Federal government. Overage and donation fish would be forfeited to the state in which catch was landed. Federal enforcement personnel would track overage/donation fish and the money paid for those fish.

Issue A: Observer Program observers would monitor the harvesting aspect of the shore-based whiting fishery. Observers would monitor 100% of all shore-based whiting trips. While aboard the vessel, observers would verify whether the vessel retained all its catch or if any catch was discarded at sea. If catch was discarded at sea, observers would estimate catch quantity and species composition. Observers could also collect sighting/interaction data for marine mammals and seabirds.

Option 3A(1): Monitoring of the shore-based whiting trips would be Federally funded. However, the Observer Program only has a limited number of observers. During the whiting primary season (April - July), few observers would be available to provide observer coverage in other sectors of the groundfish fishery. In 2003, the Observer Program deployed approximately 40 observers and participation in the shore-based whiting fishery included 35 shore-based catcher vessels and 9 processing plants.

Option 3A(2): Monitoring of the shore-based whiting trips would be industry funded through a no cost contract. Under a no cost contract, shore-based whiting vessels would pay the costs associated with a groundfish observer collecting data aboard their vessel (e.g., salary, travel) into an "observer fund" managed by the Federal government. This observer fund would be used to contract independent observer providers to supply the shore-based whiting fleet with groundfish observers. As with Option 3A(1), observer training, certification, and data collection would be controlled by NMFS.

Issue B: Observer Program observers would also monitor the dock-side aspect of the shore-based whiting fishery. At the processing plants, observers would sample salmon and overfished groundfish species incidentally taken in the shore-based whiting fishery. Based on an observer coverage plan designed to achieve an adequate level of sampling, between 10% - 50% of whiting deliveries would be sampled. The groundfish FMP addresses observers placed on vessels but does not address observers placed at processing plants. Therefore, regulatory language would need to be developed for observer protocol at plants, and the plants' responsibilities to observers.

Option 3B(1): Like Option 3A(1), monitoring of the shore-based whiting deliveries would be Federally funded.

Option 3B(2): Monitoring of the shore-based whiting deliveries would be funded by each state.

Option 3B(3): Like Option 3A(2), monitoring of the shore-based whiting deliveries would be funded by industry through a no cost contract.

Alternative 4 (Combination Monitoring): Full retention and monitoring requirements for the shore-based whiting fishery would be specified in Federal regulation and monitoring would be a combination of electronic monitoring, Federal observers and/or state monitors, and Federal and/or state enforcement personnel. Overage and donation fish would be forfeited to the state in which catch was landed. Federal and state enforcement personnel would share the tracking of overage/donation fish and the money paid for those fish.
Issue A: Electronic monitoring would cover 100% of the shore-based whiting trips and would be

used to verify full retention. Electronic monitoring equipment is automated equipment to provide accurate, timely, and verifiable fisheries data at a lower cost than that provided by an at-sea observer. The electronic monitoring system integrates an assortment of available electronic components with a software operating system to create a data collection tool. The system operates on either DC or AC voltage and autonomously logs video and vessel sensor data during the fishing trip. The system automatically restarts and resumes program functions following power interruptions. The electronic monitoring system is designed to independently monitor fishing activities on the vessel (McElderry et al. 2002). Electronic monitoring has been tested in various fisheries, including the shore-based whiting fishery, and has been able to address specific fishery monitoring objectives. Because electronic monitoring is a relatively new technology, standards for data confidentiality and privacy issues are still being developed for this type of monitoring. The installation, maintenance, and data analysis necessary for implementing an electronic monitoring system would likely be contracted out to a private company.

Option 4A(1): Electronic monitoring of the shore-based whiting trips would be Federally funded. Electronic monitoring providers would be contracted by NMFS to handle electronic monitoring installation, maintenance, and data analysis. All electronic monitoring data would be owned by NMFS.

Option 4A(2): Electronic monitoring of the shore-based whiting trips would be industry funded through a no cost contract. Under a no cost contract, shore-based whiting vessels would pay the costs associated with electronic monitoring aboard their vessel (e.g., leasing a camera, maintenance, data analysis) into an "electronic monitoring fund" managed by the Federal government. This observer fund would be used to contract independent electronic monitoring providers to handle all aspects of electronic monitoring in the shore-based whiting fishery. As with Option 4A(1), all electronic monitoring data would be owned by NMFS.

Issue B: Observer program observers and/or state samplers would monitor the dock-side aspect of the shore-based whiting fishery. At the processing plants, observers and/or samplers would sample salmon and overfished groundfish species incidentally taken in the shore-based whiting fishery. Based on the appropriate level of sampling, between 10% - 50% of whiting deliveries would be sampled.

Option 4B(1): Like Option 3A(1), monitoring of shore-based whiting deliveries would be Federally funded.

Option 4B(2): Monitoring of the shore-based whiting deliveries would be funded by each state.

Option 4B(3): Like Option 3A(2), monitoring of the shore-based whiting deliveries would be funded by industry through a no cost contract.

2.6 Comparison of the Alternatives

Table 2.6.1. A comparison of different full retention and monitoring programs for the shore-based whiting fishery.

Issues	Alternative 1 (No Action Alternative)	Alternative 2 (Status Quo)	Alternative 3 (Federal Monitoring)	Alternative 4 (Combination Monitoring)
Establishing Retention and Monitoring Requirements	* Shore-based whiting fishery would operate under cumulative trip limits specified in Federal regulation.	* Full retention and monitoring requirements would be specified in an EFP issued on an annual basis.	* Full retention and monitoring requirements would be specified in Federal regulation.	* Full retention and monitoring requirements would be specified in Federal regulation.
Verifying Full Retention of Catch	* Shore-based vessels would sort their catch at sea and discard all prohibited species as well as groundfish taken in excess of cumulative trip limits.	* There would be no monitoring for shore-based whiting trips to verify full retention of catch versus discard at sea.	* Federal observers would monitor for full retention versus discard at sea. **Option 3A(1)**: * Monitoring program would be Federally funded. **Option 3A(2)**: * Monitoring program would be funded by the shore-based whiting fleet through a no cost contract.	* Electronic monitoring would monitor for full retention versus discard at sea. **Option 4A(1)**: * Monitoring program would be Federally funded. **Option 4A(2)**: * Monitoring program would be funded by the shore-based whiting fleet through a no cost contract.
Sampling Prohibited and Overfished Species	* Shore-based whiting vessels would be subject to observer monitoring under the West Coast Groundfish Observer Program's trawl fleet coverage plan. * Monitoring would be Federally funded.	* State port samplers would track and sample salmon and overfished groundfish species at processing plants funded by the shore-based whiting industry and state and Federal management agencies.	* Federal observers would sample salmon and overfished groundfish species at processing plants. **Option 3B(1)**: * Monitoring would be Federally funded. **Option 3B(2)**: * Monitoring would be funded by each state. **Option 3B(3)**: * Monitoring would be funded by the shore-based whiting industry through a no cost contract.	* Federal observers and/or state samplers would sample salmon and overfished groundfish species at processing plants. **Option 4B(1)**: * Monitoring would be Federally funded. **Option 4B(2)**: * Monitoring would be funded by each state. **Option 4B(3)**: * Monitoring would be funded by the shore-based whiting industry through a no cost contract.
Tracking Disposition of Overage/Donation Fish	* No tracking of overage/donation fish would be necessary as catch of those species would be discarded at sea.	* State and Federal enforcement staff would share the tracking of overage/donation fish and the money paid for those fish.	* Federal enforcement personnel would track overage/donation fish and the money paid for those fish.	* Federal enforcement personnel and/or state enforcement personnel would share the tracking of overage/donation fish and the money paid for those fish.

3.0 AFFECTED ENVIRONMENT

3.1 Introduction

This chapter describes the Pacific Coast groundfish fishery and the resources that would be affected by the proposed action. Resources are discussed in the order they are affected by the proposed action. In other words, those resources that would be most affected by the proposed action are discussed first followed by those least affected by the proposed action. Socioeconomic resources are discussed in Chapter 3.2, biological resources are discussed in Chapter 3.3, and physical resources are discussed in Chapter 3.4.

3.2 Socioeconomic Characteristics of the Affected Resource

3.2.1 History of the Whiting Fishery

During the late 1970s and 1980s, the whiting fishery was conducted primarily by foreign fishing vessels and by joint venture partnerships between foreign and U.S. firms. Joint ventures were arrangements between U.S. catcher vessels and foreign companies during which the U.S. fishers would catch and deliver whiting to foreign processing vessels. Fishing operations during this period were low intensity compared to those of the 1990s and fishing typically lasted from April through September or October. In the late 1980s, at-sea processors introduced surimi technology into their operations and the fishery immediately changed to a fast-paced competition for the available quota. Surimi is a thick, paste-like or gel product made from washing and de-watering fish flesh that is further processed to create such products as artificial crab and shrimp. This accelerated whiting fishery continued in the early 1990s when U.S. firms preempted all foreign fishing and processing activities (NMFS 2002).

By 1991, surimi technology and market conditions for whiting were sufficiently developed to allow for large-scale production. This resulted in an influx of high capacity domestic catcher/processors and mothership processors which were capable of fully harvesting the whiting allocation. As these high volume domestic processors joined the fishery, the fishing pattern of the 1980s and early 1990s was replaced by a fast-paced fishery concentrated earlier in the season and further south along the coast (PFMC 1996). The pattern of fishing earlier in the year and further south changed in 1992 with the implementation of regulations designed to minimize the bycatch of salmon and rockfish in the whiting fishery.

Currently, the whiting fishery occurs primarily during April - November along the coasts of northern California, Oregon, and Washington. The fishery is conducted almost exclusively with midwater trawls. Most fishing activity occurs over bottom depths of 100 - 500 m, but offshore extensions of fishing activity have occurred. Whiting is a high volume species, but commands a relatively low price per pound. The whiting industry is composed of the tribal and non-tribal commercial fisheries each of which has their own allocations. The tribal allocation is determined on a sliding scale based on a percentage of the OY. The non-tribal commercial fishery is composed of the shore-based sector and the at-sea sector, the latter includes both the catcher/processor and mothership sectors. These sectors are not completely distinct. Separate allocations of the commercial OY have been effective since 1997 and they are 42 % to the shore-based, 34 % to the catcher/processor, and 24 % to the mothership sectors.

3.2.2 Economic Profile of the Shore-based Pacific Whiting Industry

This section presents information describing the economic characteristics of the shore-based Pacific whiting industry. Information presented in this section describes vessels that are actively involved in the shore-based Pacific whiting fishery by analyzing vessels that made landings in excess of 200,000 pounds of Pacific whiting per year. Although full retention vessels are required to register for a Pacific whiting exempted fishing permit (EFP), 200,000 pounds is an approximate threshold between vessels that consistently participate within the fishery, and vessels that had received an EFP in some years, but did not actively engage in the fishery in most years. This section also examines processors that received landings of Pacific whiting from vessels making shore-based whiting trips.

Shore-based Whiting Vessels

Participation by catcher vessels in the Pacific whiting fishery has varied slightly over the past several years. Total shore-based vessel participation has ranged from thirty-five vessels in the late 1990's, to twenty-eight vessels in 2001 and 2002. Vessels participating in the shore-based whiting fishery also participate in other fisheries as well. Landings by shore-based whiting vessels are reported for every other fishery management group, though revenues from the shrimp, salmon, and highly migratory fisheries may be considered minor compared to revenues from the general groundfish and crab fisheries.

In Table 3.2.2.1 and Figure 3.2.2.2, data are presented showing historic participation and revenue by those vessels actively engaged in the shore-based whiting fishery. In Table 3.2.2.1, each column represents a West Coast fishery, and each sub-column represents the number of vessels and the amount of revenue generated by those vessels. Each row represents a year, and each sub-row represents a vessel length category. For example, under the Pacific whiting column, the first set of cells represents the year 1998. In 1998, there were 8 vessels in the whiting fishery under 70 feet in length and those vessels averaged over $130,000 in gross revenues from Pacific whiting landings.

Most vessels that participate in the shore-based whiting fishery also participate in the West Coast general groundfish fishery. Many vessels also recorded landings of coastal pelagic species and about one-third of the whiting vessels participate in the West Coast crab fisheries. In addition to West Coast fisheries, several whiting vessels also participate in the Alaska groundfish fisheries. Vessels participating in the shore-based Pacific whiting fishery generated ex-vessel revenues from West Coast fisheries ranging from $9.6 million to $13.2 million. Revenue from Pacific whiting has represented approximately 39% - 59% of total West Coast vessel revenues depending on the year. This total does not include revenue that may have been generated from Alaska fisheries.

Participation in the Pacific whiting fishery has declined slightly in past years. This decline has occurred as average gross revenues per vessel were also declining. Gross revenues declined from a high of nearly $230,000 per vessel in 2000 to near $160,000 per vessel in 2002 and 2003. Assuming that changes in gross revenues are an indicator of changes in net revenues, then the decline in participation by shore-based whiting vessels is likely due to declining net revenues.

Table 3.2.2.1. Landings and Revenue of Shore-Based Pacific Whiting Vessels by Year, Vessel Length, and Management Group.

		Pacific Whiting			Coastal Pelagic		Crab		Other Groundfish		Highly Migratory		Shrimp		Total Rev from All Fisheries
YEAR	Vessel Length	Vessel Count	Total Rev	Avg Rev	Vessel Count	Total Rev	Vessel Count	Total Rev	Vessel Count	Total Rev	Vessel Count	Total Rev	Vessel Count	Total Rev	Total Revenue
1998	< 70	8	1,050,783	131,348	7	26,876	1	D	8	970,360	3	509	2	D	2,382,373
	70 - 74	7	1,042,632	148,947	7	18,043	2	D	7	676,481	3	1,873	1	D	1,906,280
	75 - 79	9	1,312,207	145,801	9	14,963	3	191,498	9	1,449,012	3	207	3	29,038	3,007,880
	80 - 84	3	253,651	84,550	3	9,203	2	D	3	319,195	2	D			764,844
	85 - 89	3	458,857	152,952	3				3	87,997					546,876
	> 89	4	635,341	158,835	4	1,133	1	D	4	105,895					906,311
1998 Total		35	4,831,824	138,052	34		9	799,208	35	3,633,470	11	2,733	6	242,329	9,623,787
1999	< 70	8	1,210,907	151,363	8	3,356	3	353,829	8	1,030,001	3	136	3	66,264	2,676,940
	70 - 74	6	1,380,590	230,098	6	2,075	1	D	6	706,214	3	1,164	1	D	2,240,383
	75 - 79	9	1,436,511	159,612	9	5,579	1	D	9	1,450,688	3	1,235	2	D	3,097,851
	80 - 84	3	665,265	221,755	3	3,791	2	D	3	330,879					1,299,357
	85 - 89	3	1,079,032	359,677	3				3	100,694					1,179,725
	> 89	4	906,987	226,747	4	5	1	D	4	139,559			1	D	1,488,661
1999 Total		35	6,738,045	192,516	35	15,577	8	1,349,549	35	4,050,796	9	2,535	8	226,842	12,404,710
2000	< 70	7	805,955	115,136	6	953	3	414,417	7	1,092,693	2	D	1	D	2,396,254
	70 - 74	7	1,929,947	275,707	7	5,797	2		7	922,371	2	D			2,929,493
	75 - 79	9	1,382,466	153,607	9	3,051	3	121,351	9	1,422,875	2	D	1	D	2,948,951
	80 - 84	3	716,266	238,755	3	3,639	2	D	3	304,526	1	D	1	D	1,457,247
	85 - 89	3	1,371,849	457,283	3	3,363			3	98,938	2	D			1,478,120
	> 89	5	1,545,158	309,032	5	8,630	1	D	5	226,307	4	4	1	D	1,869,282
2000 Total		35	7,875,398	225,011	34		11	1,085,715	35	4,109,681	13	1,328	4	107,539	13,245,728
2001	< 70	4	575,214	143,804	4	18,380	3	286,367	4	822,661	2	D	3	32,128	1,737,157
	70 - 74	8	1,591,876	198,984	8	26,220	3	272,021	8	665,411	3	2,635	1	D	2,569,249
	75 - 79	7	1,196,047	170,864	7	28,174	2	D	7	707,686	1	D	2	D	2,127,624
	80 - 84	3	634,925	211,642	3	34,387	2	D	3	235,107	1	D			1,044,861
	85 - 89	3	795,186	265,062	3	40,551			3	37,646					884,358
	> 89	2	D	D	2	D	1	D	2	D					D
2001 Total		28	5,661,501	202,196	28	172,263	11	1,001,382	28	2,647,764	7	2,747	6	125,477	9,695,048
2002	< 70	4	406,951	101,738	4	76	4	407,130	4	505,821			3	172,494	1,492,758
	70 - 74	8	1,237,609	154,701	7	945	2	D	8	507,348	3	69	2	D	2,127,917
	75 - 79	6	857,938	142,990	6	614	1	D	6	646,642	3	1,375	1	D	1,678,832
	80 - 84	4	756,234	189,059	4	108	2	D	4	421,834					1,572,938
	85 - 89	3	651,787	217,262	3	437			3	69,954					722,782
	> 89	2	D	D	2	D	2	D	2	D			1	D	D
2002 Total		28	4,498,592	160,664	27	2,232	11	1,235,452	28	2,243,434	6	1,444	7	384,761	8,377,776
2003	< 70	5	464,787	92,957	4	955	4	1,227,130	5	697,499	1	D	2	D	2,612,864
	70 - 74	7	1,326,887	189,555	7	12,000	2	D	7	454,279	4	2,999	1	D	2,432,072
	75 - 79	8	1,027,953	128,494	8	2,876	2	D	9	1,015,477	4	2,608	1	D	2,768,703
	80 - 84	3	582,553	194,184	3	1,274	2	D	3	236,531	1	D			1,614,819
	85 - 89	3	656,602	218,867	3	1,624			3	6,631	1	D			665,429
	> 89	2	D	D	2	D	1	D	2	D	1	D			D
2003 Total		30	4,846,455	161,549	29	20,465	12	4,115,521	31	2,748,744	14	32,108	5	396,478	12,174,589

Source: PacFIN 2004. Note: D denotes data is restricted due to confidentiality

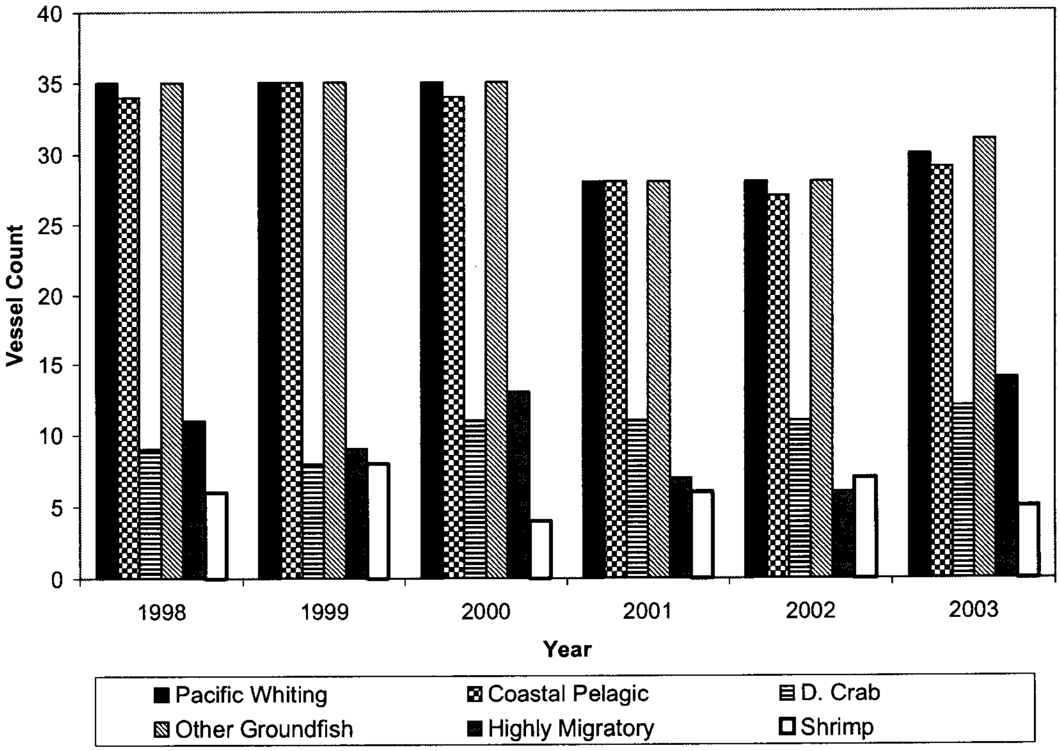

Figure 3.2.2.2. Count of Shore-Based Pacific Whiting Vessels by Year and Management Group. Source: PacFIN 2004

Shore-based Whiting Processors and Regions

This section presents information on processors, communities, and states where Pacific whiting is landed. Table 3.2.2.3 shows an overview of landings and the associated vessel revenue for Pacific whiting during 1998 to 2003. Information on revenues generated by processors does not exist at this time.

Table 3.2.2.3 Average Annual Landed Pounds and Revenue per State (1998 - 2003)

State	Avg Annual Landed Weight (lbs)	Avg Annual Landed Revenue	Number of Unique Buyers (1998 - 2003)
Oregon	122,658,576	$6,736,042	12
California	5,966,015	$364,134	3
Washington	24,210,466	$1,283,698	3
Total	152,835,058	8,383,874	18

As shown in Table 3.2.2.3, the highest percentage of Pacific whiting landings occur in Oregon, followed by Washington, and then California. Due to confidentiality, data identifying landings by community cannot be presented. However, communities receiving landings of Pacific whiting have historically included Westport and Ilwaco, Washington; Astoria, Newport, and Coos Bay, Oregon; and Eureka, Crescent City, and Fields Landing, California. Of these communities, Newport, Astoria, and Westport are typically highest in overall landed volume of Pacific whiting and the associated revenue.

Table 3.2.2.4 Shore-Side Whiting Purchasing Activity by State and Buyer

State	AD-HOC BUYER ID	1998	1999	2000	2001	2002	2003
California	A	YES	NO	YES	NO	YES	YES
	B	NO	NO	YES	NO	NO	NO
	C	YES	YES	YES	YES	NO	NO
Oregon	D	NO	YES	NO	NO	NO	NO
	E	YES	YES	YES	YES	YES	YES
	F	YES	YES	YES	YES	YES	YES
	G	YES	YES	NO	NO	NO	NO
	H	YES	NO	YES	YES	YES	YES
	I	YES	YES	YES	YES	YES	YES
	J	YES	YES	YES	NO	NO	NO
	K	NO	YES	NO	YES	YES	YES
	L	NO	YES	YES	YES	YES	YES
Washington	M	YES	YES	YES	YES	NO	YES
	N	YES	YES	YES	YES	YES	YES
	O	YES	NO	NO	NO	NO	NO
	P	NO	YES	YES	NO	NO	NO
	Q	YES	NO	YES	NO	NO	NO
	R	YES	YES	NO	NO	NO	NO
	S	YES	YES	NO	NO	NO	NO
	T	NO	NO	YES	NO	NO	NO
	U	NO	NO	YES	NO	NO	NO
	V	YES	NO	NO	NO	NO	NO

source: PacFIN database. 2004. Fish Ticket and Fish Ticket Line Table
note: YES indicates that buyer actively purchased whiting during directed shore-based whiting activity

Substantial processor consolidation has been occurring along the Pacific coast. This has coincided with declines in the landed catch of more traditional and valuable groundfish species. Although processors typically diversify their operations to maximize profit and hedge against market and species stock fluctuation, recent declines in landed catch value have likely caused processors to close their operations, or to consolidate with other operations.

Data is available to show the number of buyers purchasing Pacific whiting, but not actual processors. Landed pounds per processor are not available because records only specify the buyer of the landed catch. Buyers may be the same as processors, but they may also differ from processors. For example, catch that is landed in smaller ports will often be trucked to another port or city for processing.

Table 3.2.2.4 shows buyers by state where a vessel made landings of Pacific whiting and Pacific whiting was the The number of buyers purchasing Pacific whiting has decreased in recent years. In 1998, there were 11 buyers of Pacific whiting, and in 2002 and 2003 there were 7 buyers. In 1998, 8 buyers were registered in Oregon as receiving landings of Pacific whiting, while in 2003, there were 5 buyers. Washington has consistently had 2 buyers in any given year. California had no unique buyers recorded in 2003, but have historically had 1 to 2 buyers per year.

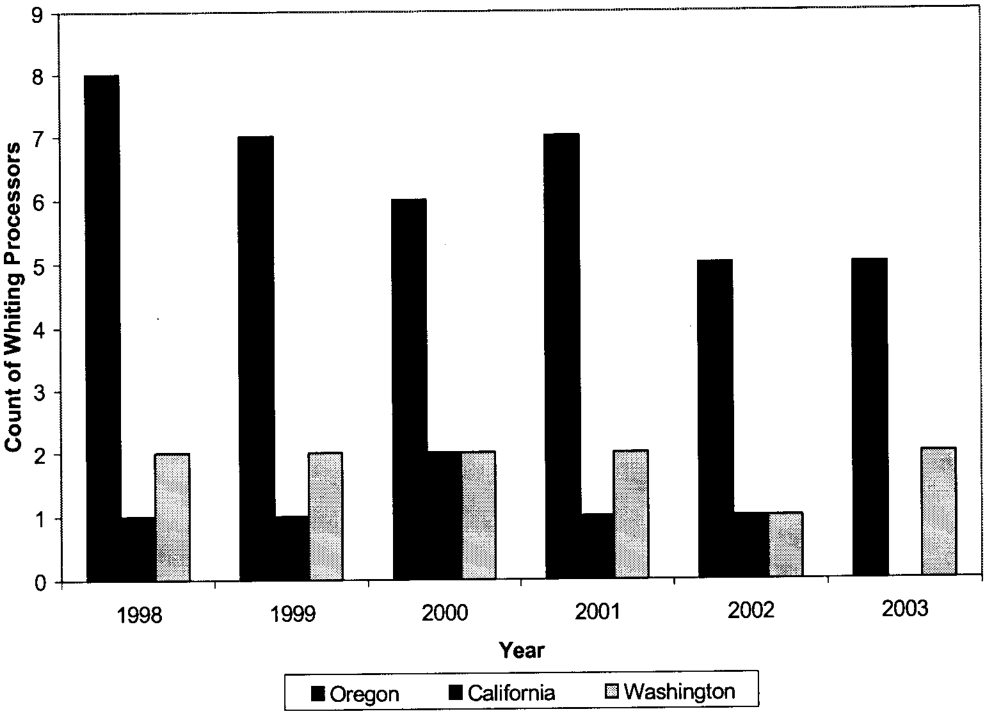

Figure 3.2.2.5. Count of Pacific Whiting Buyers by State 1998 - 2003. Source: PacFIN 2004.

3.2.3 Counties Affected by the Shore-based Whiting Fishery

Counties and communities that are actively involved in the shore-based Pacific whiting industry tend to have economies that are based on tourism, natural resources, and government. Unfortunately, data describing the economic characteristics at the community level are not disclosed by economic and demographic data reporting agencies, but data describing counties can be used as a proxy for describing the composition of major communities within that county.

Table 3.2.3.1 shows wage and salary disbursements by county and major industry in 2001 reported by the U.S. Bureau of Economic Analysis. Wage and salary disbursements are generally a measure of income generated by individuals that are not self employed. Individuals that are employed within the fishing industry will, for the most part, not be counted in these data since fishing employment is typically characterized by self-employed individuals. Estimates of individuals employed in the fishing industry are shown later.

Table 3.2.3.1 Wage and Salary Disbursements by Industry and County in 2001 (thousands of $)

Industry	Clatsop	Lincoln	Grays Harbor	Del Norte	Coos	Pacific	Humboldt
Forestry, fishing, and other	20,176	(D)	(D)	(D)	46,032	17,060	(D)
Mining	(L)	(D)	(D)	(D)	1,675	1,286	(D)
Utilities	3,335	2,943	(D)	(D)	3,469	(D)	(D)
Construction	39,200	39,073	54,234	10,588	35,564	7,405	113,920
Manufacturing	103,444	53,412	147,578	11,138	64,837	21,245	176,327
Wholesale trade	6,638	7,289	(D)	(D)	15,238	930	(D)
Retail trade	53,629	64,231	81,806	22,007	70,376	16,111	198,222
Transportation and warehousing	14,663	6,550	25,967	4,931	35,550	(D)	(D)
Information	8,503	9,910	6,494	2,865	15,035	1,189	28,540
Finance and insurance	9,956	10,270	24,794	2,591	20,683	5,984	66,992
Real estate and rental and leasing	6,114	8,570	8,920	2,629	7,260	1,348	26,653
Professional and technical services	(D)	21,820	35,199	6,417	26,141	4,545	87,891
Management of companies and enterprises	(D)	1,857	2,299	(D)	7,068	766	21,606
Administrative and waste services	7,267	16,717	7,958	(D)	22,408	3,211	48,008
Educational services	1,237	901	845	298	1,735	(L)	5,499
Health care and social assistance	56,988	39,774	74,215	33,721	67,599	11,339	220,523
Arts, entertainment, and recreation	7,079	6,412	4,754	1,233	3,441	2,187	11,037
Accommodation and food services	60,148	75,546	42,797	15,536	35,967	12,718	90,167
Other services, except public administration	16,320	18,368	32,358	7,445	24,506	8,455	79,895
Government and government enterprises	116,902	161,157	230,801	129,656	231,617	68,991	485,166

source: Bureau of Economic Analysis 2004. Note: (D) means data is restricted due to confidentiality

The data in Table 3.2.3.1 shows that the largest industries reported by the Bureau of Economic Analysis in counties associated with the shore-based Pacific whiting industry are generally *Forestry, Fishing, and other*, *Manufacturing*, *Government and government enterprise*, *Health Care and social Assistance*, *Accommodation and Food Services,* and *Retail Trade*. Industries falling within the *Forestry, Fishing, and other*, and *Manufacturing* sectors are largely made up of timber and fishing industry related business, and timber and seafood processing. *Accommodation and Food Services,* and *Retail Trade* are largely made up of businesses reliant on the tourism sector.

Table 3.2.3.2 shows data estimating employment and receipts in the fishing industry for businesses without paid employees. The U.S Census defines the fishing sector as an industry comprised of establishments primarily engaged in the commercial catching or taking of finfish, shellfish, or miscellaneous marine products from a natural habitat, such as the catching of bluefish, eels, salmon, tuna, clams, crabs, lobsters, mussels, oysters, shrimp, frogs, sea urchins, and turtles. Since most individuals employed in fish harvesting are self employed (including skippers and crewmembers), this table represents an approximation of the number of people employed in fishing, and the amount of income generated by those individuals.

Table 3.2.3.2 Fishing-Related Self-Emploment and Income by County in 2001

County	Establishments	Receipts (Thousands $)
Clatsop	280	15,023
Lincoln	286	21,928
Grays Harbor	297	15,971
Del Norte	131	3,736
Coos	166	9,199
Pacific	243	11,363
Humboldt	194	6,375

source: U.S. Census Bureau, 2004

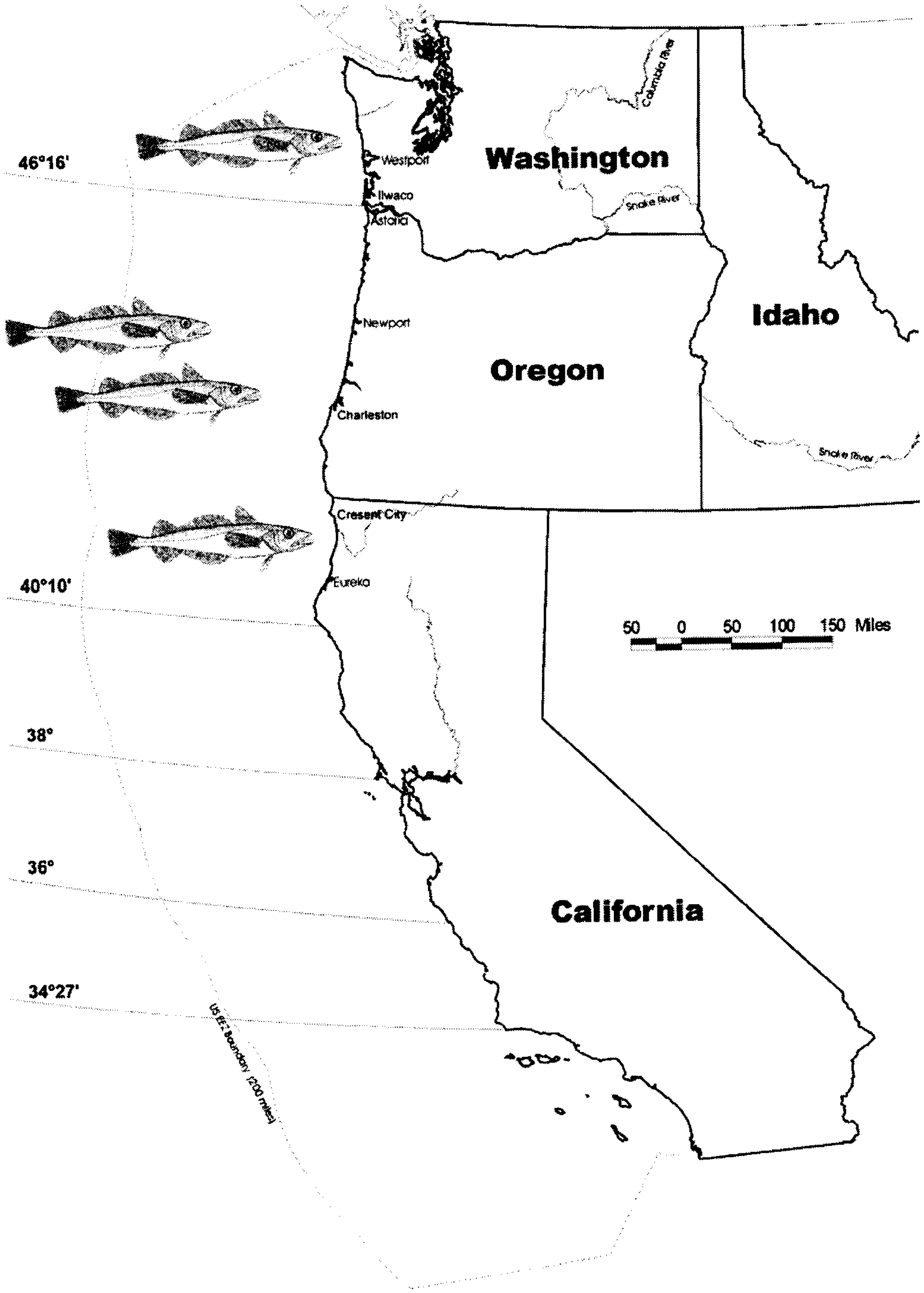

Figure 3.2.3.3. Map of the Pacific Coast showing important ports for the processing of whiting taken by the shore-based whiting fishery.

3.2.4 Shoreside Observer Program

The Shoreside Whiting Observation Program (SWOP) was established in 1992 to provide information for evaluating incidental catch in the shore-based whiting fishery and conservation measures adopted to protect salmon and other prohibited species. The program is a cooperative effort between the fishing industry and state and Federal management agencies conducted on an annual basis to account for total catch and to accommodate the landing of non-sorted catch in the shore-based whiting fishery. Participating vessels apply for and carry EFPs, issued by NMFS, that allow them to land unsorted catch at designated processing plants. Additionally, the EFPs allow vessels to land prohibited species (i.e., Pacific salmon, Pacific halibut, Dungeness crab) and groundfish in excess of trip limits without penalty, provided catch is forfeited to the state. Participants in the SWOP include: catcher vessels carrying EFPs, designated processing plants along the Pacific Coast, PFMC, NMFS, Pacific States Marine Fisheries Commission (PSMFC), ODFW, California Department of Fish and Game (CDFG), and Washington Department of Fish and Wildlife (Wiedoff and Parker 2002).

Over time, the goals of the SWOP and associated sampling methodologies have changed in response to the data needs and funding of state and Federal fishery management agencies. During the first few years of the program, SWOP's goals were a high target rate of observation (50% of the landings) and a focus on prohibited species. In 1995, the SWOP changed its emphasis to a lower rate of observation (10% of the landings) and an increased collection of biological information (length, weight, age, maturity) from whiting and selected bycatch species (yellowtail rockfish, widow rockfish, sablefish, Pacific mackerel, jack mackerel, and prohibited species)(Weeks and Hutton 1998). The required observation rate was decreased as studies indicated that fish tickets were a good representation of the species composition of landed catch. In 1997, sampling protocols changed again in response to an increased bycatch rates of yelloweye and yellowtail rockfish. Since then, the landings of yellowtail and widow rockfish in the shore-based fishery have dramatically decreased because of fishers' increased awareness of bycatch and allocation issues in the shore-based whiting fishery. In 2002, there was some concern about sablefish bycatch in the shore-based whiting fishery because of increased numbers of juvenile sablefish found along the Pacific Coast (Wiedoff and Parker 2002).

Much like the program's goals, the costs associating with operating the SWOP have also changed since the program began in 1992. The cost was approximately $60,000 (approximately $30,000 for coordination/data processing costs and approximately $30,000 for observers) in 1996 (Weeks and Hutton 1997) as compared to approximately $82,508 (approximately $46,738 for coordination/data processing costs and an estimated $35,770 for observers) in 2001 (Parker 2001). Because of a shorter season in 2003, the cost was approximately $70,327 (approximately $40,519 for coordination/data processing coast and an estimated $29,808 for observers) (Wiedoff et al. 2003). Government costs, which are not included in the above estimates, have also changed over time. These government costs cover state agencies providing sampling personnel, infrastructure, data summary and analysis during winter months, data tracking, and Pacific Council support on bycatch issues.. In the past, these costs were relatively minor. However, these costs have become increasingly substantial over time, as management agencies have increased their focus on bycatch issues, and now require months of staff time and cost more than $20,000. In 2003, Oregon processing plants hired six observers to make observations at five processing plants while WDFW and CDFG provided minimal landings coverage at the plants using existing staff. Additionally, nine processing plants contributed to the cost of the SWOP in 2003 (Wiedoff et al. 2003).

3.3 Biological Characteristics of the Affected Resource

3.3.1 Salmon Resources

As discussed in Chapter 1, the first objective for the proposed action is to track and collect morphological information from those salmon species incidentally taken in the shore-based whiting fishery. Several species of salmon found along the Pacific Coast have been listed under the Endangered Species Act (ESA) and data from the SWOP indicate that some of these species are incidentally taken in the shore-based whiting fishery.

Review of SWOP data in Table 3.3.1.1 indicates that the sockeye, chum, and pink salmon are rarely encountered in the shore-based whiting fishery. Coho is caught in relatively low numbers and chinook is the most common salmonid encountered in the shore-based whiting fishery.

Salmon

Endangered
Chinook salmon (*Oncorhynchus tshawytscha)*
Sacramento River Winter; Upper Columbia Spring

Sockeye salmon (*Oncorhynchus nerka)*
Snake River

Steelhead trout (*Oncorhynchus mykiss)*
Southern California; Upper Columbia River

Threatened
Coho salmon (*Oncorhynchus kisutch)*
Central California; Southern Oregon, and Northern California Coasts

Chinook salmon (*Oncorhynchus tshawytscha*)
Snake River Fall, Spring, and Summer; Puget Sound; Lower Columbia; Upper Willamette; Central Valley Spring; California Coastal

Chum salmon (*Oncorhynchus keta)*
Hood Canal Summer; Columbia River

Sockeye salmon (*Oncorhynchus nerka)*
Ozette Lake

Steelhead trout (*Oncorhynchus mykiss)*
South-Central California; Central California Coast; Snake River Basin; Lower Columbia; California Central Valley; Upper Willamette; Middle Columbia River; Northern California

Because several chinook salmon runs are listed under the ESA, the incidental catch of chinook salmon in the shore-based whiting fishery is a concern. The 1999 Biological Opinion analyzing the effects of the groundfish fishery on Pacific Coast salmon specifies a threshold for the incidental take of 0.05 mt chinook for all the sectors of the whiting fishery (at-sea, tribal, and shore-based) (NMFS 1999).

Chinook salmon is the largest-sized Pacific salmon with a distribution ranging from the Ventura River in California to Point Hope, Alaska in North America, and in northeastern Asia from Hokkaido, Japan to the Anadyr River in Russia (Healey 1991). Additionally, chinook salmon have been reported in the Mackenzie River area of northern Canada (McPhail and Lindsey 1970). Of the Pacific salmon, chinook salmon exhibit arguably the most diverse and complex life history strategies. Healey (1986) described 16 age categories for chinook salmon, 7 total ages with 3 possible freshwater ages. This level of complexity is roughly comparable to sockeye salmon, although sockeye salmon have a more extended freshwater residence period and use different freshwater habitats (Miller and Brannon 1982; Burgner 1991). Two generalized freshwater life-history types were initially described by Gilbert (1912): "stream-type" chinook salmon reside in freshwater for a year or more following emergence, whereas "ocean-type"chinook salmon migrate to the ocean within their first year. Healey (1983; 1991) has promoted the use of broader definitions for "ocean-type" and "stream-type" to describe two distinct races of chinook salmon. This racial approach incorporates life history traits, geographic distribution, and genetic differentiation and provides a valuable frame of reference for comparisons of chinook salmon populations.

The generalized life history of Pacific salmon involves incubation, hatching, and emergence in freshwater, migration to the ocean, and subsequent initiation of maturation and return to freshwater for completion of maturation and spawning. Juvenile rearing in freshwater can be minimal or extended. Additionally, some male chinook salmon mature in freshwater, thereby foregoing emigration to the ocean. The timing and duration of each of these stages is related to genetic and environmental determinants and their interactions. Salmon exhibit a high degree of variability in life-history traits; however, there is considerable debate as to what degree this variability is the result of local adaptation or the general plasticity of the salmonid genome (Ricker 1972; Healey 1991; Taylor 1991).

In 2000, the incidental take of chinook salmon in the shore-based whiting fishery was almost double that of past years. The incidental take of chinook salmon in the other sectors of the whiting fishery was also high and resulted in a combined bycatch rate of 0.057. This incidental take exceeded the chinook threshold for the whiting fishery and led to a re-evaluation of the biological opinion that sets the allowable chinook salmon threshold. Discussions with fishers did not reveal any change in fishing behavior that would have accounted for the increased chinook catch. One possible explanation for the increased catch was that there were simply more chinook available to the whiting fishery than in past years (Hutton and Parker 2000).

Table 3.3.1.1. Salmon incidentally taken in the shore-based whiting fishery during 1991 - 2003.

Year	Whiting (mt)	Number of Chinook	Rate of Chinook (#/mt of whiting)	Number of Coho	Rate of Coho (#/mt of whiting)	Number of Pink	Rate of Pink (#/mt of whiting)	Number of Chum	Number of Sockeye	Total Number of Salmon	Total Rate of Salmon
1991	20,359	41	0.002							41	0.002
1992	49,092	491	0.010							491	0.010
1993	41,926	419	0.010							419	0.010
1994	72,367	581	0.008	4		0		0	0	585	0.008
1995	73,397	2,954	0.040	2		15		1	0	2,972	0.040
1996	84,680	651	0.008	0		0		0	0	651	0.008
1997	87,499	1,482	0.017	2		0		0	0	1,484	0.017
1998	87,627	1,699	0.019	8		0		5	1	1,713	0.020
1999	83,388	1,696	0.020	5		11		0	0	1,712	0.021
2000	85,653	3,321	0.039	23		0		1	0	3,345	0.039
2001	73,326	2,634	0.036	35		304	0.004	32	0	3,005	0.041
2002	45,276	1,062	0.023	14		0		72	0	1,148	0.025
2003	50,964	425	0.008	0		0		0	0	425	0.008

Data are complied from an ODFW report "Salmon Bycatch in the Pacific Whiting Fisheries" (Weeks and Kaiser 1997) and unpublished ODFW data (B. Wiedoff, Marine Resources Program, ODFW, 2003, personal communication).

3.3.2 Groundfish Resources

The Pacific Coast groundfish FMP manages over 80 species, many of which are caught in multi-species fisheries. These species, which include an array of flatfish, rockfish, and roundfish, occur throughout the EEZ and occupy diverse habitats during all stages of life history. Information on the interactions between groundfish species and between groundfish and non-groundfish species varies in completeness. While a few species have been intensely studied, there is relatively little information on most groundfish species and many groundfish species have never been comprehensively assessed.

Each fishing year, NMFS and the states assesses the biological condition of the Pacific Coast groundfish stocks and the Pacific Council develops recommendations for the allowable biological catch (ABC) for major groundfish stocks. Species and species groups with ABCs in 2003 include: lingcod, Pacific whiting, sablefish, POP, shortbelly rockfish, shortspine thornyhead, longspine thornyhead, widow rockfish, chilipepper rockfish, splitnose rockfish, cowcod, darkblotched rockfish, yellowtail rockfish, bocaccio, canary rockfish, yelloweye rockfish, Dover sole, and the minor rockfish complexes (northern and southern for nearshore, continental shelf, and continental slope species). The following eight groundfish stocks have been designated as "overfished" (less than 25% of its B_{MSY}): POP, bocaccio, lingcod, canary rockfish, cowcod, darkblotched rockfish, widow rockfish, and yelloweye rockfish.

Pacific Whiting

The shore-based fleet targets Pacific whiting (*Merluccius productus*), also known as Pacific hake, a semi-pelagic merlucciid (a cod-like fish species) that range from Sanak Island in the western Gulf of Alaska to Magdalena Bay, Baja California Sur. They are most abundant in the California Current System (Bailey 1982; Hart 1973; Love 1991; NOAA 1990). Smaller populations of Pacific whiting occur in several of the larger semi-enclosed inlets of the northeast Pacific Ocean, including the Strait of Georgia, Puget Sound, and the Gulf of California (Bailey et al. 1982; Stauffer 1985). The highest densities of Pacific hake are usually between 50 and 500 m, but adults occur as deep as 920 m and as far offshore as 400 km (Bailey 1982; Bailey et al. 1982; Dark and Wilkins 1994; Dorn 1995; Hart 1973; NOAA 1990; Stauffer 1985). Hake school at depth during the day, then move to the surface and disband at night for feeding (McFarlane and Beamish 1986; Sumida and Moser 1984; Tanasich et al. 1991). Coastal stocks spawn off Baja California in the winter, then the mature adults begin moving northward and inshore, following the food supply and Davidson currents (NOAA 1990). Hake reach as far north as southern British Columbia by fall. They then begin the southern migration to spawning grounds and further offshore (Bailey et al. 1982; Dorn 1995; Smith 1995; Stauffer 1985).

Spawning occurs from December through March, peaking in late January (Smith 1995). Pacific hake are oviparous with external fertilization. Eggs of the Pacific hake are neritic and float to neutral buoyancy (Bailey et al. 1982; NOAA 1990). Hatching occurs in 5 - 6 days and within 3 - 4 months juveniles are typically 35 mm (Hollowed 1992). Juveniles move to deeper water as they get older (NOAA 1990). Females often mature at 3 - 4 years (34 - 40 cm,) and nearly all males are mature by 3 years (28 cm). Females grow more rapidly than males after four years; growth ceases for both sexes at 10 - 13 years (Bailey et al. 1982).

Mathematical models incorporating a variety of survey and observer data to assess stock size, harvest levels, and recruitment are used to estimate a single ABC for the entire U.S./Canadian coastal stock. The whiting stock biomass increased to a historical high of 5.8 million metric tons (mt) in 1987 due to exceptionally large 1980 and 1984 year classes, then declined as these year classes passed through the population and were replaced by more moderate year classes. The stock size stabilized briefly between 1995-1997, but has declined continuously over the past several years to its lowest point in 2001.

The 2002 stock assessment estimated that the biomass in 2001 was 0.7 million mt, and that the female spawning biomass was less than 20 % of the unfished biomass. Because the overfished threshold under the FMP is 25 % of the unfished biomass, the whiting stock was designated overfished in 2001. The female spawning biomass was estimated to increase over the next 3 years due to the incoming 1999 year-class, but the increase would be dependent upon the magnitude of that cohort as well as the exploitation rate (NMFS 2002).

A new 2003 whiting stock assessment estimated that the abundance of whiting has increased substantially since the last assessment based largely on the abundance of the 1999 year class. However, the pattern of stock growth is very similar to what has been estimated in past assessments. The stock was estimated to be 47 % of its unfished biomass in 2003 (2.7 million mt of age 3+ fish) when a survey catchability coefficient of 1.0 was applied and at 51 % (4.2 million mt of age 3+ fish) of its unfished biomass in 2003 when a survey catchability coefficient of 0.6 was applied. Under both scenarios, the whiting biomass in 2003 is estimated to be above the target rebuilding biomass and is no longer consider to be overfished. However, in the absence of a large year class after 1999, the stock is projected to decline again.

Incidental take in the Shore-based Whiting Fishery

Pacific whiting undertake a diurnal vertical migration and tend to form extensive midwater aggregations during the day. These dense schools occur between the depths of 100 and 250 meters (Stauffer 1985). Because whiting disperse throughout the water column at dusk and remain near the surface at night, fishing has traditionally occurred during daylight hours. The results of fishing on concentrated midwater schools results in almost pure catches, with incidental catch typically amounting to less than 3 % of the total catch by weight. Species that are incidentally taken in the whiting fishery may be commingled with whiting or merely in the vicinity of whiting schools, depending on the relationships between the various species. Major factors affecting bycatch are area, depth, season, time of day, environmental conditions, and species abundance (NMFS 2002).

One objective of the proposed action is to track the incidental catch of overfished groundfish species in the shore-based whiting fishery. In 2002, this fishery had incidental catches of widow rockfish, canary rockfish, lingcod, Pacific ocean perch (POP), bocaccio, and darkblotched rockfish. While this fishery has relatively low takes of non-whiting groundfish species, the most common groundfish species, by weight, incidentally taken in the 2003 shore-based whiting are yellowtail rockfish, sablefish, and widow rockfish. Table 3.3.2.1 shows the 2003 incidental take of overfished groundfish species as well as those groundfish species most commonly taken in the shore-based fishery during 2003.

Table 3.3.2.1. Catch of prohibited species and groundfish in the 2003 EFP shore-based whiting fishery.

Species	Catch (mt)	Species	Catch (mt)
Pacific halibut	16 (# of fish)	POP	0.30
Dungeness crab	2 (# of crab)	Darkblotched	0.26
Yellowtail	48.70	Bocaccio	0
Widow	8.97	Lingcod	0.40
Sablefish	41.54	Misc. Rockfish	10.03
Canary	0.11	Yelloweye	0.11

Data were taken from an ODFW report "Shoreside Hake Observation Program: 2003" (Wiedoff et al. 2003) available on the web at http://hmsc.oregonstate.edu/odfw/finfish/wh/index.html.

Widow Rockfish

Widow rockfish (*Sebastes entomelas*) range from Albatross Bank off Kodiak Island to Todos Santos Bay, Baja California (Eschmeyer et al. 1983; Miller and Lea 1972; NOAA 1990). Widow rockfish occur over hard bottoms along the continental shelf (NOAA 1990). Widow rockfish prefer rocky banks, seamounts, ridges near canyons, headlands, and muddy bottoms near rocks. Large widow rockfish concentrations occur off headlands such as Cape Blanco, Cape Mendocino, Point Reyes, and Point Sur. Adults form dense, irregular, midwater and semi-demersal schools deeper than 100 m at night and disperse during the day (Eschmeyer et al. 1983; NOAA 1990; Wilkins 1986). All life stages are pelagic, but older juveniles and adults are often associated with the bottom (NOAA 1990). All life stages are fairly common from Washington to California (NOAA 1990). Pelagic larvae and juveniles co-occur with yellowtail rockfish, chilipepper, shortbelly rockfish, and bocaccio larvae and juveniles off central California (Reilly et al. 1992).

Widow rockfish are viviparous, have internal fertilization, and brood their eggs until released as larvae (NOAA 1990; Ralston et al. 1996; Reilly et al. 1992). Mating occurs from late fall to early winter. Larval release occurs from December - February off California, and from February - March off Oregon. Juveniles are 21-31 mm at metamorphosis, and they grow to 25-26 cm over 3 years. Age and size at sexual maturity varies by region and sex; size generally increases with age, for females, and the further north the fish are found. Some widow rockfish mature in 3 years (25-26 cm), 50% are mature by 4-5 years (25-35 cm), and most are mature in 8 years (39-40 cm) (NOAA 1990). The maximum age of widow rockfish is 28 years, but rarely over 20 years for females and 15 years for males (NOAA 1990). The largest size is 53 cm, about 2.1 kg (Eschmeyer et al. 1983; NOAA 1990).

Widow rockfish are carnivorous, with adults feeding on small pelagic crustaceans, midwater fishes (such as age-1 or younger Pacific hake), salps, caridean shrimp, and small squids (Adams 1987; NOAA 1990). During spring, the most important prey item is salps, during the fall fish are more important, and during the winter widow rockfish primarily eat sergestid shrimp (Adams 1987). Feeding is most intense in the spring after spawning (NOAA 1990). Pelagic juveniles are opportunistic feeders and their prey consists of various life stages of calanoid copepods, and euphausiids (Reilly et al. 1992).

Canary Rockfish

Canary Rockfish (*Sebastes pinniger*) are found between Cape Colnett, Baja California, and southeastern Alaska (Boehlert 1980; Boehlert and Kappenman 1980; Hart 1973; Love 1991; Miller and Lea 1972; Richardson and Laroche 1979). There is a major population concentration of canary rockfish off Oregon (Richardson and Laroche 1979). Canary primarily inhabit waters 91 - 183 m deep (Boehlert and Kappenman 1980). In general, canary rockfish inhabit shallow water when they are young and deep water as adults (Mason 1995). Adult canary rockfish are associated with pinnacles and sharp drop-offs (Love 1991). Canary rockfish are most abundant above hard bottoms (Boehlert and Kappenman 1980). In the southern part of its range, the canary rockfish appears to be a reef-associated species (Boehlert 1980). In central California, newly settled canary rockfish are first observed at the seaward, sand-rock interface and farther seaward in deeper water (18 - 24 m).

Canary rockfish are ovoviviparous and have internal fertilization (Boehlert and Kappenman 1980; Richardson and Laroche 1979). Off California, canary rockfish spawn from November - March and from January - March off Oregon and Washington (Hart 1973; Love 1991; Richardson and Laroche 1979). The age of 50% maturity of canary rockfish is 9 years; nearly all are mature by age 13. The maximum length canary rockfish grow to is 76 cm (Boehlert and Kappenman 1980; Hart 1973; Love 1991). Canary rockfish primarily prey on planktonic creatures, such as krill, and occasionally on fish (Love 1991). Canary rockfish feeding increases during the spring-summer upwelling period when euphausiids are their dominant prey (Boehlert et al. 1989).

Lingcod

Lingcod (*Ophiodon elongatus*), a top order predator of the family Hexagrammidae, ranges from Baja California to Kodiak Island in the Gulf of Alaska. Lingcod is demersal at all life stages (Allen and Smith 1988; NOAA 1990; Shaw and Hassler 1989). Adult lingcod prefer two main habitat types: slopes of submerged banks 10 - 70 m below the surface with seaweed, kelp and eelgrass beds and channels with swift currents that flow around rocky reefs (Emmett et al. 1991; Giorgi and Congleton 1984; NOAA 1990; Shaw and Hassler 1989). Juveniles prefer sandy substrates in estuaries and shallow subtidal zones (Emmett et al. 1991; Forrester 1969; Hart 1973; NOAA 1990; Shaw and Hassler 1989). As the juveniles grow they move to deeper waters. Adult lingcod are considered a relatively sedentary species, but there are reports of migrations of greater than 100 km by sexually immature fish (Jagielo 1990; Mathews and LaRiviere 1987; Mathews 1992; Smith et al. 1990).

Mature females live in deeper water than males and move from deep water to shallow water in the winter to spawn (Forrester 1969; Hart 1973; Jagielo 1990; LaRiviere et al. 1980; Mathews and LaRiviere 1987; Mathews 1992; Smith et al. 1990). Mature males may live their whole lives associated with a single rock reef, possibly out of fidelity to a prime spawning or feeding area (Allen and Smith 1988; Shaw and Hassler 1989). Spawning generally occurs over rocky reefs in areas of swift current (Adams 1986; Adams and Hardwick 1992; Giorgi 1981; Giorgi and Congleton 1984; LaRiviere et al. 1980). After the females leave the spawning grounds, the males remain in nearshore areas to guard the nests until the eggs hatch. Hatching occurs in April off Washington but as early as January and as late as June at the geographic extremes of the lingcod range. Males begin maturing at about 2 years (50 cm), whereas females mature at 3+ years (76 cm). In the northern extent of their range, fish mature at an older age and larger size (Emmett et al. 1991; Hart 1973; Mathews and LaRiviere 1987; Miller and Geibel 1973; Shaw and Hassler 1989). The maximum age for lingcod is about 20 years (Adams and Hardwick 1992).

Lingcod are a visual predator, feeding primarily by day. Larvae are zooplanktivores (NOAA 1990). Small demersal juveniles prey upon copepods, shrimps and other small crustaceans. Larger juveniles shift to clupeids and other small fishes (Emmett et al. 1991; NOAA 1990). Adults feed primarily on demersal fishes (including smaller lingcod), squids, octopi and crabs (Hart 1973; Miller and Geibel 1973; Shaw and Hassler 1989). Lingcod eggs are eaten by gastropods, crabs, echinoderms, spiny dogfish, and cabezon. Juveniles and adults are eaten by marine mammals, sharks, and larger lingcod (Miller and Geibel 1973; NOAA 1990).

Pacific Ocean Perch

Pacific ocean perch (*Sebastes alutus*) are found from La Jolla (southern California) to the western boundary of the Aleutian Archipelago (Eschmeyer et al 1983; Gunderson 1971; Ito 1986; Miller and Lea 1972), but are common from Oregon northward (Eschmeyer et al. 1983). Pacific ocean perch primarily inhabit waters of the upper continental slope (Dark and Wilkins 1994) and are found along the edge of the continental shelf (Archibald et al. 1983). Pacific ocean perch occur as deep as 825 m, but usually are at 100 - 450 m and along submarine canyons and depressions (NOAA 1990). Larvae and juveniles are pelagic; subadults and adults are benthopelagic. Adults form large schools 30 m wide, to 80 m deep, and as much as 1,300 m long (NOAA 1990). They also form spawning schools (Gunderson 1971). Juvenile Pacific ocean perch form ball-shaped schools near the surface or hide in rocks (NOAA 1990). Throughout its range, Pacific ocean perch is generally associated with gravel, rocky or boulder type substrate found in and along gullies, canyons, and submarine depressions of the upper continental slope (Ito 1986).

Pacific ocean perch winter and spawn in deeper water (>275 m), then move to feeding grounds in shallower water (180-220 m) in the summer (June-August) as their gonads ripen (Archibald et al. 1983; Gunderson 1971; NOAA 1990). Pacific ocean perch are a slow-growing and long-lived species. The maximum age for Pacific ocean perch has been estimated at about 90 years (ODFW, personal communication). Largest size is about 54 cm and 2 kg (Archibald et al. 1983; Beamish 1979; Eschmeyer et al. 1983; Ito 1986; Mulligan and Leaman 1992; NOAA 1990; Richards 1994). Pacific ocean perch are carnivorous; larvae eat small zooplankton. Small juveniles eat copepods, and larger juveniles feed on euphausiids. Adults eat euphausiids, shrimps, squids, and small fishes. Immature fish feed throughout the year, but adults feed only seasonally, mostly April-August (NOAA 1990). Predators of Pacific ocean perch include sablefish and Pacific halibut.

Bocaccio

Bocaccio rockfish (*Sebastes paucispinis)* ranges from Kodiak Island, Alaska to Sacramento Reef, Baja California. It is abundant off southern and central California and uncommon between Cape Mendocino and Cape Blanco, although a second population exists near the Oregon-Washington border and extends north to Cape Flattery. They are found at depths ranging from 50 to 300 m (Ralston et al. 1996) and are classified as a middle shelf-mesobenthal species.

Bocaccio frequent a exceptional variety of habitats including, kelp forests, rocky reefs, midwater, and open, low relief bottoms. Larvae and small juveniles are pelagic and are commonly found in the upper 100 m of the water column. In central California, post-pelagic larvae are associated with the giant kelp canopy and also seen throughout the water column. Moser et al. (2000) found relatively high average abundances of bocaccio larvae when surveying stations in the Point Conception and Channel Islands areas, in addition to, a station southwest of Santa Rosa, a station northeast of San Nicholas Island, and a station southwest of Point Conception.

Bocaccio have been categorized as both a nearshore and offshore species because they occupy different habitats depending on life stage. After spending their first year in shallow areas along the coast, bocaccio move into deeper habitats as they age. Large juvenile and adult bocaccio are semi-demersal, found in both rocky and non-rocky habitats, and have been known to occur around artificial structures. Love et al. (2000) found the highest density of adult bocaccio (10.5 fish/100 m^2) around an oil platform was greater than the highest density of bocaccio around a natural reef (4.4 fish/100 m^2).

While adult bocaccio are usually associated with rocky vertical relief, they are also found occurring over firm sand-mud bottom, in eelgrass beds, or congregated around floating kelp beds. In Soquel Canyon, California, adults were associated with mud-boulder, rock-mud, rock-ridge, and rock-boulder habitats (Yoklavich et al. 2000). Adult bocaccio have been known to aggregate and disperse quickly and may travel more than two km per day. Bocaccio movements may also have a seasonal component, as bocaccio disappear from traditional commercial fishing areas during winter spawning and return in the spring.

All life stages of bocaccio are found in euhaline waters and they may congregate in local areas of high salinity. Warm temperatures are preferred by larvae and high larval densities have been observed in waters of 12^0C and higher. However, average larval abundance declined abruptly during the shift from the cool regime (1951 - 1976) to the warm regime (1977 - 1998) of the Pacific Decadal Osillation (PDO) in the Southern California Bight region (Moser et al. 2000).

Darkblotched Rockfish

Darkblotched rockfish (*Sebastes crameri*) has a distribution extending from the Bering Sea to Santa Catalina Island, California (Allen and Smith 1988). Based on the location of commercial landings and NMFS triennial survey data, darkblotched rockfish are frequently encountered along the central Pacific Coast (Oregon and northern California). Because they can be found at depths ranging from 29 - 549 m (Rodgers et al. 2000), usually deeper than 76 m, they are managed in the FMP as part of the slope rockfish complex. Darkblotched rockfish are an important component of the commercial groundfish trawl fishery (Nichol and Pikitch 1994; Weinburg 1994). For this fishery, they comprise the deep-water assemblage, along with shortspine thornyhead, Pacific ocean perch, and splitnose rockfish (Weinburg 1994).

Darkblotched rockfish move into deeper water as they increase in size and age. Older larvae and pelagic juveniles are found closer to the surface than many other rockfish species (Love 2002). Off Oregon, benthic juveniles are taken at depths of 55 - 200 m. Adults have been found in water as shallow as 29 m, but are most abundant in the deeper portion of their range. In 1999, NMFS triennial survey data found that 91% of the estimated darkblotched rockfish biomass was found at depths between 180 - 360 m, with the remaining balance between 360 - 540 m (Rodgers et al. 2000).

Throughout their range, darkblotched rockfish are associated with mud and rock habitats. The greatest numbers of darkblotched larvae and pelagic juveniles are found 83 - 93 km offshore; juvenile darkblotched can be taken as far offshore as 194 km. Off central California, young darkblotched rockfish recruit to soft substrate and low relief. Demersal juveniles are often found perched on the highest structure in the benthic habitat (Love 2002). Adults are typically observed resting on mud, near cobble and boulders and do not often rise above the bottom (Love 2002). In Soquel Canyon, California, adults were most frequently associated with mud boulder, mud rock, rock mud, and mud cobble habitats (Yoklavich et al. 2000). Darkblotched rockfish make limited migrations once they recruit to the adult stock.

Darkblotched rockfish are viviparous (Nichol and Pickitch 1994). Insemination of female darkblotched rockfish occurs from August to December, fertilization and parturition occurs from December to March off Oregon and California, primarily in February off Oregon and Washington (Hart 1973; Nichol and Pickitch 1994; Richardson and Laroche 1979). Females attain 50% maturity at a greater size (36.5 cm) and age (8.4 years) than males (29.6 cm and 5.1 years) (Nichol and Pickitch 1994). Adults can grow to 57 cm (Hart 1973). Pelagic young are food for albacore (Hart 1973).

Sablefish

Sablefish (*Anoplopoma fimbria*) are abundant in the north Pacific, from Honshu Island, Japan, north to the Bering Sea, and southeast to Cedros Island, Baja California. There are at least three genetically distinct populations off the West Coast of North America: one south of Monterey characterized by slower growth rates and smaller average size, one that ranges from Monterey to the U.S./Canada border that is characterized by moderate growth rates and size, and one ranging off British Columbia and Alaska characterized by fast growth rates and large size. Large adults are uncommon south of Point Conception (Hart 1973; Love 1991; McFarlane and Beamish 1983a; McFarlane and Beamish 1983b; NOAA 1990). Adults are found as deep as 1,900 m, but are most abundant between 200 and 1,000 m (Mason et al. 1983). Off southern California, sablefish were abundant to depths of 1500 m. Adults and large juveniles commonly occur over sand and mud (McFarlane and Beamish 1983a; NOAA 1990) in deep marine waters.

Spawning occurs annually in the late fall through winter in waters greater than 300 m (Hart 1973; NOAA 1990). Sablefish are oviparous with external fertilization (NOAA 1990). Eggs hatch in about 15 days (Mason et al. 1983; NOAA 1990) and are demersal until the yolk sac is absorbed (Mason et al. 1983). After yolk sac is absorbed, juveniles become pelagic. Older juveniles and adults are benthopelagic. Larvae and small juveniles move inshore after spawning and may rear for up to four years (Boehlert and Yoklavich 1985; Mason et al. 1983). Older juveniles and adults inhabit progressively deeper waters.

Sablefish larvae prey on copepods and copepod nauplii. Pelagic juveniles feed on small fishes and cephalopods, mainly squids (Hart 1973; Mason et al. 1983). Demersal juveniles eat small demersal fishes, amphipods and krill (NOAA 1990). Adult sablefish feed on fishes like rockfishes and octopus (Hart 1973; McFarlane and Beamish 1983a). Larvae and pelagic juvenile sablefish are heavily preyed upon by sea birds and pelagic fishes. Juveniles are eaten by Pacific cod, Pacific halibut, lingcod, spiny dogfish, and marine mammals, such as orcas (Cailliet et al. 1988; Hart 1973; Love 1991; Mason et al. 1983; NOAA 1990). Sablefish compete with many other co-occurring species for food, mainly Pacific cod and spiny dogfish (Allen 1982).

Yellowtail Rockfish

Yellowtail rockfish (*Sebastes flavidus*) range from San Diego, California, to Kodiak Island, Alaska (Fraidenburg 1980; Gotshall 1981; Lorz et al. 1983; Love 1991; Miller and Lea 1972; Norton and MacFarlane 1995). The center of yellowtail rockfish abundance is from Oregon to British Columbia (Fraidenburg 1980). Yellowtail rockfish are a common, demersal species abundant over the middle shelf (Carlson and Haight 1972; Fraidenburg 1980; Tagart 1991; Weinberg 1994). Yellowtail rockfish are most common near the bottom, but not on the bottom (Love 1991; Stanley et al. 1994). Yellowtail rockfish adults are considered semi-pelagic (Stanley et al. 1994; Stein et al. 1992) or pelagic, which allows them to range over wider areas than benthic rockfish (Pearcy 1992). Adult yellowtail rockfish occur along steeply sloping shores or above rocky reefs (Hart 1973). They can be found above mud with cobble, boulder and rock ridges, and sand habitats; they are not, however, found on mud, mud with boulder, or flat rock (Love 1991; Stein et al. 1992). Yellowtail rockfish form large (sometimes greater than 1,000 fish) schools and can be found alone or in association with other rockfishes (Love 1991; Pearcy 1992; Rosenthal et al. 1982; Stein et al. 1992; Tagart 1991). These schools may persist at the same location for many years (Pearcy 1992).

Yellowtail rockfish are viviparous (Norton and MacFarlane 1995) and mate from October to December. Parturition peaks in February and March and from November to March off California (Westrheim 1975). Young-of-the-year pelagic juveniles often appear in kelp beds beginning in April and live in and around kelp in midwater during the day, descending to the bottom at night (Love 1991; Tagart 1991). Male yellowtail rockfish are 34 cm to 41 cm in length (five years to nine years) at 50% maturity, females are 37 cm to 45 cm (six years to ten years) (Tagart 1991). Yellowtail rockfish are long-lived and slow-growing; the oldest recorded individual was 64 years old (Fraidenburg 1981; Tagart 1991). Yellowtail rockfish have a high growth rate relative to other rockfish species (Tagart 1991). They reach a maximum size of about 55 cm in approximately 15 years (Tagart 1991). Yellowtail rockfish feed mainly on pelagic animals, but are opportunistic, occasionally eating benthic animals as well (Lorz et al. 1983). Large juveniles and adults eat fish (small Pacific whiting, Pacific herring, smelt, anchovies, lanternfishes, and others), along with squid, krill, and other planktonic organisms (euphausiids, salps, and pyrosomes) (Love 1991; Phillips 1964; Rosenthal et al. 1982; Tagart 1991).

3.3.3 Non-Groundfish Species

Two species managed under the Coastal Pelagic Species Fishery Management Plan were also incidentally taken in the 2003 shore-based whiting fishery, jack mackerel and Pacific mackerel. Like whiting, these are schooling fish that migrate in coastal waters and are not associated with the ocean bottom. The incidental catch of these species in the 2003 shore-based whiting fishery was as follows: 67,920 kg of jack mackerel and 420 kg of Pacific mackerel (Wiedoff et al. 2003).

Endangered Species

Pacific Coast marine species listed as endangered or threatened under the ESA are discussed in the salmon resources, marine mammal, seabird, and sea turtle sections. Under the ESA, a species is listed as "endangered" if it is in danger of extinction throughout a significant portion of its range and "threatened" if it is likely to become an endangered species within the foreseeable future throughout all, or a significant portion, of its range.

Marine Mammals

The waters off Washington, Oregon, and California (WOC) support a wide variety of marine mammals. Approximately thirty species, including seals and sea lions, sea otters, and whales, dolphins, and porpoise, occur within the EEZ. Many marine mammal species seasonally migrate through Pacific Coast waters, while others are year round residents.

Species Listed as Endangered Under the ESA
Sperm whale (*Physeter macrocephalus*),
Humpback whale (*Megaptera novaeangliae*),
Blue whale (*Balaenoptera musculus*), and
Fin whale (*Balaenoptera physalus*).

Species Listed as Threatened Under the ESA
Steller sea lion (*Eumetopias jubatus*)Eastern Stock,
Guadalupe fur seal (*Arctocephalus townsendi*), and
Southern sea otter (*Enhydra lutris*) California Stock.

Species Listed as Depleted under the MMPA
Northern fur seal (*Callorhinus ursinus*) Eastern Pacific Stock and
Killer whale (*Orcinus orca*) Eastern North Pacific Southern
Resident Stock.

The Marine Mammal Protection Act (MMPA) and the ESA are the Federal legislation that guide marine mammal species protection and conservation policy. Under the MMPA on the West Coast, NMFS is responsible for the management of cetaceans and pinnipeds, while the U.S. Fish and Wildlife Service (USFWS) manages sea otters. Stock assessment reports review new information every year for strategic stocks (those whose human-caused mortality and injury exceeds the potential biological removal (PBR)) and every three years for non-strategic stocks. Marine mammals whose abundance falls below the optimum sustainable population (OSP) are listed as "depleted" according to the MMPA.

Fisheries that interact with species listed as depleted, threatened, or endangered may be subject to management restrictions under the MMPA and ESA. NMFS publishes an annual list of fisheries in the Federal Register separating commercial fisheries into one of three categories, based on the level of serious injury and mortality of marine mammals occurring incidentally in that fishery. The categorization of a fishery in the list of fisheries determines whether participants in that fishery are subject to certain provisions of the MMPA, such as registration, observer coverage, and take reduction plan requirements. The Washington/Oregon/California (WOC) groundfish fisheries are in Category III, indicating a remote likelihood of, or no known serious injuries or mortalities, to marine mammals.

Seabirds

The highly productive California Current System, an eastern boundary current that stretches from Baja Mexico to southern British Columbia, supports more than two million breeding seabirds and at least twice that number of migrant visitors. Tyler et al. (1993) reviewed seabird distribution and abundance in relation to oceanographic processes in the California Current System and found that over 100 species have been recorded within the EEZ including: albatross, shearwaters, petrels, storm-petrels, cormorants, pelicans, gulls, terns and alcids (murres, murrelets, guillemots, auklets and puffins). In addition to these "classic" seabird, millions of other birds are seasonally abundant in this oceanic habitat including: waterfowl, waterbirds (loons and grebes), and shorebirds (phalaropes). Not surprisingly, there is considerable overlap of fishing areas and areas of high bird density in this highly productive upwelling system. The species composition and abundance of birds varies spatially and temporally. The highest seabird biomass is found over the continental shelf and bird density is highest during the spring and fall when local breeding species and migrants predominate.

Species Listed as Endangered Under the ESA
Short-tail albatross (*Phoebastria albatrus*),
California brown pelican (*Pelecanus occidentalis*), and
California least tern (*Sterna antillarum browni*).

Species Listed as Threatened Under the ESA
Marbled murrelet (*Brachyramphs marmoratus*).

Seabirds Listed by the USFWS as
Birds of Conservation Concern

Black-footed albatross (*Phoebastria nigripes*)
Ashy storm-petrel (*Oceanodroma homochroa*)
Gull-billed tern (*Sterna nilotica*)
Elegant tern (*Sterna elegans*)
Arctic Tern (*Sterna paradisaea*)
Black skimmer (*Rynchops niger*)
Xantus's murrelet (*Synthliboramphus hypoleucus*)

The USFWS is the primary Federal agency responsible for seabird conservation and management. Under the Magnuson-Stevens Act, NMFS is required to ensure fishery management actions comply with other laws designed to protect seabirds. NMFS is also required to consult with USFWS if fishery management plan actions may affect seabird species listed as endangered or threatened.

Sea Turtles
Sea turtles are highly migratory and four of the six species found in U.S. waters have been sighted off the Pacific Coast. Little is known about the interactions between sea turtles and West Coast commercial fisheries. The directed fishing for sea turtles in WOC groundfish fisheries is prohibited, because of their ESA listings, but the incidental take of sea turtles by trawl gear may occur. The management and conservation of sea turtles is shared between NMFS and USFWS.

Species Listed as Endangered Under the ESA
Green turtle (*Chelonia mydas*),
Leatherback turtle (*Dermochelys coriacea*), and
Olive ridely turtle (*Lepidochelys olivacea*).

Species Listed as Threatened Under the ESA
Loggerhead turtle (*Caretta caretta*)

3.4 Physical Characteristics of the Affected Resource

3.4.1 California Current System

In the North Pacific Ocean, the large, clockwise-moving North Pacific Gyre circulates cold, sub-arctic surface water eastward across the North Pacific, splitting at the North American continent into the northward-moving Alaska Current and the southward-moving California Current. Along the U.S. West Coast, the surface California Current flows southward through the U.S. West Coast EEZ, the management area for the groundfish FMP. The California Current is known as an eastern boundary current, meaning that it draws ocean water along the eastern edge of an oceanic current gyre. Along the continental margin and beneath the California Current flows the northward-moving California Undercurrent. Influenced by the California Current system and coastal winds, waters off the U.S. West Coast are subject to major nutrient upwelling, particularly off Cape Mendocino (Bakun 1996). Shoreline topographic features such as Cape Blanco, Point Conception, and bathymetric features such as banks, canyons, and other submerged features, often create large-scale current patterns like eddies, jets, and squirts. Currents off Cape Blanco, for example, are known for a current "jet" that drives surface water offshore to be replaced by upwelling sub-surface water (Barth et al. 2000). One of the better-known current eddies off the West Coast occurs in the Southern California Bight between Point Conception and Baja California (Longhurst 1998), wherein the current circles back on itself by moving in a northward and counterclockwise direction just within the Bight. The influence of these lesser current patterns and of the California Current on the physical and biological environment varies seasonally (Lynn 1987) and through larger-scale climate variation, such as El Niño-La Niña or Pacific Decadal Oscillation (Longhurst 1998).

3.4.2 Essential Fish Habitat. The 80 plus groundfish species managed by the FMP occur throughout the EEZ and occupy diverse habitats at all stages in their life histories. Some species are widely dispersed during certain life stages, particularly those with pelagic eggs and larvae; the essential fish habitat (EFH) for these species/stages is correspondingly large. On the other hand, the EFH of some species/stages may be comparatively small, such as that of adults of many nearshore rockfishes which show strong affinities to a particular location or type of substrate.

EFH for Pacific coast groundfish is defined as the aquatic habitat necessary to allow for groundfish production to support long-term sustainable fisheries for groundfish and for groundfish contributions to a healthy ecosystem. Descriptions of groundfish fishery EFH for each of the 80 plus groundfish species and their life stages result in over 400 EFH identifications. When these EFHs are taken together, the groundfish fishery EFH includes all waters from the mean higher high water line, and the upriver extent of saltwater intrusion in river mouths, along the coasts of Washington, Oregon, and California seaward to the boundary of the U.S. EEZ.

The FMP groups the various EFH descriptions into seven major habitat types called "composite" EFHs. This approach focuses on ecological relationships among species and between the species and their habitat, reflecting an ecosystem approach in defining EFH. The seven "composite" EFH identifications are as follows:

1. Estuarine - Those waters, substrates and associated biological communities within bays and estuaries of the EEZ, from mean higher high water level (MHHW, which is the high tide line) or extent of upriver saltwater intrusion to the respective outer boundaries for each bay or estuary as defined in 33 CFR 80.1 (Coast Guard lines of demarcation).

2. Rocky Shelf - Those waters, substrates, and associated biological communities living on or within ten meters (5.5 fathoms) overlying rocky areas, including reefs, pinnacles, boulders and cobble, along the continental shelf, excluding canyons, from the high tide line MHHW to the shelf break (~200 meters or 109 fathoms).

3. Nonrocky Shelf - Those waters, substrates, and associated biological communities living on or within ten meters (5.5 fathoms) overlying the substrates of the continental shelf, excluding the rocky shelf and canyon composites, from the high tide line MHHW to the shelf break (~200 meters or 109 fathoms).

4. Canyon - Those waters, substrates, and associated biological communities living within submarine canyons, including the walls, beds, seafloor, and any outcrops or landslide morphology, such as slump scarps and debris fields.

5. Continental Slope/Basin - Those waters, substrates, and biological communities living on or within 20 meters (11 fathoms) overlying the substrates of the continental slope and basin below the shelf break (~200 meters or 109 fathoms) and extending to the westward boundary of the EEZ.

6. Neritic Zone - Those waters and biological communities living in the water column more than ten meters (5.5 fathoms) above the continental shelf.

7. Oceanic Zone - Those waters and biological communities living in the water column more than 20 meters (11 fathoms) above the continental slope and abyssal plain, extending to the westward boundary of the EEZ.

Life history and habitat needs for the 80 plus species managed under the FMP are described in the EFH appendix to Amendment 11, which is available online at http://www.nwr.noaa.gov/1sustfsh/efhappendix/page1.html

NMFS is drafting a new EIS on West Coast Groundfish EFH. Information on the drafting process is available at http://www.nwr.noaa.gov/1sustfsh/groundfish/eis_efh/efh/

The shore-based whiting fishery typically occurs off the coasts of Washington, Oregon, and northern California. Because the proposed action is a monitoring program, it is not predicted to affect the physical characteristics of the Pacific Coast groundfish fishery.

4.0 ANALYSIS OF THE ALTERNATIVES

4.1 Introduction

This chapter describes the effects of the proposed action, establishing full retention and monitoring requirements in the shore-based whiting fishery, on the Pacific Coast groundfish fishery. Effects are analyzed in the order that they are affected by the proposed action. Therefore, those resources most affected are discussed first, followed by those resources that are least affected. Effects on the socioeconomic environment are analyzed in Chapter 4.2, effects on the biological environment are analyzed in Chapter 4.3, and effects on the physical environment are analyzed in Chapter 4.4.

4.2 Effects on the Socioeconomic Environment

There are three primary socioeconomic considerations when establishing full retention and monitoring requirements in the shore-based whiting fishery on the Pacific Coast groundfish fishery. These socioeconomic considerations are: establishing or not establishing full retention requirements in the shore-based monitoring program, the costs associated with different full retention and monitoring programs that may be established in shore-based fishery, and economic effects of full retention and monitoring requirements on the shore-based whiting fishery.

4.2.1 Establishing Full Retention and Monitoring Requirements in the Shore-based Fishery

As discussed in Chapter One, there are several needs for establishing full retention and monitoring requirements in the shore-based whiting fishery. The different options available to establish retention and monitoring requirements are not predicted to be substantial, but retention and monitoring requirements will vary with alternatives.

Under Alternative 1 (No Action Alternative), there would be no provisions for full retention in the shore-based fishery. Therefore, the shore-based whiting vessels would be subject to the groundfish trawl cumulative trip limits specified in Federal regulations and would be required to sort their catch at sea. Monitoring in the shore-based whiting fleet would be included in the Observer Program's coverage plan for the groundfish trawl fleet. This alternative does not provide for full retention in the shore-based whiting fishery, therefore, it does not meet the needs of the proposed action and should not be considered as a preferred alternative.

Under Alternative 2 (Status Quo), the annual process of issuing exempted fishing permits (EFPs) would continue as it has for over a decade. Full retention and monitoring requirements would be specified in EFPs that are issued to participants in the shore-based whiting fishery on an annual basis. By definition, EFPs authorize fishing for groundfish in a manner that would otherwise be prohibited for limited, experimental purposes (50 CFR 679.6.) Thus, EFPs are intended to provide for limited testing of a fishing strategy, gear type, or monitoring program that may eventually be implemented on a larger fleet-wide scale and are not a permanent solution to the monitoring needs of the shore-based whiting fishery. Because of the success of the shore-based whiting EFP, indicating that it is feasible to retain and monitor the incidental take of salmon and groundfish species in the shore-based whiting fishery, it is now appropriate to establish full retention and monitoring for salmon and other non-target species incidentally taken in the shore-based whiting fishery in Federal regulations. This alternative is not in keeping with the intended use of EFPs, therefore, it should not be considered as a preferred alternative.

Under Alternative 3 (Federal Monitoring), full retention and monitoring requirements for the shore-based whiting fishery would be specified in Federal regulation. This alternative meets the needs of the proposed action, including establishing a standardized reporting methodology to assess the type and amount of bycatch occurring in the shore-based whiting fishery, satisfying the terms and conditions of the 1992 Biological Opinion, and maintaining the integrity of groundfish rebuilding plans. This alternative also satisfies the purposes of the proposed action, including establishing full retention in the shore-based fishery, reducing discard in the shore-based fishery by allowing the landing of prohibited species and groundfish taken in excess of trip limits, and by developing a full retention monitoring program. Therefore, this alternative should be considered for designation as a preferred alternative.

Under Alternative 4 (Combination Monitoring), full retention and monitoring requirements for the shore-based whiting fishery would be specified in Federal regulation. Because electronic monitoring is a relatively new technology, standards for data confidentiality and privacy issues are still being developed for this type of monitoring. When implementing Alternative 4, it is important that Federal regulations reflect current NMFS policy on electronic monitoring and are designed to protect both data confidentiality and the privacy of vessel owners. Much like Alternative 3, Alternative 4 meets the needs and satisfies the purposes of the proposed action and should be considered for designation as a preferred alternative.

4.2.2 The Cost of Full Retention and Monitoring Programs

The cost of full retention and monitoring is an important issue to consider when establishing these requirements in the shore-based whiting fishery. Similarly, it is important to carefully consider how costs associated with full retention and monitoring requirements are funded. The costs associated with implementing a monitoring program are not expected to be substantial, but the cost of full retention and monitoring requirement will vary with alternatives.

Under Alternative 1 (No Action Alternative), there would be no provisions for full retention in the shore-based fishery and the shore-based whiting fleet would be subject to the groundfish trawl cumulative trip limits. Monitoring in the shore-based whiting fleet would be provided for in the Observer Program's coverage plan for the groundfish trawl fleet and would be Federally funded. The estimated cost to the Federal government of Alternative 1 is $51,000 (see Table 4.2.2.1 for a break-down of costs).

Under Alternative 2 (Status Quo), the cost of the SWOP in 2005 is estimated at about $148,000. This cost is based on SWOP costs over the last few years and provides for coordination/data analysis, observer coverage, and administrative costs (see Table 4.2.2.1 for a break-down of costs). Over the last decade, the cost of this program has been shared between management agencies and the shore-based whiting fishery. Budget reductions in 2003 and projected budget reductions in 2004 are expected to affect the money that would be available to fund this program. Both state and Federal budgets for fisheries management have been reduced from historical levels and these reductions may make it difficult for continuing funding from these management agencies. The cost of the monitoring program under Alternative 2 is more than under Alternative 1 but less than under all other Alternatives.

Under Alternative 3 (Federal Monitoring), the cost of a Federal monitoring program for the shore-based whiting fleet in 2005 is estimated at about $690,000. The cost provides for 100% observer coverage on all shore-based whiting trips, observers sampling 10% - 50% of shore-based whiting deliveries, and Federal enforcement personnel tracking overage and donation fish (see Table 4.2.2.1 for a break-down of costs). Under Option 3A(1) and Option 3B(1), the cost of monitoring in the shore-based whiting fishery would be covered by the Federal government. At the present time, the Observer Program does not have the necessary staff to monitor the shore-based whiting fishery. If the Observer Program provided monitoring for the shore-based whiting trips, resources would be diverted from other sectors of the Pacific Coast groundfish fishery during the shore-based whiting primary season, which could compromise the collection of data needed for effective management of the Pacific Coast groundfish fishery. Under Option 3A(2) and Option 3B(3), the shore-based whiting fleet would fund observer coverage on all shore-based whiting trips through a no cost contract. While whiting is a high volume species, it commands a relatively low price per pound. The annual estimated revenue over the last five years of whiting landed by the shore-based fleet is approximately 6 million dollars and per catcher vessel is approximately $181,000. If the shore-based whiting fleet were responsible for funding observer coverage on all shore-based whiting trip, the cost associated with the monitoring could represent a substantial portion of their annual income. Under Option 3B(2), the states of Washington, Oregon, and California would provide the funding for the sampling of shore-based whiting deliveries at processing plants. The states have experienced severe budget reductions in 2003 and 2004, with budgets for 2005 expected to be similarly restrictive. At the present time, the states do not have the financial resources to fund this program. The cost of the monitoring program under Alternative 3 is greater than under all other alternatives.

Under Alternative 4 (Combination Monitoring), the cost of a combination monitoring program for the shore-based whiting fleet in 2005 is estimated at about $410,000. The cost provides for 100% electronic monitoring coverage on all shore-based whiting trips, groundfish observers and/or state samplers sampling 10% - 50% of shore-based whiting deliveries, and a combination of Federal and state enforcement personnel tracking overage and donation fish (see Table 4.2.2.1 for a break-down of costs). Under Option 4A(1) and Option 4B(1), the cost of monitoring in the shore-based whiting fishery would be covered by the Federal government. Under Option 4A(2) and Option 4B(3), the shore-based whiting fleet would fund observer coverage on all shore-based whiting trips through no cost contract. Under Option 4B(2), the states of Washington, Oregon, and California would provide funding for the sampling of shore-based whiting deliveries at processing plants. Government budget reductions in 2003 and 2004 and projected budget reductions in 2005 are expected to affect the money that would be available to fund this program. Both state and Federal budgets have been reduced from historical levels and these reductions may make it difficult for continuing funding from these management agencies. The cost of the monitoring program under Alternative 4 is less than Alternative 2 but more than under all other Alternatives.

Table 4.2.2.1. Estimate of costs associated with the full retention monitoring programs for the shore-based whiting fishery.

Aspects of a Monitoring System	Alternative 1 (No Action Alternative)	Alternative 2 (Staus Quo)	Alternative 3 (Federal Monitoring)	Alternative 4 (Combination Monitoring)
Verifying Full Retention	$250 / day for groundfish observers and catch sampling 30 vessels 60 day fishery 10% trips covered $6,000 (admin support) = $51,000	No sampling = $0	$250 / day for groundfish observers and full retention monitoring 30 vessels 60 day fishery 100% trips covered $30,000 (admin support) = $480,000	$50 / day for electronic monitoring and full retention monitoring 30 vessels 60 day fishery 100 % trips covered $80,000 (admin support) = $170,000
Tracking and sampling prohibited species and overfished groundfish species in processing plants	No sampling = $0	$150 / day 10 port samplers 60 day fishery 10% - 35% of deliveries sampled $38,000 (admin support) = $128, 000	$250 / day 10 groundfish observers 60 day fishery 10% - 50 % of deliveries sampled $30,000 (admin support) = $180,000	$250 / day 10 groundfish observers or monitors 60 day fishery 10% - 50% of deliveries sampled $30,000 (admin support) = $180,000
Tracking overage/donation fish and the money paid for those fish	$0	$20,000	$30,000	$30,000
Total	$51,000	$148,000	$690,000	$410,000

4.2.3 Economic Effects on the Shore-based Whiting Industry

Possible economic impacts to the Pacific whiting industry are a function of costs imposed upon the industry as a result of monitoring requirements and changes in product quality if sorting at sea is required. Additional costs will decrease revenues, as will requiring vessels to sort at sea. Depending on changes in revenues or the level of costs borne by the fishing sector, some vessels may choose not to participate in the fishery, resulting in a longer season than what may otherwise be the case. If the fishing sector has additional costs imposed upon them, fishers may demand higher prices from processors, resulting in a de-facto cost sharing between the fishing and processing sector. This would have consequences on the processing sector as well. Depending on the level of compensation to fishers, some processors may choose not to buy Pacific whiting, or may place vessels on trip limits in order to spread out the processing season and decrease costs elsewhere. For example, a longer processing season may require less peak demand/overtime labor, resulting in lower labor costs.

Table 4.2.2.2 Average Historic Revenues and Alternative Costs at the Vessel Level

Variable	Variable Type	Alt. 1	Alt. 2	Alt. 3(A2,B3)	Alt. 4(A2,B3)
Cost	Total Additional Program Cost	NONE	NONE	$690,000	$370,000
	Avg. Additional Vessel Cost	NONE	NONE	$480,000	$170,000
	Avg. Additional Shoreside Cost	NONE	NONE	$180,000	$180,000
	Avg. Additional Other Cost	NONE	NONE	$30,000	$30,000
Revenue	Average Total Vessel Revenue	UNKN	$5,741,969	$5,741,969	$5,741,969
Percentage	Avg. Vessel Cost as a Percent of Avg. Vessel Revenue	-	-	8.4%	3.0%
	Program Cost as a Percent of Avg. Vessel Revenue	-	-	12.0%	6.4%

source: PacFIN 2004

Note: a "-" means there is no calculation that can be made for the alternative

The amount of total gross revenue generated by the shore-based whiting fleet is unlikely to change in all alternatives other than Alternative 1 since it is likely the fleet will still be able to catch its allotted tonnage. However, industry net revenues may change depending on the alternative. Possible impacts include: changes in net revenues, vessel participation, and season length. In this section of the document, analysis is provided showing possible impacts to the fishing sector from additional costs imposed by a new monitoring program. Table 4.2.2.2 shows the costs across alternatives, average 1998 - 2003 ex-vessel revenues, and alternative costs as a percentage of those revenues. For example, compared to average ex-vessel revenues from 1998 - 2003, Alternative 3(A2,3B) vessel costs would equal approximately 8.4%. In 2004, a substantial increase in the shore-based allowable catch was permitted. Anecdotal evidence suggests that ex-vessel prices will be lower than in 2003. Assuming 2004 prices will be $0.01 lower than 2003, and that program costs would be the same in 2004 as shown in Table 4.2.2, then Alternative 3 vessel costs would vessel costs would equal approximately 5.3% of ex-vessel revenues, and Alternative 4 vessel costs would represent approximately 1.9% of ex-vessel revenues.

In some fisheries, the industry may be able to pass additional costs on to the consumer of the good. However, Pacific whiting fishers and processors are best described as "price takers" when it pertains to the sale of goods manufactured from the Pacific whiting resource. Goods produced from Pacific whiting compete - and can be substituted with - nearly identical goods produced from Alaska pollock, Atlantic Blue whiting, and Seafin bream, for example. An increase in the price of Pacific whiting products to the consumer would most likely induce consumers to switch consumption away from Pacific whiting toward a substitute such as Alaska pollock. Due to the number and quantity of nearly identical substitutes, it is unlikely that the Pacific whiting industry will be able to pass program costs on to the consumer, and instead will be forced to bear the entire program costs themselves if government sources do not fund the cost of the program. Under a new cost structure, some changes in fleet characteristics may occur, including changes in the number of vessels participating in the fishery, and changes in season length. Although anecdotal evidence suggests that profit margins gained by Pacific whiting vessels are low, there are no data available to verify an actual value. The most widely used profit margin estimates reside in the Research Group's Fisheries Economic Assessment Model which estimates profit margins for the class of large groundfish trawlers as approximately 10 percent (The Research Group, Corvallis, Oregon, 2004, personal communication). Therefore, the estimate for analytical purposes in this document are impacts associated with a ten percent profit margin. However, a range of possible profit margins is presented along with the change in number of vessels and change in season length (if applicable) from additional costs imposed upon the fleet. One of the main assumptions used to determine when vessels may leave the fishery is based on the notion that commercial fishers will work to build catch history in anticipation of an ITQ program as long as doing so does not result in a zero or negative profit margin. This approach is used because the Council has recently begun discussions of a trawl individual quota program, which may motivate whiting fishers to behave in a manner that will build catch history. Fishers operating under the presumption that catch history during the current and future time period will count toward quota shares under a quota program will behave in a manner to retain and build current and future capital assets. The expectation that future capital wealth will result from fishing activity, or that a lack of activity can diminish capital wealth, can act in place of current monetary wealth from fishing activities. This may work to make a low rate of return from fishing activities palatable to those remaining in the fishery, and make participation in the whiting fishery higher than what may otherwise be the case.

Table 4.2.2.3 uses the above assumptions to show the impact of the alternatives. This analysis has taken into account vessels that were bought out through the buyback program, and assumes that vessels remaining in the general groundfish fishery do not move to fill the voids left by those vessels that exited the whiting fishery through the buyback. Therefore, although Alternative 1 represents the status quo, adjustments have been made to the average number of vessels and average season length by factoring out the 4 active vessels that were eliminated through the buyback program. Over the 1998 - 2003 period, the average number of vessels participating in the shore-based whiting fishery was 32, and the average season length was 72 days. After factoring out 4 vessels, the average number of vessels participating would have been 29 per year (the four vessels that were bought out did not participate in the whiting fishery each year) and the average season length would have increased to 79 days. Table 4.2.3 below is organized in a fashion that examines each alternative in rows, each type of impact in sub-rows, and the result of various profit margins in columns.

Table 4.2.2.3 shows the results of analysis under several possible vessel profit margins. This analysis is only applicable to industry funded alternatives, and only pertains to the vessel portion of each alternative. Although industry funded alternatives may also impact the processing sector, there are no data available to estimate impacts to that sector.

The analysis shows that under an industry funded options of Alternative 3 and 4 Alternative 4, changes may occur in the Pacific whiting fleet and this may be reflected in fewer vessels and a longer season length. This result is projected over the 1998 - 2003 period and represents what the fishery would have looked like had the alternatives been in place during that period.

Table 4.2.2.3 Average Number of Vessels and Season Length by Alternative and Assumed Profit Margin

Alternative	Measure	Assumed Profit Margin			
		0%	5%	10%	20%
Alt. 1 (No Action)	Avg. No. of Vessels Avg. Season Length	UNKN UNKN	UNKN UNKN	UNKN UNKN	UNKN UNKN
Alt. 2 (Status Quo)	Avg. No. of Vessels Avg. Season Length	29 79	29 79	29 79	29 79
Alt. 3(A2,B3) (Federal Observers)	Avg. No. of Vessels Avg. Season Length	26 88	28 82	29 79	29 79
Alt. 4(A2,3B) (Combination Monitoring)	Avg. No. of Vessels Avg. Season Length	28 82	29 79	29 79	29 79

Another socioeconomic effect of implementing a monitoring system in the shore-based fishery is a monitoring program's ability to track the money exchanged for and/or donation of landings of groundfish taken in excess of trip limits and the prohibited species (i.e., salmon). With an effective monitoring system in place to track the money associated with the sale of these fish and the donation of these fish, there would be less incentive for fishers to target and land groundfish in excess of trip limits or prohibited species in order to receive a profit.

4.3 Effects on the Biological Environment

The biological effects of implementing a monitoring program in the shore-based whiting fishery on the Pacific Coast groundfish fishery include such things as monitoring system coverage levels, the tracking and sampling of salmon incidentally taken in the shore-based fishery, and the tracking and sampling of overfished species incidentally taken in the shore-based fishery. Implementing a monitoring program in the shore-based fishery will also affect what is known about interactions between the shore-based whiting fishery and non-groundfish species, marine mammals, seabirds, and sea turtles.

4.3.1 Monitoring System Coverage Levels

Coverage levels play an important role in determining the effectiveness and cost of a monitoring program of monitoring program. As discussed in Chapter Two, NMFS determined that a level of 100% monitoring (i.e., all shore-based whiting vessels would be monitored on all trips for full retention of catch) is the only monitoring level appropriate for accurately documenting compliance with full retention. In the shore-based whiting fishery, catch of prohibited species and overfished species are rare and intermittent, therefore, any discarding at sea of these species would also be rare and intermittent. As only high levels of monitoring are appropriate for documenting rare and intermittent events, NMFS's decision to only consider a level of 100% monitoring for verification of full retention is further supported. As an appropriate level of monitoring for the sampling of prohibited species and overfished groundfish species at processing plants is still being analyzed , this EA analyzes a range of dockside monitoring levels.

The effect of different monitoring system coverage levels on the socio-economic environment of the Pacific Coast groundfish fishery is discussed in Chapter 4.2.2 of this EA. Therefore, the discussion in this section will focus on how coverage levels, and their direct influence on the quantity and/or quality of data collected under the different monitoring alternatives, affect the biological resources of the Pacific Coast groundfish fishery.

Under Alternative 1 (No Action Alternative), there would be no provisions for full retention in the shore-based fishery. Therefore, the shore-based whiting fleet would be subject to the groundfish trawl cumulative trip limits and required to sort their catch at sea. Monitoring in the shore-based whiting fleet would be provided for in the Observer Program's coverage plan for the groundfish trawl fleet. Shore-based whiting vessels would be randomly selected to carry NMFS groundfish observers with approximately 10% of the shore-based whiting fleet receiving at-sea observer coverage in 2005. Because catch would be sorted at sea, there would be no sampling for prohibited or overfished species or tracking of overage/donation fish at the processing plants where shore-based whiting catch is landed. Coverage levels would be similar to those under Alternative 2 but less than those under all other Alternatives.

Under Alternative 2 (Status Quo), the Shoreside Whiting Observer Program (SWOP) has adjusted their sampling goals and coverage requirements over time to meet the needs of fishery managers and keep costs within the available budget. The SWOP would not provide coverage aboard the shore-based whiting vessels but would continue to sample 10% - 35% of shore-based deliveries to processing plants. State and Federal enforcement personnel would track overage/donation fish and the money paid for those fish. Coverage levels under Alternative 2 would be similar to those under Alternative 1 but less than those under all other Alternatives.

Under Alternative 3 (Federal Monitoring), the proposed coverage levels are based on the level of monitoring necessary to satisfy compliance with full retention requirements and the level of monitoring necessary to effectively track and sample prohibited and overfished species at processing plants. Under Alternative 3, Federal observers would cover 100% of shore-based whiting trips (approximately 600 - 700) per season to verify full retention of catch. Because several groundfish species have been declared overfished, including several species incidentally taken in the shore-based whiting fishery (e.g., widow rockfish, canary rockfish, Pacific ocean perch, darkblotched rockfish, bocaccio, and lingcod), tracking the total mortality of these species is important. Additionally, providing observer coverage on some but not all whiting trips may result in differential fishing strategies. For example, vessels with observers onboard might be more likely to fish in areas known to have lower rockfish encounter rates and/or retain all their catch than vessels without observers. Therefore, 100% observer coverage on shore-based whiting trips would aid in quantifying the total mortality of overfished species and ensure accurate data. The proposed sampling levels at processing plants under Alternative 3 would likely be at least 10% and less than 50% of the deliveries. Having between 10% - 50% of deliveries sampled would ensure that both salmon and overfished groundfish species are accurately quantified and sampled. Federal enforcement personnel would track overage/donation fish and the money paid for those fish. Coverage levels under Alternative 3 would be better/similar to those under Alternative 4 and greater than those under Alternative 1 and Alternative 2.

Under Alternative 4 (Combination Monitoring), the proposed coverage levels are also based on the level of monitoring necessary to satisfy compliance with full retention requirements as well as the level of monitoring necessary to effectively track and sample prohibited and overfished species at processing plants. Under Alternative 4, an electronic monitoring system would be installed on each shore-based whiting vessel for the duration of the shore-based whiting primary season. This electronic monitoring system would observe 100% of shore-based whiting trips and verify full retention of catch. While an electronic monitoring system could be used to verify whether catch was dumped at sea, it probably could not be used to quantify the amount of catch dumped or estimate the species composition of catch dumped. Under Alternative 4, state samplers and/or groundfish observers would observe a portion of shore-based whiting deliveries made to plants. Similar to Alternative 2, that portion would likely be at least 10% and less than 50% of the deliveries. State and Federal enforcement personnel would track overage/donation fish and the money paid for those fish. Coverage levels under Alternative 4 would be similar/less than to those under Alternative 3 and greater than those under Alternative 1 and Alternative 2.

4.3.2 Salmon Resources

As discussed in Chapter 1, one need for the proposed action is to track and sample salmon species incidentally taken in the shore-based whiting fishery. The August 1992 Biological Opinion analyzing the effects of the Pacific Coast groundfish fishery on salmon stocks listed under the ESA requires the Pacific Council to provide for monitoring of the salmon incidentally taken in the midwater trawl whiting fishery (NMFS 1992). Currently, the need for monitoring in the whiting fishery is based on not jeopardizing the existence of threatened Snake River fall chinook, lower Columbia River chinook, upper Willamette River chinook, and Puget Sound chinook (NMFS 2002). Monitoring needs could change if additional salmon species were listed or as additional incidental take data are needed for other management purposes.

The effects of the alternatives (i.e., different monitoring programs for the shore-based whiting fishery) on salmon resources include both direct and indirect effects. The direct effects would include the acquired knowledge and understanding of salmon incidentally taken in the shore-based fishery. For example, knowledge about whether salmon are discarded at sea or whether all captured salmon are delivered to the processing plants. Having this type of information would enable fishery managers to make informed management decisions with respect to managing the total mortality of salmon. Additionally, sampling the salmon at processing plants would provide such information as species, age, length, weight, number, and maturity of those salmon that are incidentally taken in the shore-based whiting fishery. The indirect effects of the proposed action on salmon resources will depend on how the information collected by the monitoring program is used. For example, if the incidental take of salmon, specifically chinook salmon, in the shore-based whiting fishery is higher than originally thought, it may result in a re-evaluation of the biological opinion that set the allowable chinook salmon threshold. This information may also result in an effort to minimize the total mortality of chinook salmon, perhaps by reducing the directed harvest of chinook salmon or reducing the season length or fishing area for the whiting fishery.

Because the proposed action is a monitoring program, all alternatives are predicted to have minimal effects on Pacific Coast salmon species. However, the effects on knowledge and understanding of salmon incidentally taken in the shore-based whiting may vary with the type of monitoring program implemented in the shore-based whiting fishery.

Without any full retention provisions for the shore-based whiting fleet, Alternative 1 (No Action Alternative) would result in the shore-based whiting fleet sorting their catch at sea and discarding incidentally taken salmon species as soon as possible. Because the shore-based whiting fleet would be subject to groundfish trawl cumulative trip limits, shore-based whiting vessels would be part of the Observer Program's observer coverage plan for the groundfish trawl fleet. Therefore, NMFS groundfish observers would observe approximately 10% of the shore-based whiting fleet in 2005. When groundfish observers are aboard a shore-based whiting trip, they would collect data (i.e., species, age, length, weight , number, maturity) on salmon species incidentally taken in the shore-based whiting fishery. However, groundfish observers would likely only cover approximately 10% of shore-based whiting trips, therefore, there would be no salmon data collected during approximately 90% of the shore-based whiting trips. Alternative 1 is predicted to generate less information on salmon species incidentally taken in the shore-based whiting fishery than all other Alternatives.

Alternative 2 (Status Quo) would continue the sampling regime for incidentally taken salmon established by the SWOP. There would be no coverage aboard shore-based whiting trips, to verify whether all incidentally taken salmon are retained, but between 10% - 35% of shore-based whiting deliveries at processing plants would be sampled for salmon. Data such as species, age, length, weight , number, and maturity would be collected from those salmon that are incidentally taken in the shore-based whiting fishery, retained, and delivered to processing plants. Salmon delivered to processing plants would be available to local charitable food donation organizations. Alternative 2 is predicted to generate more information on salmon species incidentally taken in the shore-based whiting fishery than Alternative 1 but less information than all other Alternatives.

Under Alternative 3 (Federal Monitoring), there would be 100% observer coverage on shore-based whiting trips to verify whether all captured salmon were retained and sampled at the plant or whether salmon were discarded are sea. If salmon were discarded at sea, it may be possible for observers to determine which salmon species were discarded and to estimate the quantity discarded. Groundfish observers would also sample 10% - 50% of shore-based whiting deliveries at processing plants to collect such information as species, age, length, weight, number, and maturity from those salmon that are incidentally taken in the shore-based whiting fishery. Alternative 3 is predicted to generate more information on salmon species incidentally taken in the shore-based whiting fishery than all other Alternatives.

Under Alternative 4 (Combination Monitoring), electronic monitoring system would be used to monitor 100% of shore-based whiting trips. It is expected that the electronic monitoring system would be able to document if a large amount of catch were discarded at sea but it is not expected that the electronic monitoring would always be able to document whether a small amount of catch were discarded at sea. It is also not expected that the electronic monitoring would be able to document the species composition of catch dumped at sea. Groundfish observers and/or state samplers would also sample 10% - 50% of shore-based whiting deliveries at processing plants to collect such information as species, age, length, weight , number, and maturity from those salmon that are incidentally taken in the shore-based whiting fishery. Alternative 4 is predicted to generate less information on salmon species incidentally taken in the shore-based whiting fishery than Alternative 3 but more information than under Alternative 1 and Alternative 2.

4.3.3 Groundfish Resources

As discussed in Chapter 1, there is an increasing need to accurately track other aspects of the shore-based whiting fishery's bycatch. There are currently eight overfished groundfish species along the Pacific Coast and at least six of these species (widow rockfish, darkblotched rockfish, Pacific ocean perch, canary rockfish, bocaccio, and lingcod) are incidentally taken in the shore-based whiting fishery. Additionally, other groundfish species, sablefish and yellowtail rockfish, are commonly incidentally taken in the shore-based whiting fishery.

The effects of the alternatives (i.e., different monitoring programs for the shore-based whiting fishery) on groundfish resources include both direct and indirect effects The direct effects would include the acquired knowledge and understanding of groundfish incidentally taken in the shore-based fishery. For example, knowledge about whether groundfish are discarded at sea or whether all captured groundfish are delivered to the processing plants. Having this type of information would enable fishery managers to make informed management decisions with respect to managing the total mortality of groundfish, specifically overfished groundfish species. Additionally, sampling groundfish at the processing plants would provide such information as species, age, length, weight, number, and maturity for those groundfish that are incidentally taken in the shore-based whiting fishery. The indirect effects of the proposed action on groundfish resources will depend on how the information collected by the monitoring program is used. For example, if the incidental take of groundfish species, specifically overfished groundfish species, in the shore-based whiting fishery is linked to the location, seasonality, or time of day of fishing activities, efforts could be made to adjust fishing strategies in an effort to avoid capturing non-whiting groundfish species.

Because the proposed action is a monitoring program, all alternatives are predicted to have minimal effects on Pacific Coast groundfish species. However, the effects on knowledge and understanding of groundfish, specifically overfished groundfish species, incidentally taken in the shore-based whiting may vary with the type of monitoring program implemented in the shore-based whiting fishery.

Without any full retention provisions for the shore-based whiting fleet, Alternative 1 (No Action Alternative) would result in the shore-based whiting fleet sorting their catch at sea and discarding all groundfish taken in excess of cumulative limited entry trawl trip limits at sea. Because the shore-based whiting fleet would be subject to groundfish trawl cumulative trip limits, shore-based whiting vessels would be part of the Observer Program's observer coverage plan for the groundfish trawl fleet. Therefore, NMFS groundfish observers would observer approximately 10% of the shore-based whiting fleet in 2005. When groundfish observers are aboard a shore-based whiting trip, they would collect data (i.e., species, age, length, weight, number, maturity) on groundfish species incidentally taken in the shore-based whiting fishery. However, groundfish observers would likely only cover approximately 10% of shore-based whiting trips, therefore, there would be no groundfish data collected during approximately 90% of the shore-based whiting trips. Alternative 1 is predicted to generate less information on groundfish species taken in the shore-based whiting fishery than all other Alternatives.

Alternative 2 (Status Quo) would continue the sampling regime for groundfish species taken in the shore-based whiting fishery established by the SWOP. There would be no coverage aboard shore-based whiting trips, to verify whether all groundfish species are retained, but between 10% - 35% of shore-based whiting deliveries at processing plants would be sampled for groundfish. Data such as species, age, length, weight, number, and maturity would be collected from those groundfish that are taken in the shore-based whiting fishery, retained, and delivered to processing plants. Groundfish taken in excess of cumulative limited entry trawl trip limits and delivered to processing plants would be available to local charitable food donation organizations. Alternative 2 is predicted to generate more information on groundfish species taken in the shore-based whiting fishery than Alternative 1 but less information than all other Alternatives.

Under Alternative 3 (Federal Monitoring), there would be 100% observer coverage on shore-based whiting trips to verify whether all groundfish species were retained and sampled at the plant or whether groundfish species were discarded are sea. If groundfish were discarded at sea, it may be possible for observers to determine which groundfish species were discarded and to estimate the quantity discarded. Groundfish observers would also sample 10% - 50% of shore-based whiting deliveries at processing plants to collect such information as species, age, length, weight, number, and maturity from those groundfish species taken in the shore-based whiting fishery. Alternative 3 is predicted to generate more information on groundfish species taken in the shore-based whiting fishery than all other Alternatives.

Under Alternative 4 (Combination Monitoring), electronic monitoring system would be used to monitor 100% of shore-based whiting trips. It is expected that the electronic monitoring system would be able to document if a large amount of catch were discarded at sea but it is not expected that the electronic monitoring would always be able to document whether a small amount of catch were discarded at sea. It is also not expected that the electronic monitoring would be able to document the species composition of catch dumped at sea. Groundfish observers and/or state samplers would also sample 10% - 50% of shore-based whiting deliveries at processing plants to collect such information as species, age, length, weight, number, and maturity from those groundfish species taken in the shore-based whiting fishery. Alternative 4 is predicted to generate less information on groundfish species incidentally taken in the shore-based whiting fishery than Alternative 3 but more information than under Alternative 1 and Alternative 2.

4.3.4 Non-Groundfish Species

The effects of the alternatives (i.e., different monitoring programs for the shore-based whiting fishery) on non-groundfish resources include both direct and indirect effects The direct effects would include the acquired knowledge and understanding of non-groundfish species incidentally taken in the shore-based fishery. Having this type of information would enable fishery managers to make better informed management decisions with respect to managing the total mortality of non-groundfish species, specifically coastal pelagic species and groundfish species. The indirect effects of the proposed action on groundfish resources will depend on how the information collected by the monitoring program is used. For example, if the incidental take of non-groundfish species, specifically coastal pelagic species, in the shore-based whiting fishery is linked to the location, seasonality, or time of day of fishing activities, efforts may be made to adjust fishing strategies in order to avoid capturing non-groundfish species.

Because the proposed action is a monitoring program, all alternatives are predicted to have minimal effects on non-groundfish species. However, the effects on knowledge and understanding of non-groundfish species incidentally taken in the shore-based whiting may vary with the type of monitoring program implemented in the shore-based whiting fleet. The amount of information generated by this proposed action on non-groundfish species is predicted to be the greatest under Alternative 3 (Federal Monitoring), slightly less under Alternative 4 (Combination Monitoring), less under Alternative 2 (Status Quo), and the least under Alternative 1 (No Action Alternative).

Endangered Species
The effects of this proposed action and the differences between alternatives on endangered and/or threatened salmon, marine mammals, seabirds, and sea turtles is discussed in the salmon resources section, the marine mammal section, the seabird section, and the sea turtle section.

Marine Mammals
There is limited information documenting the interactions of groundfish fisheries and marine mammals, but marine mammals are probably affected by many aspects of groundfish fisheries. The incidental take of marine mammals, defined as any serious injury or mortality resulting from commercial fishing operations, is reported to NMFS by vessel operators. In the Pacific Coast groundfish fisheries, incidental take is infrequent and primarily occurs in trawl fisheries (Forney et al. 2000). Additional effects of groundfish fisheries on marine mammals are more difficult to quantify due to a lack of behavioral and ecological information about marine mammals. However, marine mammals may be affected by increased noise in the oceans, change in prey availability, habitat changes due to fishing gear, vessel traffic in and around important habitat (i.e., areas used for foraging, breeding, raising offspring, or hauling-out), at-sea garbage dumping, and diesel or oil discharged into the water associated with commercial fisheries.

Based on its Category III status, the incidental take of marine mammals in the Pacific Coast groundfish fisheries does not significantly impact marine mammal stocks. To date, there are no documented marine mammals takes in the shore-based whiting fishery (B. Wiedoff, Marine Resources Program, ODFW, 2003, personal communication).

Marine mammals species found off the Pacific Coast are either year around residents or transients traveling to feeding/breeding grounds. Because the proposed action is a monitoring program, all alternatives are predicted to have minimal effects on marine mammal species. However, the effects on knowledge and understanding of marine mammals interactions with the shore-based whiting may vary with the type of monitoring program implemented in the shore-based whiting fleet.

The amount of information generated by this proposed action on marine mammal interactions with the shore-based whiting fleet is predicted to be the greatest under Alternative 3 (Federal Monitoring), slightly less under Alternative 4 (Combination Monitoring), less under Alternative 1 (No Action Alternative), and the least under Alternative 2 (Status Quo).

Seabirds
Interactions between seabirds and fishing operations are wide-spread and have led to conservation concerns in many fisheries throughout the world. Abundant food in the form of offal (discarded fish and fish processing waste) and bait attract birds to fishing vessels. Of the gear used in the Pacific Coast groundfish fisheries, seabirds are occasionally taken incidentally by trawl and pot gear, but they are most often taken by longline gear. Besides entanglement in fishing gear, seabirds may be affected by commercial fisheries in various ways. Change in prey availability may be linked to directed fishing and the discarding of fish and offal. Vessel traffic may affect seabirds when it occurs in and around important foraging and breeding habitat and increases the likelihood of bird storms. In addition, seabirds may be exposed to at-sea garbage dumping and the diesel and oil discharged into the water associated with commercial fisheries.

To date, there are no documented seabird takes in the shore-based whiting fishery (B. Wiedoff, Marine Resources Program, ODFW, 2003, personal communication).

Because the proposed action is a monitoring program, all alternatives are predicted to have minimal effects on seabird species. However, the effects on knowledge and understanding of seabird interactions with the shore-based whiting may slightly vary with the type of monitoring program implemented in the shore-based whiting fleet.

The amount of information generated by this proposed action on seabird interactions with the shore-based whiting fleet is predicted to be the greatest under Alternative 3 (Federal Monitoring), slightly less under Alternative 4 (Combination Monitoring), less under Alternative 1 (No Action Alternative), and the least under Alternative 2 (Status Quo).

Sea Turtles
There is limited information about interactions between sea turtles and Pacific Coast commercial fisheries. Sea turtles are known to be taken incidentally by the California-based pelagic longline fleet and the California halibut gillnet fishery. Because of gear and fishing strategies differences between those fisheries and the groundfish fisheries, the expected take of sea turtles by groundfish gear is minimal. In addition to being incidentally taken in fishing gear, turtles are vulnerable to collisions with vessels and can be killed or injured when struck, especially if struck with an engaged propeller. Entanglement in abandoned fishing gear can also cause death or injury to sea turtles by drowning or loss of a limb. The discard of garbage at sea can be harmful for sea turtles, because the ingestion of such garbage may choke or poison them. Sea turtles have ingested plastic bags, beverage six-pack rings, styrofoam, and other items commonly found aboard fishing vessels. The accidental discharge of diesel and oil from fishing vessels may also put sea turtles at risk, as they are sensitive to chemical contaminates in the water.

To date, there are no documented sea turtle takes in the shore-based whiting fishery (B. Wiedoff, Marine Resources Program, ODFW, 2003, personal communication).

Because the proposed action is a monitoring program, all alternatives are predicted to have minimal effects on sea turtle species. However, the effects on knowledge and understanding of sea turtle interactions with the shore-based whiting may vary with the type of monitoring program implemented in the shore-based whiting fleet.

The amount of information generated by this proposed action on sea turtle interactions with the shore-based whiting fleet is predicted to be the greatest under Alternative 3 (Federal Monitoring), slightly less under Alternative 4 (Combination Monitoring), less under Alternative 1 (No Action Alternative), and the least under Alternative 2 (Status Quo).

4.4 Effects on the Physical Environment

The effects of fishery management practices on the physical environment typically include such things as fishing gear effects on the ocean floor, changes in water quality associated with vessel traffic, and fish processing discards as a result of fishing practices. Because the proposed action is a monitoring program, all alternatives are predicted to have minimal effects, if any, on the California Current System and essential fish habitat.

4.5 Effects of the Alternatives

Table 2.6.1. A comparison of different full retention and monitoring programs for the shore-based whiting fishery.

Issues	Alternative 1 (No Action Alternative)	Alternative 2 (Status Quo)	Alternative 3 (Federal Monitoring)	Alternative 4 (Combination Monitoring)
Establishing Retention and Monitoring Requirements	* Shore-based whiting fishery would operate under cumulative trip limits specified in Federal regulation.	* Full retention and monitoring requirements would be specified in an EFP that is issued on an annual basis.	* Full retention and monitoring requirements would be specified in Federal regulation.	* Full retention and monitoring requirements would be specified in Federal regulation.
Verifying Full Retention of Catch	* Shore-based vessels would sort their catch at sea and discard all prohibited species as well as groundfish taken in excess of cumulative trip limits.	* There would be no monitoring for shore-based whiting trips to verify full retention of catch versus discard at sea.	* Federal observers would monitor 100% of shore-based whiting trips for full retention versus discard at sea. **Option 3A(1)** * Monitoring program would be Federally funded. **Option 3A(2)** * Monitoring program would be funded by the shore-based whiting fleet through a no cost contract.	* Electronic monitoring would monitor 100% of shore-based whiting trips for full retention versus discard at sea. **Option 4A(1)** * Monitoring program would be Federally funded. **Option 4A(2)** * Monitoring program would be funded by the shore-based whiting fleet through a no cost contract.
Sampling Prohibited and Overfished Species	* Shore-based whiting vessels would be subject to observer monitoring under the West Coast Groundfish Observer Program's trawl fleet coverage plan. * Monitoring would be Federally funded.	* State port samplers would track and sample salmon and overfished groundfish species at processing plants funded by the shore-based whiting industry and state and Federal management agencies.	* Federal observers would sample 10% - 50% of shore-based whiting deliveries at processing plants for salmon and overfished groundfish species. **Option 3B(1)** * Monitoring would be Federally funded. **Option 3B(2)** * Monitoring would be funded by each state. **Option 3B(3)** * Monitoring would be funded by the shore-based whiting industry through a no cost contract.	* Federal observers and/or state samplers would sample 10% - 50% of shore-based whiting deliveries at processing plants for salmon and overfished groundfish species. **Option 4B(1)** * Monitoring would be Federally funded. **Option 4B(2)** * Monitoring would be funded by each state. **Option 4B(3)** * Monitoring would be funded by the shore-based whiting industry through a no cost contract.
Tracking Disposition of Overage/Donation Fish	* No tracking of overage/donation fish would be necessary as catch of those species would be discarded at sea.	* State and Federal enforcement staff would share the tracking of overage/donation fish and the money paid for those fish.	* Federal enforcement personnel would track overage/donation fish and the money paid for those fish.	* Federal enforcement personnel and/or state enforcement personnel would share the tracking of overage/donation fish and the money paid for those fish.
Fisheries Data	* Generates the least amount of fisheries data.	* Generates more fisheries data than Alternative 1 but less data than Alternatives 3 and 4.	* Generates the greatest amount of fisheries data.	* Generates more fisheries data than Alternatives 1 and 2 but less data than Alternative 3.
Estimated Cost of Monitoring Program	* Cost is estimated at $51,000.	* Cost is estimated at $148,000.	* Cost is estimated at $690,000.	* Cost is estimated at $410,000.

4.6 Preliminary Assessment of Cumulative Effects

When implementing new full retention and monitoring requirements, it is necessary to consider the cumulative effects on the physical, biological, and socioeconomic aspects of the Pacific Coast groundfish fishery. Cumulative effects are those effects on the environment that result from the incremental effects of the action when added to other past, present, and reasonably foreseeable future actions regardless of what agency (Federal or non-Federal) or person undertakes such other actions. Cumulative impacts can result from individually minor but collectively significant actions taking place over a period of time.

As discussed in Chapter 4.2 of the EA, the effects of implementing full retention and monitoring requirements in the shore-based whiting fishery on the socio-economic environment of the Pacific Coast groundfish fishery include such things as the cost of the different monitoring programs and the economic effects on the shore-based whiting industry. In addition to the direct costs imposed upon the shore-based whiting industry from changes in monitoring requirements, other recent costs facing the industry include the cost of a vessel monitoring system and landing taxes being paid to cover the loan costs of the limited entry trawl vessel and permit buyback program. Whether the limited entry trawl buyback program results in a net gain or net loss to the remaining fishers has yet to be determined, and therefore, vessels may still benefit from the limited entry trawl buyback program even though landing taxes are being paid. While the proposed action is not expected to significantly affect groundfish fishing fleets and communities, the effects associated with implementing a full retention and monitoring program in the shore-based whiting fleet will vary with alternatives. Over time, the cumulative effects of fishing and non-fishing activities may have an effect on the socio-economic environment. As more information is gathered about the cumulative effects of fishing and non-fishing human activities on the socio-economic environment, additional management measures may be taken to mitigate the effects if necessary.

As discussed in Chapter 4.3 of the EA, the effects of implementing full retention and monitoring requirements in the shore-based whiting fishery on the biological environment of the Pacific Coast groundfish fishery include such things as the tracking and sampling of salmon and overfished groundfish species incidentally taken in the shore-based fishery. Implementing a monitoring program in the shore-based fishery will also affect what is known about interactions between non-groundfish species, marine mammals, seabirds, and sea turtles and the shore-based whiting fishery. Because the proposed action is a monitoring program, all alternatives are predicted to have minimal effects on Pacific Coast salmon species. However, the effects on knowledge and understanding of salmon incidentally taken in the shore-based whiting may vary with the type of monitoring program implemented in the shore-based whiting fishery. As more information is gathered about the cumulative effects of fishing and non-fishing human activities on the biological environment, additional management measures may be taken to mitigate the effects if necessary.

As discussed in Chapter 4.4 of the EA, the effects of implementing full retention and monitoring requirements in the shore-based whiting fishery on the physical environment of the Pacific Coast groundfish fishery are predicted to be minimal. There are no data to suggest that characteristics of the California Current System or EFH will be affected by a monitoring program in the shore-based whiting fishery. As more information is gathered about the cumulative effects of fishing and non-fishing human activities on the physical environment, additional management measures may be taken to mitigate the effects if necessary.

4.7 "Significance" Considerations

Section 1508.27 of the CEQ Regulations lists ten points to be considered in determining whether or not impacts are significant. Those points are as follows: (1) beneficial and adverse impacts, (2) public health or safety, (3) unique characteristics, (4) controversial effects, (5) uncertainty or unique/unknown risks, (6) precedent/principle setting, (7) relationship/cumulative impact, (8) historical/cultural impacts, (9) endangered/threatened species impacts, and (10) interaction with existing laws for habitat protection. Table 4.7.1 (at the end of this section) summarizes the expected effects of the proposed action and alternatives discussed throughout Chapter 4 of this EA.

1. *Beneficial and Adverse Impacts.* As discussed in Chapter 4 of the EA, the proposed action is not predicted to have significant biological or physical effects, however, it may have significant effects on the socio-economic environment.

Gross Revenues - Information on gross revenues was discussed in Chapter 3.2 of this EA. That information shows available data at the ex-vessel level and describes revenues and revenue sources at the processor level. Changes in gross revenues are only expected to occur under Alternative 1. Under this alternative sorting at sea would be required, leading to more time between hauling and storing the whiting in chilled holds. Since Pacific whiting flesh is highly susceptible to unfavorable storage environments, this would result in cases of lower quality whiting, spoilage, and a decreased price for landings.

Cost Impacts - Very little data exists describing the cost structure of trawl vessels in Pacific groundfish fisheries. The most recent effort used a survey technique to estimate various costs for various vessel categories. Unfortunately, the data collected under this effort was not statistically significant, and therefore, is not being used for analysis in this EA. The most widely used estimate for cost structure is within the Fisheries Economic Assessment Model (FEAM), which estimates regional economic impacts associated with changes in commercial fisheries. The FEAM uses a set of estimates for deriving economic impacts, and one of these estimates is the profit margin of vessels. For this EA, the profit margin for a "Large Groundfish Trawler" in the FEAM is used as the best estimate of a vessels cost structure. This estimate is 10 percent, meaning that an industry funded Option under Alternative 3 could be viewed as having a significant effect on some vessels in the Pacific whiting fleet, since vessel level costs are a substantial portion of this percentage. All other alternatives are not expected to have a significant cost impact.

Net Returns - The net returns to industry are the combined effect of changes in gross revenues and costs. As described above, Alternative 1 is expected to have a significant impact on gross revenues by decreasing the quality of landed catch. Although significant additional costs aren't imposed on the industry under this Alternative, the decrease in gross revenues will likely have a significant impact on net returns. As described previously, vessel-level costs with an industry funded Option under Alternative 3 are expected to be equivalent to approximately 8 percent of the gross revenues generated by Pacific whiting vessels from Pacific whiting activities. This represents a substantial portion of the estimated 10 percent profit margin for these vessels. Therefore, an industry funded Option under Alternative 3 is expected to have a significant impact on the cost structure of portions of the industry and a significant impact on net returns.

Communities - Community involvement and association with shore-based Pacific whiting activities is largely centered on processing and distribution activities resulting from landed catch, the number of shore-based whiting fishers residing in each community, and the secondary and tertiary economic impacts of revenues associated with those activities. Examples of significant community impacts would be the closure of a large processing plant, substantial losses in residential commercial fisher income, or if large numbers of commercial fishers leave the community. Due to the relatively small number of shore-based Pacific whiting fishers in each community, the diversified nature of most processors, and the likelihood that the shore-based fleet will continue to catch its allotted tonnage, none of the alternatives is expected to have a significant impact on communities.

Consumer Effects - Consumer effects are generally described through changes in consumer surplus. Consumer surplus is measured as what consumers would be willing to pay for a quantity of a particular good above what they are required to pay. An increase in price, or decrease in supply, will reduce consumer surplus. In the case of Pacific whiting, there are many market substitutes including Alaska Pollock, Atlantic Blue Whiting, and Seafin Bream. In many instances, Pacific whiting is an ingredient used in the production of surimi. In other cases, it is used for fillets and head and gut products. When sold on the market, Pacific whiting competes with other substitutes, and on a global scale, Pacific whiting makes up a small portion of that class of products. This means that consumers can easily switch from Pacific whiting products, to another product that is almost identical. Due to this ease of product substitutability, all alternatives are expected to have no significant effect on consumers.

Safety Effects - Commercial fishing is a hazardous occupation with substantial risk. Some studies have been done on the impact of fisheries management on safety, but these studies have focused on major changes with fisheries such as the effect of implementing an Individual Transferable Quota system. Safety improvements are often correlated to actions that eliminate the race for fish, but little is known about whether other changes in the prosecution of the fishery can have the same positive consequences, or negative consequences.

Impacts on Other Fisheries - Many businesses involved in the shore-based Pacific whiting fishery also participate in other fisheries. Chapter 3.2 describes the participation of shore-based catcher vessels in other Pacific coast fisheries. Many of these vessels participate in the general Groundfish trawl fishery, the Dungeness crab fishery, and Groundfish fisheries in Alaska. In addition, several vessels recorded landings of shrimp, coastal pelagic species, and salmon. Diversification is typical of businesses that are seeking to reduce financial risk (spreading out revenues across a variety of sources). Participation in other fisheries can also be seen as profit maximizing behavior. The intensity in which vessels participate in various fisheries is likely due to potential revenues within that fishery and the stability of those revenues each year. An alternative that changes the profitability of a fishery, or that changes the stability of that fishery may change the composition of the fleet within that fishery. For example, if an alternative makes participation in that fishery relatively expensive, some vessels may choose to not participate in the fishery and focus instead on parallel fisheries since parallel fisheries may appear more attractive when faced with those higher costs.

Under the alternatives presented in this EA, only Alternative 1 has an unknown effect. The impact under this alternative is unknown because it is unknown what the changes in net revenues would be under this scenario, and therefore it is unknown if industry participation will change. Although other alternatives may result in some vessels leaving the shore-based whiting fishery, that number is likely to be small. Therefore, all other alternatives are expected to have no significant impact on other fisheries.

Bycatch and Discard - The Pacific whiting fishery incidentally takes other groundfish and salmon species during directed fishing activity. All alternatives except Alternative 1 require or allow full retention for all species including salmon, which is a prohibited species in other groundfish fishing activities. Full retention fisheries, by definition, increase utilization and reduce discards of incidentally caught species that may otherwise not be landed. Increased retention and utilization can have positive socioeconomic impacts as increased retention may allow for additional production and use of those species by society. Compared to the status quo (which is a full retention alternative) Alternative 3 and Alternative 4 are not expected to have a significant impact. Alternative 1 is expected to have a negatively significant impact on discards since sorting and discarding at sea will be required.

2. *Public health or Safety.* Because the proposed action is a monitoring program, it is not predicted to significantly affect public health or safety. Implementing Alternative 1 or Alternative 3 would involve placing groundfish observers aboard shore-based whiting vessels, however, observing aboard these vessels is not beyond the scope of their job descriptions and should not result in additional safety hazzards. Alternatives 2 - 4 provide for sampling of shore-based whiting deliveries in processing plants by groundfish observers and/or port or state samplers. Once again, these duties are in keeping with their job descriptions and should not result in additional safety hazards.

3. *Unique Characteristics.* As discussed in Chapter 4.3 of the EA, the proposed action is not predicted to jeopardize the sustainability of any groundfish species. In fact, implementing a full retention monitoring program is predicted to generate information about bycatch in the shore-based whiting fishery that will be used for the sustainable management of groundfish species.

4. *Controversial Effects.* Implementing full retention and monitoring requirements in the shore-based whiting fishery is not controversial. However, electronic monitoring is a relatively new technology and there are issues of data confidentiality and ownership of images that new for NMFS and not yet adequately addressed in the Magnuson-Stevens Act.

5. *Unique/Unknown Risks.* The proposed action is not predicted to have any uncertainty or unique/unknown risks associated with it.

6. *Precedent/Principle Setting.* The proposed action may involve some elements of precedent setting as Alternatives 3 and 4 establish 100% monitoring as the level of monitoring necessary to monitor for compliance with full retention requirements and Alternative 4 establishes electronic monitoring as an appropriate tool for monitoring full retention of catch.

7. *Relationship/Cumulative Impact.* As discussed in Chapter 4.6 of the EA, the proposed action is not predicted to result in significant cumulative effects on either the physical, biological, or socio-economic environment of the Pacific Coast groundfish fishery.

8. *Historical/Cultural Impacts.* The proposed action is not predicted to have any historical/cultural effects.

9. *Endangered/Threatened Species Impacts.* As discussed in Chapter 4.3 of the EA, the proposed action is not predicted to have a significant effect on endangered, threatened, or depleted species. In fact, implementing a full retention monitoring program is predicted to generate information about bycatch in the shore-based whiting fishery that may be used for the sustainable management of endangered, threatened, or depleted species.

10. *Interaction with Existing Laws for Habitat Protection.* As discussed in Chapter 4.4 of the EA, the proposed action is not predicted to have a significant effect on habitat.

Table 4.7.1. Summary of the effects of the alternatives on the Pacific Coast groundfish fishery.

Pacific Coast Groundfish Fishery	Alternative 1 (No Action Alternative)	Alternative 2 (Status Quo)	Alternative 3 (Federal Monitoring)	Alternative 4 (Combination Monitoring)
Socio-Economic Environment				
Gross Revenues	S-	N	N	N
Cost Effects	N	N	S-	N
Net Revenues	S-	N	S-	N
Safety	U	N	U	U
Communities	N	N	N	N
Other Fisheries	U	N	N	N
Consumer Effects	N	N	N	N
Bycatch and Discard	S-	N	N	N
Biological Environment				
Salmon Species	N	N	N	N
Groundfish Species	N	N	N	N
Non-groundfish Species	N	N	N	N
Endangered Species	N	N	N	N
Marine Mammals	N	N	N	N
Seabirds	N	N	N	N
Sea Turtles	N	N	N	N
Physical Environment				
California Current System	N	N	N	N
Essential Fish Habitat	N	N	N	N
N= Non-significant Effect; S = Significant Effect; U = Unknown Effect; + = Positive; - = Negative				

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PACIFIC COAST GROUNDFISH FISHERY EXEMPTED FISHING PERMIT
AUTHORITY: Title 50, Code of Federal Regulations
Sections 600.745 and 660.406, and Subpart G of part 660

MONITORING INCIDENTAL CATCH IN THE PACIFIC WHITING FISHERY

F/V **Vessel name**

PERMIT # **04-HAK-XX**
Pacific Coast Groundfish
Limited Entry Permit # xx

The Administrator of the Northwest Region of the National Marine Fisheries Service (NMFS), acting on behalf of the Secretary of Commerce, hereby permits the master and owner of the fishing vessel **[insert vessel name]**, documentation number **XXXXXX**, to engage in the exempted harvest of Pacific Coast groundfish over which the United States exercises fishery management authority under the Magnuson-Stevens Fishery Conservation and Management Act, 16 United States Code 1801 et seq. (Magnuson-Stevens Act), and implementing groundfish regulations at 50 CFR Part 660, Subpart G and section 600.745, and under salmon regulations at 50 CFR 660.406. The exempted fishing must be conducted in accordance with the provisions of the Magnuson-Stevens Act and 50 CFR Parts 600 and 660, Subpart G except as provided in the attached terms and conditions incorporated herein.

This permit implements a cooperative state/federal/industry observation program to monitor the bycatch of salmon and groundfish in the shore-based component of the Pacific whiting fishery. This permit is valid when signed by both the Regional Administrator and the authorized representative of the vessel (hereinafter referred to as the "permit holder"). It expires 24 hours after notification by the Regional Administrator of termination of this permit, or on December 31, 2004, whichever is earlier. It also may be terminated or modified earlier by regulatory action pursuant to 50 CFR Part 660, Subpart G, or revocation, suspension, or modification pursuant to 15 CFR Part 904, or successor regulations, or by the terms and conditions of this permit. The Regional Administrator will notify the vessel owner of the conclusion of the observation program and the termination of the permit if other than December 31, 2004.

Signature
D. Robert Lohn, Acting Regional Administrator
Northwest Region
National Marine Fisheries Service

Date Signed

Signature
XX, permit holder.

Date Signed

By signing this document, the permit holder agrees to comply with the intent and the terms and conditions of this permit, and is responsible for seeing that this information is understood by the vessel's crew.

Vessel Owner's Name/Address:
name, address, phone, fax XX

EXEMPTED FISHING PERMIT

MONITORING INCIDENTAL CATCH IN THE PACIFIC WHITING FISHERY

TERMS AND CONDITIONS

A. PURPOSE. The purpose of this program is to determine levels of incidental catch of salmon and groundfish taken by vessels that participate in the shore-based primary season for Pacific whiting. Target fishing on any species other than Pacific whiting (particularly yellowtail and widow rockfish) is contrary to the intent of this program and may result in unrealistically high estimates of incidental catch. This would reflect on the entire shore-based Pacific whiting fleet, and may result in additional restrictions.

Incidental species caught while fishing for Pacific whiting are counted against a vessel's cumulative trip limit for the incidental species. Although landings in excess of a trip limit currently are allowed under this EFP, the proceeds from the sale of overages are abandoned to the State where landed or NMFS. Any overages are deducted from the optimum yield and therefore reduce the amount of fish available to non-whiting fishers.

B. SCOPE.

1. This permit implements a cooperative observation program with the states of California, Oregon, and Washington to monitor the incidental catch of salmon and groundfish caught by Pacific whiting trawl vessels that deliver shoreside.

2. This permit applies to all fishing activities by the permitted vessel targeting on Pacific whiting during the effective dates of the permit. **The permit holder is responsible for instructing all vessel operators and crew members concerning the terms and conditions of this permit.**

3. This permit authorizes, for limited purposes as described in this permit, the following activities which would otherwise be prohibited by 50 CFR 660.306 (b) and (f); 50 CFR 600.725 (p); and 50 CFR 660.405:

    a. Retention, until offloading, of prohibited species including, salmonids incidentally caught in a pelagic trawl;

    b. Retention, until offloading, of groundfish in excess of trip limits.

4. All other provisions of 50 CFR Part 660, Subpart G, including restrictions specified by or pursuant to 50 CFR 660.323, apply to fishing conducted under this permit.

5. NMFS sponsors the EFP program. The States of Oregon, Washington, and California are the EFP applicants, and as such have the authority to select which vessels and processors are allowed to participate in the program. The State(s) where the Pacific whiting are or will be landed may decline to approve a vessel or processor and may choose not to forward the processor's name to NMFS for inclusion in Appendix A, designated processor list (DPL), on an EFP permit. The States may modify Appendix A to an EFP to add or delete a processor from the DPL, provided such changes are

promptly communicated to the NMFS Fisheries Permit Office staff and the communications occur before EFP fish are landed at the processing facility.

C. EXEMPTED FISHING.

1. This permit is valid only for vessels participating under the States' observation program that are using pelagic trawl gear to target Pacific whiting during the shore-based primary season.

2. All fishing trips by the permitted vessel targeting on Pacific whiting during the effective dates must be conducted in accordance with this permit.

3. A fishing trip targeting on Pacific whiting is defined for the purposes of this permit as a fishing trip resulting in the landing of 10,000 pounds or more of Pacific whiting.

4. If a vessel lands less than 10,000 pounds of Pacific whiting from a fishing trip, then that trip will not be considered as "targeting on Pacific whiting," and therefore that trip will not be governed by this permit. Consequently, all fish landed from such a trip will count toward otherwise applicable trip limits in effect at the time in the Pacific coast groundfish fishery. Trip limits shall apply to all trips within a cumulative trip limit period that fail to target on Pacific whiting.

5. Proceeds from the sale of groundfish caught in excess of current trip limits, but required to be retained under this EFP, will be abandoned to the State of landing.

6. Prohibited species, including, salmonids incidentally caught in a pelagic trawl, that are required to be retained under this EFP, will be abandoned to the State of landing.

D. EFFECTIVE DATES.

1. This permit is valid from the date signed by the Regional Administrator, NMFS, and the-permit holder.

2. This permit applies only to the primary Pacific whiting season, as announced in the Federal Register and terminates on December 31, 2004, unless terminated at an earlier date by one of the following actions: at the request of the vessel owner or the permit holder, in which case the permit is terminated on the date requested and no further notification from the Regional Administrator or State is required; at the request of the cooperating State, when the State observation program ends, or when the processing plant(s) designated in Appendix A are no longer included in the sampling program conducted by the State, in which case written notification from the State to the vessel owner is required and termination occurs no sooner than 24 hours after delivery of the notification; when the Regional Administrator determines it is necessary to issue amended permits containing additional restrictions, in which case termination occurs no sooner than 24 hours after delivery of the notice of termination from the Regional Administrator to the vessel owner; when the Pacific whiting fishery is closed because of achievement of the shore-based allocation, commercial harvest guideline, or species' harvest guideline, in which case termination occurs concurrent with the closure, as announced in the Federal Register, in which case further written notification of the vessel owner is not required.

3. The vessel owner is responsible for advising the permit holder of the termination of the permit.

E. <u>LANDINGS</u>.

1. This permit is valid only for landings made at processing plants that have been designated by the States as participants in the observation program. The States will require a written agreement to be signed by a representative of a processing plant before that processing plant is accepted as a "designated processor" to ensure that the purposes of the EFP program are implemented.

    a. Designated processing plants are listed in Appendix A to this permit. The DPL in Appendix A may be revised by NMFS or the State observation program coordinator. The revised DPL must be attached to this permit. The State may decline issuance of an EFP to a vessel if the designated processor is in a different state, if there is reason to believe the vessel's catch cannot or will not be sorted according to current laws, cannot be monitored under reasonable conditions, if there is not an adequate facility for storing prohibited species, or if there is no designated processor for that vessel. The State agency may decline listing a processor as a designated processor if the processing plant's representative did not sign a written agreement with the State or if the processor is not, or has not been, in compliance with a signed written agreement with the State.

    b. The States will provide instructions to each participating processing plant specifying the plant's role and responsibilities in the observation program and procedures for abandoning the market value of any groundfish trip limit overages to NMFS. Designated processing plants have agreed to: (1) allow State personnel and program observers to sample Pacific whiting landings and all associated incidental catch; (2) set-aside all salmonids for biological sampling and disposition by State agency personnel; and (3) remit to the State of landing or NMFS the market value of any groundfish trip limit overages.

2. The permit holder must contact the appropriate State coordinator listed below to make arrangements for observations of offloading of catch at a designated processing plant.

    In California: Mike Fukushima, California Dept. of Fish and Game, 707- 441-5797.
    In Oregon: Brett Wiedoff, Oregon Dept. of Fish and Wildlife, 541-867-0300
    In Washington: Brian Culver, Wash. Dept. of Fish and Wildlife, 360-249-4628

3. All fish caught during an exempted fishing trip must be offloaded at only one designated processing plant (i.e. the offloading of catch from one trip cannot be split between processing plants). Once offloading has commenced at a designated processing plant, all fish onboard the vessel must be offloaded at that plant.

F. FISHING RESTRICTIONS.

1. Discards.

a. **At-sea discarding of any catch is prohibited**. **All** catch caught while fishing under this permit **must** be brought onboard the vessel and may only be discarded because of emergency safety concerns. Any discarded fish must be documented according to the instructions in paragraph I. 1. c. Discarding catch for other reasons is not consistent with the intent of this permit. Discarding that results from the practice of intentionally catching more fish than are needed to fill the hold is not considered a safety related emergency. Fishing gear and sensors should be adjusted to prevent excessive amounts of fish from being taken. Discarding is not permitted because the composition of the catch is considered to be undesirable (i.e. large amounts of bycatch, or unsuitable sized whiting).

b. **All** catch brought on board the vessel under this permit **must** be retained onboard the fishing vessel and delivered shoreside for sampling under the State observation program.

2. Disposition of salmon. Salmon caught under this permit shall be retained and landed, but cannot be sold. Salmon will be set aside for disposition in accordance with State instructions to processing plants, which may include providing salmon to a food bank or food bank resource coordinator authorized by the State coordinator.

3. Groundfish trip limits.

a. Groundfish trip limits will apply to vessels operating under this permit except that overages in trip limits will not be in violation of 50 CFR 660.323 so long as such overage is surrendered to the State of landing or NMFS.

b. The Regional Administrator may place limits on the overages of groundfish trip limits during the course of the exempted fishery. If such restrictions are necessary, the Regional Administrator will terminate this permit and issue an amended permit containing the additional restrictions on groundfish trip limits as determined necessary by NMFS in consultation with the states.

5. Fishing inside the 100-fathom contour in the Eureka area: This permit **does not** authorize a vessel to take and retain more than 10,000 pounds of Pacific whiting caught shoreward of the 100-fathom contour in the Eureka area (43°00' - 40°30' N. lat.).

G. GEAR RESTRICTIONS. Only pelagic trawl gear authorized under 50 CFR Part 660, Subpart G may be used.

H. REPORTING REQUIREMENTS.

1. If requested, the permit holder must provide, departure and arrival notification to the State or observer program coordinator including reasonable notice of unexpected changes in fishing plans, to allow for the sampling of the catch at offloading, for installation and maintenance of electronic video monitoring equipment, and for deployment of at-sea observers, if any.

2. For landings at processing plants in California, the vessel operator must notify CDFG at least 12 hours before departing port to commence fishing under this permit.

I. DATA REQUIREMENTS. It is unlawful to fail to report catches as required while fishing pursuant to an exempted fishing permit (50 CFR 600.725(l)).

1. Trawl Logs. Trawl logbooks as required by the applicable state law must be maintained by the vessel operator. "Exempted Fishing Trip" (or "Experimental Fishing Trip") shall be written on the log for each trip conducted under this permit.

   a. Estimated pounds of all species caught in each tow must be recorded in the logbook.

   b. If salmon, Pacific halibut, or Dungeness crab are observed at-sea, the numbers observed, by species, are to be recorded by tow in the logbook. The total number of salmon, Pacific halibut, or Dungeness crab landed must be recorded, by species, in the "remarks" section of the log.

   c. If fish are discarded in the event of emergency safety concerns (see paragraph F. 1.), an estimate of the amount discarded with the species (list the 3 most prevalent species, if possible), location of the tow, and reason for discarding (such as "bag too full to safely pull on board") shall be recorded (and labeled "discard") on a separate line in the logbook required by the State of landing.

2. Other Reports. This permit does not relieve the vessel operator from any other state or federal reporting requirements.

3. Public Release of Information. The fishing activities carried out under this permit, which are otherwise prohibited, are for the purpose of collecting information. The vessel owner, operator, and permit holder agree to the public release of any and all information obtained as a result of activities conducted under this permit. Data from individual vessels may be released for purposes of examining incidental catch levels and rates of non-whiting species and prohibited species.

J. OBSERVER AND OTHER MONITORING REQUIREMENTS.

1. Shoreside monitors. The state coordinators will make necessary arrangements to ensure achievement of the observation program objective for randomly selected coverage of at least 10 percent of the landings by vessels participating in the exempted fishery. The State will review coverage rates on a monthly basis and advise the permit holder of any deficiencies in observer coverage that must be resolved to meet program objectives. A State may deny issuance of an EFP if necessary to assure adequate coverage.

2. At-sea observers. A state-sponsored or federal at-sea observer may be assigned to a vessel to monitor discard and incidental catch levels, to determine fishing practices that may result in high or low incidental catch levels, and to compare incidental catch from vessels that carry observers and those that do not. Any state observer must be approved by the State coordinator before deployment. The vessel owner, operator and permit holder shall allow an observer to accompany the vessel during fishing under this permit when an observer is assigned under the states' observation programs. If an at-sea observer is

assigned, the vessel operator or owner shall abide by groundfish observer regulations at 50 CFR 660.306, and 50 CFR 660.360 (d) & (j).

3. NMFS Observer coverage requirements at 50 CFR 660.360 are independent of state observer requirements. Vessels that carry a state-sponsored observer may also be required to carry a NMFS observer. A state observer is not a substitute for a NMFS observer and a vessel carrying a state observer is not exempt from federal observer requirements. However, a state may choose to waive state observer coverage for vessels that are carrying federal observers.

4. Electronic Video Monitoring Equipment A vessel may be required to carry electronic video monitoring equipment to monitor for at-sea discarding of catch. When a vessel is notified by NMFS or the state that they will be required to carry electronic video monitoring equipment, they must schedule a time for installation of the unit. The installation must be scheduled before the vessel leaves port on the next EFP fishing trip. If a unit is not installed before the next EFP fishing trip the permit holder will be in violation of the terms and conditions of this permit and the permit may therefore be terminated. However, on a trip-by-trip basis NMFS may choose to waive the requirement for installation if the equipment cannot be initiated within 12 hours of the scheduled time due to contractor or NMFS delays. As necessary, the vessel operator must allow for maintenance of electronic video monitoring equipment. While electronic video monitoring equipment is aboard the vessel, the system must not be interfered with, damaged, or the power source turned off.

K. SANCTIONS.

Failure of the vessel owner, operator, or permit holder to comply with the terms and conditions of this permit, a notice issued under 50 CFR Part 660, Subpart G, any other applicable provision of 50 CFR Parts 600 and 660 Subpart G, the Magnuson-Stevens Act, or any other regulations promulgated thereunder, may be grounds for revocation, suspension, or modification of this permit as well as civil or criminal penalties under the Magnuson-Stevens Act with respect to all persons and vessels conducting activities under the EFP (50 CFR 600.745(b)(8)).

L. WAIVER.

The permit holder on his/her own behalf, and on behalf of all persons conducting activities authorized by the permit under his/her direction, waives any and all claims against the United States or the State, and its agents and employees, for any liability whatsoever for personal injury, death, or damage to property directly or indirectly due to activities under this permit.

APPENDIX A

EXEMPTED FISHING PERMIT
MONITORING INCIDENTAL CATCH IN THE PACIFIC WHITING FISHERY

Vessel Name: **xx**

EFP#: 04-HAK-xx

1. Designated processor(s):

xx[EXAMPLE:]
Eureka Fisheries, Inc.
P.O. Box 217
Field's Landing, CA 95537
attn: Tom Devere

ph: (707) 463-1673
fx: (707) 463-7952

2. Changes to this appendix:

		Authorizing Official	
Item Changed	Date Approved	Name	Agency

Exhibit C.7.a
Supplemental Power Point Presentation
June 2004

Establishing a Full Retention and Monitoring Program in the Shore-based Whiting Fishery

Implementing Amendment 10 to the Pacific Coast Groundfish FMP

Draft Environmental Assessment

Further Development of Alternatives

- NMFS held a public scoping meeting in Newport, Oregon on December 8, 2003
- NMFS attended ODFW 2004 whiting EFP meetings in Oregon
- Discussion at these meetings shaped the range of alternatives

Components of a Monitoring Program (Issues)

- Establishing full retention and monitoring
- Verifying full retention of catch
- Sampling prohibited and overfished species
- Tracking overage and donation fish

Monitoring Options (Alternatives)

- No full retention or monitoring
- Exempted Fishing Permit (EFP) process
- Federal Observer Monitoring Program
- Combination Monitoring Program

Analysis of the Alternatives

- Effects of establishing a full retention and monitoring program on groundfish fishery
- Most alternatives predicted to have minimal effects on groundfish fishery
- Alternatives vary by cost and the quality of the data produced

Alternative 1 – No Action Alternative

- No provision for full retention
- Vessels required to sort catch at sea
- Observer coverage is provided by the West Coast Observer Program
- Monitoring is Federally funded
- Generates the least amount of fisheries data
- Estimated cost is $51,000

Alternative 2 – Status Quo

- Full retention requirements specified in the EFP
- No monitoring at sea to verify full retention
- State port samplers track/sample salmon and groundfish species at plants
- Monitoring costs are shared by industry and management agencies

Alternative 2 – Status Quo (continued)

- State and Federal enforcement staff track overage/donation fish
- Generates more fisheries data than Alternative 1 but less than Alternatives 3 or 4
- Estimated cost is $148,000

Alternative 3 – Federal Observer Monitoring Program

- Full retention and monitoring requirements specified in Federal regulation
- Federal observers monitor 100% of shore-based whiting trips
- At sea monitoring funded Federally (Option 3A(1) or by industry (Option 3A(2))

Alternative 3 – Federal Observer Monitoring Program (cont.)

- Federal observers track/sample salmon and groundfish species at plants
- Plant sampling funded Federally (Option 3B(1) or by the States (Option 3B(2) or by industry (Option 3B(3))
- Federal enforcement staff track overage/donation fish
- Generates greatest amount of fisheries data
- Estimated cost is $690,000

Alternative 4 – Combination Monitoring Program

- Full retention and monitoring requirements specified in Federal regulation
- Electronic monitoring on 100% of shore-based whiting trips
- At sea monitoring funded Federally (Option 4A(1) or by industry (Option 4A(2))

Alternative 4 – Combination Monitoring Program (cont.)

- Federal observers/state samplers track/sample salmon and groundfish species at plants
- Plant sampling funded Federally (Option 4B(1) or by the States (Option 4B(2) or by industry (Option 4B(3))
- Federal/State enforcement staff track overage/donation fish
- Generates more fisheries data than Alternatives 1 and 2 but less than 3
- Estimated cost is $380,000

Exhibit C.7.c
Supplemental EC Report
June 2004

ENFORCEMENT CONSULTANTS REPORT ON MONITORING PROGRAM ALTERNATIVES FOR THE SHORE-BASED PACIFIC WHITING FISHERY

The Enforcement Consultants (EC) have been briefed by NMFS personnel relative to the monitoring program alternatives for the shore-based Pacific whiting fishery. The EC believes alternatives that do not provide for a state/federal enforcement partnership would be detrimental to fully utilizing available enforcement resources. The states have historically participated in investigations involving violations related to this fishery. The EC would like to be involved in the development of related regulations. Industry needs to recognize that the parameters under which the current test is being conducted may change once the program has been fully evaluated.

PFMC
06/17/04

Exhibit C.7.c
Supplemental GAP Report
June 2004

GROUNDFISH ADVISORY SUBPANEL STATEMENT ON MONITORING PROGRAM ALTERNATIVES FOR THE SHORE-BASED PACIFIC WHITING FISHERY

The Groundfish Advisory Subpanel (GAP) met with staff from the NMFS Northwest Region to discuss options on monitoring programs for the Pacific whiting fishery.

The GAP concentrated its attention on Table 2.6.1 in Exhibit C.7.a Attachment 1, the Preliminary Draft Environmental Assessment (PDEA). While the GAP generally agrees that the PDEA covers the range of alternatives, it suggests that the Council include two sets of sub-options which will more fully encompass the alternatives.

Under Alternative 3, in the category of “Tracking Disposition of Overage/Donation Fish,” the GAP recommends two sub-options. The first would consist of the current option, having federal personnel track overages. The second would mirror the option in Alternative 4, which would have state personnel track overages. Regardless of who is responsible for overall monitoring, the GAP notes that state enforcement personnel currently track overages and would likely do so in the future. Overages are usually handled under state fish and wildlife laws and regulations and that well known and accepted process should continue, especially since state landing fee laws are applied to landings of overages.

Under both Alternative 3 and Alternative 4, in the category of “Sampling Prohibited and Overfished Species,” the GAP recommends additional sub-options which we would label “3B(4)” and “4B(4).” Under these sub-options, funding would be shared by the federal government, the states, and the whiting industry, rather than placing the entire financial burden on a single entity. Members of the whiting industry indicated a willingness to share in funding as partners with the states and the federal government, and this possibility should be let open.

Finally, the GAP recommends the Council not rush to judgement on this program by picking a preferred alternative in September. The GAP notes that the shore-based whiting fishery has just begun using video monitors in the current whiting season. We should allow some time to fully examine the successes and failures of the video monitoring effort before pushing ahead with a preferred alternative. Our goal is not to delay the program, but rather to ensure that the best, most cost-effective monitoring program can be developed and put in place.

PFMC
06/17/04

Exhibit C.8
Situation Summary
June 2004

COUNCIL CLARIFICATION OF TENTATIVELY ADOPTED 2005-2006 MANAGEMENT MEASURES (***IF NECESSARY***)

Situation: This agenda item provides the chance for the GAP and GMT to present initial analysis of the 2005 and 2006 management measures tentatively adopted under agendum C.6 and receive further clarification, guidance and direction from the Council. This guidance will be used to refine recommendations and analyses the Council may need to make final decisions on 2005 and 2006 management measures under agendum C.10.

Council Action:

> **Provide guidance and direction for analysis of proposed 2005-06 management measure alternatives.**

Reference Materials:

None.

Agenda Order:

a. Agendum Overview — John DeVore
b. Reports and Comments of Advisory Bodies
c. Public Comment
d. Council Guidance and Direction

PFMC
05/24/04

Exhibit C.8.b
Supplemental EC Report
June 2004

ENFORCEMENT CONSULTANTS STATEMENT ON COUNCIL CLARIFICATION OF TENTATIVELY ADOPTED 2005/2006 MANAGEMENT MEASURES

The Enforcement Consultants (EC) is concerned over the increased complexities being proposed in the California recreational fishery's depth management options. In particular, "slotted" open areas based on waypoints in the *Federal Register* such as the 30 fm to 60 fm and 20 fm to 40 fm proposals will be difficult for the private skiff fleet to comply with and will, therefore, be burdensome for enforcement. The EC believes the more complex the management strategies to increase fishing time on the water; the more the skiff fleet will be unable to comply with these complicated regulations. The EC is very concerned about turning otherwise honest, well-intentioned sport fishers into "violators" with the implementation of these management strategies. Keeping regulations as simple as possible is in the best interest of both the sport fishers and in the enforcement of those regulations.

The EC recommends depth restrictions be from shoreward and constant throughout the season.

PFMC
06/17/04

Exhibit C.8.b
Supplemental GMT Report
June 2004

GROUNDFISH MANAGEMENT TEAM (GMT) REPORT ON 2005-06 MANAGEMENT MEASURES

The GMT does not have any questions or need for clarification on the Council guidance provided under agenda item C.6. The GMT will have a final statement prepared for C.10. which will be all-inclusive with regard to Council action. The GMT analyzed the limited entry trawl options and discussed the following issues, and makes these recommendations:

LIMITED ENTRY TRAWL

Management Options

The GMT adjusted the trawl model for 2005 and 2006 predictions based on adjustments made for inseason management in June 2004, and a slight adjustment that predicts higher period 1 participation in 2005 compared to 2004. Inseason adjustments were based on model performance compared to QSM data through April. The additional period 1 participation adjustment is based on the notion that fewer trawl vessels would participate in the Dungeness crab fisheries in 2005 and 2006 as compared to this year. This year's crab fishery was exceptional, and more trawl vessels may have been participating in the crab fishery in period 1 compared to past years. These adjustments to 2005 and 2006 resulted in a higher degree of predicted catch which required some downward adjustments to trip limits to stay within the OYs on some target species.

The results of the model adjustments for Tables 1 and 2 are contained in Attachment 1. Model results include lower petrale limits in Table 2 as compared to Table 1, and what was modeled previously. The GMT continues to recommend the option in Table 1.

Estimated Impacts

The estimated impacts on overfished species and the amounts of target species that are expected to be harvested are also contained in Attachment 1. Specifically, canary rockfish impacts are estimated to be 5.2 mt for Option 1 and 4.9 mt for Option 2. The GMT's primary concern relative to canary rockfish is to provide its best estimate of impacts to ensure that the canary OY is not exceeded and that rebuilding projections are not jeopardized.

There are several factors which may contribute to uncertainty in the bycatch model. These include:

- The bycatch rates from the SFFT gear were produced under an EFP when participating fishers were adhering to bycatch caps and had 100% observer coverage. While the GMT and SSC believes these rates are appropriate to use, there may be changes in fishing behavior associated with removing these regulatory provisions which are difficult to predict.

- The GMT adjusted the bycatch rates in the winter periods when the EFP was not conducted based on assuming that the seasonal differential demonstrated in the FRAM rates would also apply to the SFFT gear.

- The bycatch model is estimating an amount of participation with SFFT gear for different periods and with different levels of success relative to achieving trip limits which is based on historic participation by individual permit holders. It is difficult to predict how many and which specific individuals will convert to SFFT gear.

An additional consideration is that FRAM observer data with bycatch rates from fishers using SFFT gear will not be available until November 2005 (for July 2004-June 2005) and November 2006 (for July 2005-June 2006). Given these uncertainties, the GMT does not believe that 6.0 mt would be a sufficient estimate. The GMT cannot come up with a quantitative amount, but believes an appropriate range for consideration would be 6.0 mt-9.2 mt, which is the current amount specified for 2004.

GENERAL RECREATIONAL

The GMT recommends that state recreational regulations be designated as routine management measures in the federal regulations to allow adoption of federal conforming regulations as inseason actions.

OREGON RECREATIONAL

Inseason Management Response

If the recreational harvest guideline for canary, yelloweye, or lingcod specified for the Washington/Oregon area is projected to be exceeded, the Oregon Department of Fish and Wildlife will consult with the Washington Department of Fish and Wildlife, and may take action inseason to close all or portions of the recreational fishery deeper than 20 or 30 fms, or adjust seasons, bag limits, or size limits, as needed. For purposes of consistency and clarification, the action taken by the Oregon Department of Fish and Wildlife would be specified in federal regulations.

CALIFORNIA RECREATIONAL ISSUES

Management Options

The GMT has yet to have a thorough review of the California Department of Fish and Game recreational options and the resulting impacts. However, the GMT notes that Options 5 and 5a (copies attached) both include large closed periods (Jan-June in most areas) and recommends that California analyze options that include opening in June and closing in July. This would allow fishery managers to assess impacts to overfished species inseason and consider adjustments, if needed, before reopening the fishery in August.

The GMT has not discussed such issues as a lingcod minimum size limit, the shore-based and diver exemptions, and the option for differential bag limits between CPFV and other recreational fishing modes. The GMT has discussed the following issues and has these recommendations:

Retention of Other Flatfish with Sanddab Gear

There is a request to allow the retention of other flatfish by fishers targeting sanddabs with approved gear. The GMT notes that the small hook size provisions in place were expected to result in an almost exclusive fishery for sanddabs. Providing for the retention of all other flatfish would increase the incentive to target those species and could result in unforeseen bycatch issues. The GMT notes that bycatch in the current fishery is very minimal, and therefore questions the need to provide for it. However, if the Council does wish to accommodate bycatch in this fishery, the GMT recommends allowing only a minor bycatch of other flatfish (1 or 2 fish) in conjunction with sanddab catches.

Waypoints for Cordell Bank

The closure around Cordell Bank is currently a five nm radius around a central point. The GMT recommends that the closed area be defined by coordinates which approximate the 100-fm depth contour around the area. These coordinates have been provided to NMFS.

Ridgeback Prawn Exemption

There is a request to have a ridgeback prawn trawl exemption to the trawl RCA when the shallow boundary is at 75-fms. The GMT recommends that this exemption not go forward at this time. We understand that a bycatch study on this fishery is currently underway and data may be available inseason in 2005 or 2006. After the data become available, the GMT will review the data to assess whether the bycatch in this fishery is at a level that can be accommodated. It is our understanding that implementation of this exemption in 2005 or 2006 may require an EA tiered from the 2005-06 EIS.

UPDATED BYCATCH SCORECARDS

The GMT will have updated bycatch scorecards under agenda item C.10. The GMT did update the canary rockfish portion of the scorecard using the recreational harvest guidelines in place of estimated impacts. The GMT has calculated the canary rockfish OY and the residual amount with different estimated impacts for the limited entry trawl fishery, as well as the commercial/ recreational catch sharing. The GMT recommends a placeholder for the 2006 EFP set asides in the bycatch scorecard at the same EFP subtotal for 2005 (2.5 mt). The resulting canary OYs with the different trawl impacts and the commercial/recreational catch sharing is as follows:

	2005			**2006**		
LE Trawl	OY	Comm	Rec	OY	Comm	Rec
6.0 mt	46.0 mt	57.9%	42.1%	48.2	58.9%	41.1%
9.2 mt	47.2 mt	60.8%	39.2%	49.3	61.7%	38.3%

GMT Recommendations:

1. Approve the limited entry trawl option contained in Attachment 1, Table 1.
2. Approve an estimate of canary rockfish impacts for the bycatch scorecard for 2005 and 2006 in the 6.0-9.2 mt range to accommodate uncertainties in the GMT bycatch model.
3. Approve the GMT recommended language regarding the designation of state recreational regulations as routine management measures in the federal regulations.
4. Approve the language regarding Oregon's recreational inseason management response.
5. Direct the GMT to analyze California recreational options which include openings in June (where currently closed in Options 5 and 5a) with closures in July (where currently open in

Options 5 and 5a).

6. If the retention of other flatfish in the sanddab fishery is approved, then include a sublimit to ensure that catch remains incidental to sanddabs (1-2 fish).
7. Approve the use of waypoints to define the closed area around Cordell Bank approximating the 100-fm depth contour.
8. Approve the GMT recommendation of a placeholder for the 2006 EFP set asides in the bycatch scorecard at the same EFP subtotal for 2005 (2.5 mt).

Attachment 1 Table 1. Different North / South Limits and 4 periods with 100 fathom inline

ESTIMATED MORTALITY

		North	South	Total
Rebuilding Species	Lingcod	94.2	30.0	124.2
	Canary	4.6	0.6	5.2
	POP	88.2	0.0	88.2
	Darkblotch	63.0	13.0	76.0
	Widow	1.8	0.1	1.9
	Bocaccio	0.0	51.2	51.2
	Y'eye	0.3	0.1	0.4
	Cowcod	0.0	0.5	0.5
Target Species	Sablefish	2,620	762	3,382
	Longspine	558	296	854
	Shortspine	610	284	894
	Dover	5,241	2,120	7,361
	Arrowtooth	2,504	210	2,714
	Petrale	2,398	263	2,661
	Other Flat & Eng. Sole	4,551	1,473	6,023
	Slope Rock	203	400	603

TRIP LIMITS AND RCA BOUDARIES

		RCA Boundaries									
SUBAREA	Period	INLINE	OUTLINE	Sablefish	Longspine	Shortspine	Dover	Other Flat & Eng.	Petrale	Arrowt'th	Slope Rock
N 40 10	1	75	150	9,500	15,000	3,500	69,000	110,000	No Limit	No Limit	8,000
	2	100	150	9,500	15,000	3,500	69,000	110,000	42,000	150,000	8,000
	3	100	150	17,000	23,000	4,900	30,000	110,000	42,000	150,000	8,000
	4	100	150	17,000	23,000	4,900	30,000	110,000	42,000	150,000	8,000
	5	100	150	17,000	23,000	4,900	30,000	110,000	42,000	150,000	8,000
	6	75	150	8,000	15,000	3,500	69,000	110,000	No Limit	No Limit	8,000
North Select Gear Limit	1	75	150	1,500	1,000	1,000	20,000	100,000	25,000	70,000	8,000
	2	100	150	10,000	1,000	1,000	35,000	100,000	35,000	70,000	8,000
	3	100	150	10,000	1,000	3,000	50,000	100,000	35,000	70,000	8,000
	4	100	150	10,000	1,000	3,000	50,000	100,000	35,000	70,000	8,000
	5	100	150	10,000	1,000	3,000	50,000	100,000	35,000	70,000	8,000
	6	75	150	1,500	1,000	1,000	20,000	100,000	25,000	70,000	8,000
38 - 40 10	1	75	150	14,000	19,000	4,200	50,000	110,000	No Limit	No Limit	40,000
	2	100	150	14,000	19,000	4,200	50,000	110,000	42,000	10,000	40,000
	3	100	150	14,000	19,000	4,200	50,000	110,000	42,000	10,000	40,000
	4	100	150	14,000	19,000	4,200	50,000	110,000	42,000	10,000	40,000
	5	100	150	14,000	19,000	4,200	50,000	110,000	42,000	10,000	40,000
	6	75	150	14,000	19,000	4,200	50,000	110,000	No Limit	No Limit	40,000
S. 38	1	75	150	14,000	19,000	4,200	50,000	110,000	No Limit	No Limit	40,000
	2	100	150	14,000	19,000	4,200	50,000	110,000	42,000	10,000	40,000
	3	100	150	14,000	19,000	4,200	50,000	110,000	42,000	10,000	40,000
	4	100	150	14,000	19,000	4,200	50,000	110,000	42,000	10,000	40,000
	5	100	150	14,000	19,000	4,200	50,000	110,000	42,000	10,000	40,000
	6	75	150	14,000	19,000	4,200	50,000	110,000	No Limit	No Limit	40,000

Attachment 1 Table 2. Equal North / South Limits and 3 periods with 100 fathom inline

ESTIMATED MORTALITY

		North	South	Total
Rebuilding Species	Lingcod	100.0	28.9	128.9
	Canary	4.3	0.6	4.9
	POP	87.5	0.0	87.5
	Darkblotch	61.3	12.6	73.9
	Widow	1.7	0.1	1.8
	Bocaccio	0.0	47.2	47.2
	Y'eye	0.3	0.1	0.4
	Cowcod	0.0	0.4	0.4
Target Species	Sablefish	2,744	744	3,487
	Longspine	577	296	873
	Shortspine	603	284	888
	Dover	5,226	1,991	7,217
	Arrowtooth	2,496	209	2,705
	Petrale	2,336	254	2,590
	Other Flat & Eng. Sole	4,517	1,462	5,979
	Slope Rock	203	400	603

LIMITS AND RCA BOUDARIES

		RCA Boundaries									
SUBAREA	Period	INLINE	OUTLINE	Sablefish	Longspine	Shortspine	Dover	Other Flat & Eng.	Petrale	Arrowt'th	Slope Rock
N 40 10	1	75	150	14,000	19,000	4,200	47,000	110,000	No Limit	No Limit	8,000
	2	100	150	14,000	19,000	4,200	47,000	110,000	30,000	150,000	8,000
	3	100	150	14,000	19,000	4,200	47,000	110,000	30,000	150,000	8,000
	4	75	150	14,000	19,000	4,200	47,000	110,000	30,000	150,000	8,000
	5	100	150	14,000	19,000	4,200	47,000	110,000	30,000	150,000	8,000
	6	75	150	14,000	19,000	4,200	47,000	110,000	No Limit	No Limit	8,000
North Select Gear Limit	1	75	150	1,500	1,000	1,000	20,000	100,000	30,000	70,000	8,000
	2	100	150	10,000	1,000	1,000	50,000	100,000	30,000	70,000	8,000
	3	100	150	10,000	1,000	3,000	50,000	100,000	30,000	70,000	8,000
	4	75	150	10,000	1,000	3,000	50,000	100,000	30,000	70,000	8,000
	5	100	150	10,000	1,000	3,000	50,000	100,000	30,000	70,000	8,000
	6	75	150	1,500	1,000	1,000	20,000	100,000	30,000	70,000	8,000
38 - 40 10	1	75	150	14,000	19,000	4,200	47,000	110,000	No Limit	No Limit	40,000
	2	100	150	14,000	19,000	4,200	47,000	110,000	30,000	10,000	40,000
	3	100	150	14,000	19,000	4,200	47,000	110,000	30,000	10,000	40,000
	4	75	150	14,000	19,000	4,200	47,000	110,000	30,000	10,000	40,000
	5	100	150	14,000	19,000	4,200	47,000	110,000	30,000	10,000	40,000
	6	75	150	14,000	19,000	4,200	47,000	110,000	No Limit	No Limit	40,000
S. 38	1	75	150	14,000	19,000	4,200	47,000	110,000	No Limit	No Limit	40,000
	2	100	150	14,000	19,000	4,200	47,000	110,000	30,000	10,000	40,000
	3	100	150	14,000	19,000	4,200	47,000	110,000	30,000	10,000	40,000
	4	75	150	14,000	19,000	4,200	47,000	110,000	30,000	10,000	40,000
	5	100	150	14,000	19,000	4,200	47,000	110,000	30,000	10,000	40,000
	6	75	150	14,000	19,000	4,200	47,000	110,000	No Limit	No Limit	40,000

California Recreational Season and Depth Options
Draft for GMT Meeting at June Council Meeting
Option 5 & 5a, Version 6/17/04 1300

Includes no diver based or shore fishing exemption or shore take during 20-40 or 30-60 fm rockfish closures

California Recreational Season and Depth Options
Draft for PFMC June GMT Meeting

Option 5	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
North							<40	<40	<40	<40		
N-Central							<20	<20	<20	<20	<30	
S-Central North							<20	<20	<20	<20	<30	
S-Central South					20-40	20-40	20-40	20-40	20-40			
South				30-60	30-60	30-60	<40	<40	<40	<40		
South Scorpionfish			30-60	30-60						<40	<40	

Region	BLK	MNR^2	CAN	LNG	BOC
North	87.2		0.5	34.4	0.0
N-Central	44.1	200.6	4.6	179.2	0.0
S-Central N	33.1	150.5	2.0	85.5	0.1
S-Central S	11.0	50.2	1.0	7.5	0.2
South	0.0	69.6	0.3	42.1	32.0
Total	175.5	470.8	8.5	348.6	32.3
HG/HT	**184**	**471**	**9.3**	**422**	**77.0**
Difference	-5%	0%	-9%	-17%	-58%

Option 5a	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
North							<40	<40	<40	<40		
Central							<20	<20	<20	<20	<30	
South				30-60	30-60	30-60	<40	<40	<40	<40		
South Scorpionfish			30-60	30-60						<40	<40	

Region	BLK	MNR^2	CAN	LNG	BOC
North	87.2		0.5	34.4	0.0
Central	88.1	400.5	8.6	264.3	0.4
South	0.0	69.6	0.3	42.1	32.0
Total	175.4	470.1	9.4	340.8	32.4
HG/HT^1	**184**	**471**	**9.3**	**422**	**77.0**
Difference	-5%	0%	1%	-19%	-58%

incorrect and still
being calculated

per
MKR

Exhibit C.9
Situation Summary
June 2004

UPDATE ON TRAWL INDIVIDUAL QUOTA (TIQ) PROGRAM

Situation: At the November 2003 Council meeting, the Council voted unanimously to move forward with consideration of a dedicated access privilege program of individual quotas for the groundfish trawl fishery, via preparation of an EIS. Written updates on progress were presented at the March and April 2004 Council meetings. The following events, occurring since the April Council meeting, reflect progress since then.

May 4	TIQ Oversight Committee agreed to plans for expenditure of funds and the process, through the step in which the Council specifies an initial set of options for preliminary analysis.
May 7	The Advisory Committee for the California Groundfish Fishery Disaster Relief Program made funding the Council IFQ process its first priority for surplus funds.
May 21	Council Chairman, Don Hansen, appointed panel of independent experts as an unpaid review body (Exhibit C.9.a, Attachment 1).
May 24	Notice of intent to produce an EIS was published in the Federal Register (provided as part of the scoping document).
May 25-26	TIQ Enforcement Group met to scope enforcement issues.
June 8-9	TIQ Analytical Team met with independent experts panel and contractors to scope analytical tasks.
June 13	Scoping hearing held in Foster City California.

The formal public comment period of the scoping process is scheduled to end August 2. Two additional scoping hearings are proposed.

Possible hearing schedule and locations, for Council consideration:	
Tuesday July 20, 2004	Seattle, Washington
Tuesday July 27, 2004	Newport, Oregon

Several additional steps will occur preparatory to the next Council decision, whether or not to continue the process and specify initial options for comprehensive analysis. The TIQ Analytical Team is scheduled to meet again July 1 and 2 to develop an approach for analysis that can be developed while the scoping process is completed. Following completion of the scoping process the independent experts panel will meet to review the results of the scoping process. Then, the scoping results, panels comments, and analysis will be given to the TIQ Committee for review and development of comments for the Council. The TIQ Enforcement Group will meet to review scoping comments and develop options for the Council and the groundfish Allocation Committee will meet to evaluate the scope of the between sector allocation tasks that may be entailed in this project. When these activities are completed, a summary of public comment together with reports from the TIQ Committee, TIQ Analytical Team, TIQ Enforcement Group, the TIQ Independent Experts Panel and the Allocation Committee will be presented to the Council for review, determination of whether or not to move forward, and specification of initial options for intensive analysis.

A draft public scoping document is provided for Council review and approval (Exhibit C.9.a, Attachment 2).

Council Action:

1. **Provide Guidance on Next Steps in the Process and Approve Scoping Documents for Public Distribution.**

Reference Materials:

1. Exhibit C.9.a, Attachment 1: Membership on the Ad Hoc Groundfish Trawl IQ Independent Experts Panel.
2. Exhibit C.9.a, Attachment 2: Draft Public Scoping Document: Dedicated Access Privileges for the Pacific Coast Limited Entry Trawl Groundfish Fishery.
3. Exhibit C.9.c, Public Comment.

Agenda Order:

a.	Agendum Overview	Jim Seger
b.	Reports and Comments of Advisory Bodies	
c.	Public Comment	
d.	**Council Action:** Provide Guidance on Further Development and Approve Scoping Documents for Public Distribution	

PFMC
06/01/04

Exhibit C.9.a
Attachment 1
June 2004

MEMBERSHIP OF THE AD HOC GROUNDFISH TRAWL INDEPENDENT EXPERTS PANEL

Mr. Christopher M. Dewees
Dr. Robert Francis
Dr. Susan Hanna
Dr. Dan Huppert
Dr. Gilbert Sylvia

PFMC
06/01/04

Exhibit C.9.a
Attachment 2
June 2004

Public Scoping Document:
Dedicated Access Privileges for the Pacific Coast Limited Entry Trawl Groundfish Fishery

List of Tables

Terminology and Acronyms

Buyer/Processor - All references to buyers or processors are references to the first receiver of a vessel’s catch.

DAP - Dedicated Access Privileges - (A form of output control whereby an individual fisherman, community, or other entity is granted the privilege to catch a specified portion of the total allowable catch)

ICA - Incidental Catch Allowance (an amount of catch available to a harvesting sector to cover incidental catch, not allocated individually)

IQ - Individual Quota (IQ for fishing or processing)

- IBQ - Individual Bycatch Quota (IQ for fishing, must be held for the catch certain species for which discard is <u>required</u>–prohibited species)
- IFQ - Individual Fishing Quota (IQ for fishing, must be held for catch, catch may be retained or discarded at the fisher discretion but once caught it counts against the IFQ regardless of its final disposition)
- IPQ - Individual Processing Quota (IQ for processing)

- QS - Quotas Shares (IQ held as percent of total quota allocated to an individual)
- Quota Pounds - Annual Individual Quota (IQ held as pounds allocated annually based on the quota share held)

1.0 INTRODUCTION

1.1 The Scoping Process and Organization of this Document

Overview

Scoping is an early and open public process conducted in compliance with the National Environmental Policy Act (NEPA). Two types of comment are sought during the scoping process:

- Alternatives that should be considered.
- Impacts of the alternatives that should be covered in the environmental analysis.

The policy that is the subject of this scoping process is the possible creation of a dedicated access privilege system for the Pacific Coast groundfish limited entry trawl fishery to address problems, goals and objectives identified in Section 1.2. Dedicated access privileges (DAP) are a "form of output control whereby an individual fisherman, community, or other entity is granted the privilege to catch a specified portion of the total allowable catch." One type of dedicated access privilege with which may people are familiar with is individual fishing quotas (IFQs). The primary type of dedicated access privilege proposed thus far is IFQs.

This public scoping period will run through August 2, 2004.

You may submit comments, on issues and alternatives, by any of the following methods:

- E-mail: TrawlAccessEIS.nwr@noaa.gov. Enter "Scoping Comments" in the subject line of the message.
- Fax: 503-820-2299.
- Mail: Dr. Donald McIsaac, Pacific Fishery Management Council, 7700 NE Ambassador Pl., Suite 200, Portland, OR, 97220.

A hearing was held June 13, 2004 in Foster City, California.
Two additional hearings will be held in the latter half of July:
July 20, in Seattle??, Washington
July 27, in Newport??, Oregon

Type of Environmental Analysis

There are generally two types of environmental analysis conducted pursuant to NEPA: an environmental assessment and an environmental impact statement (EIS). An EIS is conducted when a determination is made that an action has a reasonable probability of having significant environmental impacts. Criteria for significance under NEPA are provided in Appendix B. For the dedicated access privilege proposal a determination has been made that there is a reasonable likelihood of significance, therefore, environmental impact statements will be developed.

Two Decision Stages

The Council will need to deal with two main issues, if a dedicated access privilege program is to be recommended and implemented: first is the design of the program, second is the establishment of allocations of groundfish between the limited entry trawl and other groundfish fisheries. These two issues will be dealt with in separate but related EISs.

This scoping process is intended to address program design issues that will be covered in the DAP EIS. There will be a separate scoping process to address the between sector allocation EIS. While the DAP EIS is not intended to support the between sector allocation decision, the program design issues addressed in the DAP EIS will help determine the species for which the allocations must be made. One of the key decisions before the Council will be which species would be managed under dedicated access privileges and which species might be managed through other types of regulations. Those managed through other types of regulations may not need be the subject of a between sector allocation decision in the second EIS.

Public scoping for an EIS on the between allocation issue is scheduled to begin after a decision has been made on alternatives to be considered in the draft DAP EIS. While alternative DAP programs are being designed, the Council's allocation committee will engage in some initial discussions on the need for intersector allocations to support a DAP program. Preliminary comments on the between sector allocation issue may be sent to the Council office or e-mailed to pfmc.comments@noaa.gov (enter "Intersector Groundfish Allocation" in the subject line).

Organization of This Document

Dedicated access privileges are being proposed to address the problem statement, goals, and objectives presented in Section 1.2. Comment is sought both on other types of management programs that should be considered to address the issues identified in Section 1.2 and the specific design elements for a possible IFQ program. Alternatives currently being considered are provided in Section 2.0 and those detailed design elements thus far identified for an IFQ program are provided in Appendix A. The potential design elements provided in Appendix A are based on the initial recommendations from the Council's Ad Hoc Trawl Individual Quota Committee (Appendix D). The work done by the TIQC is expected to stimulate and focus public comment on central issues for consideration by the Council.

Documentation of the Scoping Results

Comments pertaining to alternatives and impacts will be recorded, summarized and presented to the Council for consideration when it makes its decision on the alternatives to use if it proceeds to with the drafting of a DAP EIS. With respect to specific design elements for an IFQ program, public comments and recommendations will summarized and presented to the Council in Appendix A along with those recommendations developed by other Council committees and, in particular, the recommendations of the TIQC.

1.2 Purpose and Need for the Proposed Action

1.2.1 The Proposed Action

The proposed alternatives to the status quo are programs that provide dedicated access privileges for participants in the non-tribal Pacific Coast groundfish trawl fishery. The main dedicated access privilege alternative the Pacific Council is considering is an individual fishing quota (IFQ) program for the Pacific Coast groundfish limited entry trawl fishery off Washington, Oregon, and California. A trawl IFQ program would change management of harvest in the trawl fishery from a trip limit system with cumulative trip limits for every two-month period to a quota system where each quota share could be harvested at any time during an open season. Status quo (no action) will also be considered along with dedicated access privilege and other reasonable alternatives that may be proposed to address issues identified in the problem statement.

1.2.2 Statement of Need

Despite the recently completed buyback program, management of the West Coast groundfish trawl fishery is still marked by serious biological, social, and economic concerns; and discord between fishermen and managers and between different sectors of the fishery, similar to those cited in the U.S. Commission on Ocean Policy's April 2004 preliminary report. The trawl fishery is viewed as economically unsustainable given the current status of the stocks and the various measures to protect these stocks. One major source of discord and concern stems from the management of bycatch, particularly of overfished species as described in the draft programmatic bycatch DEIS. The notice of availability of the DEIS was published in the *Federal Register* on February 27, 2004 (69 FR 9314). The DEIS is available from the Pacific Council office ((see ADDRESSES). After reviewing the draft programmatic bycatch DEIS the Pacific Council adopted a preferred alternative for addressing bycatch that included IFQ programs. The alternatives to status quo to be evaluated in the dedicated access EIS are amendments to the FMP and associated regulations to address these concerns through the use of dedicated access privileges. The concerns are described in more detail in the following problem statement.

As a result of bycatch problems, considerable harvest opportunity is being forgone in an economically stressed fishery. The trawl groundfish fishery is a multispecies fishery in which fishers exert varying and limited control of the mix of species in their catch. The optimum yields (OYs) for many overfished species have been set at low levels that place a major constraint on the industry's ability to fully harvest the available OYs of the more abundant target species that occur with the overfished species, wasting economic opportunity. Average discard rates for the fleet are applied to projected bycatch of overfished species. These discard rates determine the degree to which managers must constrain the harvest of targeted species that co-occur with overfished species. These discard rates are developed over a long period of time and do not rapidly respond to changes in fishing behavior by individual vessels or for the fleet as a whole. Under this system, there is little direct incentive for individual vessels to do everything possible to avoid take of species for which there are conservation concerns, such as overfished species. In an economically stressed environment, uncertainties about average bycatch rates become highly controversial. As a consequence, members of fishing fleets tend to place pressure on managers to be less conservative in their estimates of bycatch. Thus, in the current system there are uncertainties about the appropriate bycatch estimation factors, few incentives for the individual to reduce bycatch rates, and an associated loss of economic opportunity related to the harvest of target species.

The current management regime is not responsive to the wide variety of fishing business strategies and operational concerns. For example, historically the Pacific Council has tried to maintain a year-round groundfish fishery. Such a pattern works well for some business strategies in the industry, but there has been substantial comment from fishers who would prefer being able to pursue a more seasonal groundfish fishing strategy. The current management system does not have the flexibility to accommodate these disparate interests. Nor does it have the sophistication, information, and ability to make timely responses necessary to react to changes in market, weather, and harvest conditions that occur during the fishing year. The ability to react to changing conditions is key to conducting an efficient fishery in a manner that is safe for the participants.

Fishery stock depletion and economic deterioration of the fishery are concerns for fishing communities. Communities have a vital interest in the short-term and long-term economic viability of the industry, the income and employment opportunities it provides, and the safety of participants in the fishery.

In summary, management of the fishery is challenged with the competing goals of: controlling bycatch, taking advantage of the available allowable harvests of more abundant stocks (including conducting safe and efficient harvest activities in a manner that optimizes net benefits over the short-term and long-term), increasing management efficiency, and responding to community interest.

1.2.3 Purpose of the Proposed Action

The purpose of the proposed action is to resolve or ameliorate problems in the fishery related to the current access system by addressing the following goals and objectives.

Goals

1. Provide for a well managed system for protection and conservation of groundfish resources.
2. Provide for a viable and efficient groundfish industry.
3. Increase net benefits that arise from the fishery.
4. Provide for a fair and equitable distribution of fishery benefits.
5. Provide for a safe fishery.
6. Capacity rationalization through market forces.

Objectives

1. Takes into account structure of the stocks.
2. Minimize ecological impacts while taking the available harvest.
3. Reduce bycatch and discard.
4. Encourage sustainable fishing practices.
5. Account for total groundfish mortality.
6. Promote individual accountability - responsibility for landed catch and bycatch.
7. Avoid provisions where the primary intent is a change in marketing power balance between harvesting and processing sectors
8. Avoid excessive quota concentration.
9. Provide certainty/stability for economic planning.
10. Provide operational flexibility.
11. Minimize adverse effects on fishing communities to the extent practical.

12. Promote economic and employment benefits through the seafood catching, processing and distribution elements of the industry.
13. Provide efficient and effective monitoring and enforcement.
14. Design a responsive review and modification mechanism.

Design features of the IFQ alternative should be related to these objectives (NRC, 1999, pg 197).

In considering modification to the current rules for access to the fishery and harvest from the fishery, the goals and objectives for the groundfish fishery management plan and the MS Act national standards will be considered (Appendix C).

1.3 Background

Council consideration of limited entry programs, such as license limitation and IFQs, has been in response to significant over capacity problems in the harvesting sector of the groundfish fishery. IFQ programs have been under Council discussion since before the 1987 inception of the limited entry committee that designed the West Coast groundfish license limitation program. When the Council adopted the groundfish license limitation program in 1991, it acknowledged that additional capacity control measures would be required. It was anticipated that the license limitation program would limit the growth of harvesting capacity but would not resolve the overcapacity problem. The Council's first effort to develop an IQ program was for the fixed gear sablefish fishery. This effort was cut short in 1996 by a Congressional moratorium on new IQ programs. The groundfish fishery was declared a disaster in the year 2000. The groundfish strategic plan, adopted in October 2000, listed reduction of harvesting capacity as one of its main goals. Given the moratorium on IQs, the plan included a trawl vessel buyback program as a short to intermediate term objective, and a trawl IQ or mandatory permit stacking program[1/] as an intermediate to long-term objective. IQs for trawlers have been on the Council's workload list since just after the October 2000 adoption of the strategic plan. In June 2001, the Council created an Ad Hoc Trawl Permit Stacking Work Group. That group met February 26, 2002, but then activity was suspended while the permit buyback program was developed and other Council workload priorities were addressed. The moratorium on IQ programs expired October 1, 2002, and the buyback program was completed in December of 2003.

The Pacific Groundfish Limited Entry Trawl Buyback Program was designed with the following goals:

- Reduce capacity in the groundfish fishery
- Increase the remaining harvesters' productivity
- Financially stabilize the fishery
- Conserve and manage groundfish

1/ Mandatory permit stacking reduces capacity in the fishery by requiring permit holders to acquire an additional permit to continue fishing.

On December 4, 2003, under the buyback program, 91 trawl vessels and their Pacific Groundfish limited entry trawl permits were permanently retired from the fishery. The buyback program reduced the available pool of limited entry permits for vessels that deliver to shore plants and motherships from 263 permits to 172 permits, excluding the ten permits associated with the catcher-processor fleet. In terms of 2002 groundfish ex-vessel revenues, buyback program vessels accounted for 40 percent of the $32 million landed by all groundfish trawlers, either on shore or delivered to non-tribal motherships. The buyback program was funded by a $10 million appropriation and a $36 million buyback loan (approved in an industry referendum). This loan will be paid back by members of the participating fleets through landings fees to be paid over the course of 30 years.

A major concern after completion of the buyback program was that relatively unused permits (latent permits) would be acquired by those who sold their permit under the program and would then be used at higher levels of effort. The Council decided not to take action to address concerns about permit latency. In reaching its decision the Council noted the degree of permit latency in the Pacific Coast program was not as substantial as in other limited entry systems that had been subject to buyback programs. The Council found no need to take remedial action given the relatively low degree of long term latency represented by currently unfished permits and the low level of concern among those bearing the responsibility for repaying the industry loan that largely funded the buyback program. Further, it was stated that moving forward with the IFQ project was a better solution to the issues of overcapacity in the fleet. Such an IFQ program would obviate the need to address any remaining concerns with latent permit issues.

At its September 2003 meeting, the Council chair was authorized to appoint the TIQC. This committee met October 28 and 29 and began developing an IFQ alternative for consideration. At its November 2003, meeting the Council heard testimony that individual quotas (IQs) have been identified as a management tool that could potentially do more than any other management tool to permanently resolve various problems in the trawl fishery, including bycatch and other conservation concerns, safety, and industry economic viability. The Council concurred and acted to:

- Recommend November 6, 2003 be published as a control date for IFQ and individual processing quota (IPQ) programs (Appendix E).
- Identify that additional resources would be required for consideration of a trawl IQ program.
- Task the staff with preparing a detailed draft plan for IQ program development, identifying the necessary budget, and pursing funding options.

NMFS did not publish the IPQ control date, because of restrictions on consideration of individual processing quota programs. Another meeting of the TIQC was held on March 18-19, 2004 to continue with initial scoping options for an IFQ alternative. A notice of intent to develop an EIS and formally initiate scoping was published in the *Federal Register* on May 24, 2004 (Appendix F). A trawl individual quota enforcement group meeting was held May 25-26 to scope enforcement issues related to IFQs and a TIQ Analytical Team meeting was held June 8-9 to scope analytical issues.

2.0 ALTERNATIVES AND IMPACTS

2.1 Description of the Alternatives

The policy that is the subject of this scoping process is the possible creation of a dedicated access privilege system for the Pacific Coast groundfish limited entry trawl fishery. The primary type of dedicated access privilege proposed thus far is IFQs. Specification of an IFQ or other alternatives for the groundfish trawl fishery requires answering three main questions:

1 What would be the specific design elements of the IFQ system and other possible management tools?
2. Which species and species groups would be managed with which types of management tools?
3. What would be the initial intersector allocations of nonwhiting species: between whiting sectors and nonwhiting sectors?

For an IFQ program there may also be a limited-entry-trawl/open-access allocation issue that arises if the groundfish catch of trawl vessels with open access gear (e.g. pink shrimp) is not covered by the IFQ program. If an option is chosen which would affect the open access fleet, the allocation itself would be addressed in the allocation EIS (see Section 1.1, Two Decision Stages).

2.1.1 Alternative Harvest Control Tools

There are a number of management tools that may be applied to controlling harvest in the trawl fishery. Potentially, different tools could be applied to different species and areas. The Council will need to make decisions on design elements for the alternative management tools. Design of the IFQ program alternatives will likely require the most attention. The decision on which tools to apply to which species is treated in Section 2.1.2.

There are four main alternatives for controlling total harvest that are presented here. Under each alternative, there are other tools such as rockfish conservation areas that might or might not remain in place to further control the harvest rates of particular species.

Status Quo Management: cumulative landing limits and season closures are the primary tools.

Trawl Individual Quotas: IFQs and individual bycatch quotas (IBQs). IBQs is the term applied to individual quota used to control the catch of prohibited species. A list of possible types of design elements that may be considered for an IFQ program is provided in this section. Discussion of the design elements and initial recommendations from some Council committee's (primarily the TIQC) are provided in Appendix A.

Cumulative Catch Limits: Cumulative catch limits apply to the vessel and are like cumulative landing limits, except they would apply to catch rather than landings. When the cumulative catch limit is reached, a vessel would have to cease operations in segments of the fishery where a particular species is caught. Cumulative catch limits might or might not be temporarily transferable between vessels within the designated period to which they apply.

Incidental Catch Allowances: Incidental catch allowances are sector catch caps. They apply to a segment of the fleet and when that segment of the fleet reaches its catch cap for a species the segment would have to stop fishing. Cumulative limits might still be used to control harvest rates.

Status Quo Management

Cumulative Landing Limits (Cumulative Limits)

Cumulative limits are a kind of trip limit. Trip limits have been a feature of groundfish management since the inception of the FMP; over time the regime has become more complex, covering a wider range of species and fishery sectors. The basic concept is to set a limit on the how much of a given species (or multi-species complex[2/]) an individual vessel may land in a fixed time period. Thus trip limits, as currently implemented, are retention or landing limits. Any groundfish captured beyond the specified limit are classified as bycatch (if discarded) or a violation (if retained). As long as a vessel owner does not retain more fish than the limit, additional fishing is allowed. Originally, these limits were per trip limits; today the limits are for a two-month cumulative limit period, in order to reduce the likelihood of regulatory discards. Vessels are allowed to make as many individual trips as the fisherman desires; so long as cumulative landing limits are not exceeded additional fishing is allowed. In general, separate limits are established for U.S. waters north and south of 40° 10' N latitude (approximately Cape Mendocino, California). The Pacific whiting fishery is a significant exception to trip limit management.

Seasons

Most fisheries are managed to achieve a year round season; in fact, this is one of the key objectives expressed in the groundfish FMP because buyers and processors regard a continuous and consistent supply of fish as essential to maintaining markets. In the last two years managing fisheries to prevent OYs from being exceeded before the end of the year has become increasingly difficult because of the low harvest limits for some overfished species, and some fisheries have been closed early.

Only one groundfish trawl fishery is managed primarily with a season closure, the Pacific whiting fishery. The length of the whiting season is determined by how quickly the OY is taken. The OY is allocated according to fixed percentages between vessels delivering to shore-based processors, at sea motherships, at-sea catcher/processor, and the tribal fleet. Seasons for sectors of the nontribal fishery are staggered, usually beginning on April 1 with shoreside deliveries in California. Each sector's season runs until the allocation for the sector has been caught. Before and after the season openings there is some opportunity to retain whiting under a 10,000 pound cumulative landing limit.

2/ Many less commercially important or less frequently caught species are combined in stock complexes for the purposes of management. These species may not be differentiated in reported landings and most have not been assessed; these factors make it impossible to manage these species individually. Multi-species complexes currently in use include the minor rockfish (additionally separated into several sub-categories), other flatfish, and other fish categories.

Trawl Individual Quota Management (IFQ and IBQ)

Under IFQs, total harvest is controlled by allocating an amount of quota to individual fishers and holding those individuals responsible for ensuring that their harvest does not exceed the amount they are allocated. The MS Act defines IFQs as “a Federal permit under a limited access system to harvest a quantity of fish expressed by a unit or units representing a percentage of the total allowable catch of a fishery that may be received or held for exclusive use by a person.” [Sec 3(21)]. IFQs differ from cumulative limits in that, in general, they may not be infringed upon by the harvest of others. In contrast, with cumulative limits or season closures, increased participation by other fishers can cause reduction in the cumulative limits or reduction in the season length. Typically IFQs also allow the fishers great flexibility in determining the time and area of harvest, and, where IFQs are transferable, the scale of their harvest operation.

The term IFQ applies to fish that may be retained or discarded by a fisherman while IBQ is reserved for fish that must be discarded (prohibited species).

The following is a list of IFQ program design elements covered in Appendix A. The list is based on preliminary work of the TIQC. Additions to the list may be made as a result of public comment and the comments of other Council advisory bodies.

- Portion of the Limited Entry Trawl Fleet Allocation for Which IFQs are Required
- Area Restrictions on IFQ
- IFQ and Limited Entry Permit Holding Requirements
- Transfer Rules
    - Transfer of IFQ to a Different Sector for Use
    - Eligible Owners/Holders (Who May Own/Hold)
    - Leasing - Duration of Transfer
    - Time of Sale
    - Divisibility
    - Liens
    - Accumulation Limits
    - Vertical Integration Limit
- Rollover to a Following Year
- Use-or-Lose Provisions
- Entry Level Opportunities
- Tracking IFQ, Monitoring Landings, and Enforcement
- Cost Recovery/Sharing and Rent Extraction
- Penalties
- Procedures for Program Performance Monitoring, Review and Revision (MS Act (d)(5)(A))
- Data Collection
- Initial IFQ Allocation
    - Qualifying Criteria: Membership in an Eligible Group
    - Qualifying Criteria: Recent Participation
    - Allocation “Formula” (Size of Individual Allocations)
    - Catch History: Species/Species Groups to Be Used for Allocation
    - Catch History: Allocation Periods

Catch History: Combined Permits and Other Exceptional Situations
Initial Issuance Appeals Process

There are generally a number of different ways to specify each design element. The term “design option” is being used to refer to the different ways to specify design elements (e.g. a 5% cap on ownership vs. a 10% cap on ownership). The term “alternative” is being reserved for reference to an IFQ program constructed of a set of design elements (e.g. a program composed of a 5% ownership cap, a 10% rollover provision, a 1999-2003 qualifying period, etc.) Preliminary TIQC recommendations on design options are included as part of Appendix A and public comment is sought on additional design options for consideration.

One issue that will need to be settled as part of the design of the IFQ alternatives is the date after which qualifying activities (such as landings) would not count toward an initial allocation of IFQ. To this end, a control data of November 6, 2003 has been published (Appendix E).

Another issue that comes up anytime IFQs are discussed is whether or not the IFQ constitute a property right. IFQs do not change the basic ownership of the resource. The resource is a public resource managed by the government as a public trust. Under the current management system, the government manages the resource to the public benefit by controlling harvest and allowing catch taken under the management rules to be converted to private property sometime between when it is caught and sold to a fish buyer. An IFQ system would not change the current public ownership of the resource and would likely make little change in the determination of when particular catch might be considered private property. IFQs are an alternative way for the government to control and organize harvest activity. They do so by creating a harvest privilege. A harvest privilege is different from ownership of the resource. The Magnuson-Stevens Act contains specific language pertaining to the limits to this harvest privilege:

Sec. 303(d)(2)	No provision of law shall be construed to limit the authority of a Council to submit and the Secretary to approve the termination or limitation, without compensation to holders of any limited access system permits . . . or regulations that provides for a limited access system, including an individual quota program.
Sec. 303(d)(3),	“An individual fishing quota. . .. (B) may be revoked or limited at any time in accordance with the MS Act (C) shall not infer any right of compensation to the holder of such individual fishing quota . . . if it is revoked or limited; and (D) shall not be construed to create, any right, title , or interest in or to any fish before the fish is harvested.

Cumulative Catch Limits

Cumulative catch limits apply to catch rather than landings and require 100% accounting of catch. These cumulative catch limits might be specified as temporarily transferable between vessels but could not be transferred between periods. The cumulative catch limits might be used to manage toward catch quotas or catch based harvest guidelines (as distinct from status quo landing quotas or harvest guidelines).

ICAs (Pooled Species Caps)

ICAs are sector level catch limits and are not allocated to individual vessels. ICAs differ from status quo sector level landings quotas in that they apply to catch rather than landings. As implied by the name, ICAs would generally be used for incidental species rather than targeted catch. A sector may be kept within its ICA by application of season closures, cumulative limits or other mechanisms to slow or stop the fishery. If a sector reaches its ICAs, all mortality caused by that sector must be halted, usually achieved through a season closure. Fish taken under an ICA may be retained or discarded, unless full retention rules are in place or the ICA is provided for a prohibited species, in which case discard would be mandatory. ICAs for prohibited species are often termed prohibited species caps (PSC).

2.1.2 Choice of Species to Which Harvest Control Measures Will Apply

The overriding question before the Council is one of how to best control total catch of the limited entry trawl fleet. Under status quo management, access to the trawl fishery is controlled under a license limitation system and total harvest in the fishery is controlled predominantly using trip limit and cumulative limit management. IFQs, a kind of direct access privilege, have been proposed as an alternative means for controlling access and managing harvest. ICAs and cumulative catch limits are other tools being discussed to be applied in concert with IFQs (see Section 2.1.1).

Different management approaches may be used for different species. Different combinations of management measures and species are used to structure alternatives. To stimulate discussion and bring issues into focus, the TIQC has constructed a number of initial alternatives for public consideration during the scoping process. The following are the guidelines under which the specific alternatives mixes of harvest measures were constructed.

> Alternative 1 (Status Quo). All species are managed under one of the following: cumulative limits, season closures (Pacific whiting), catch monitoring only (no regulatory constraints).
>
> Alternative 2 (IFQ Only for Primary Trawl Targets). IFQ for groundfish species that are primarily trawl targets with minimal harvest by other sectors (whiting split by sector, DTS, slope rockfish, nearshore flatfish) and target species for which there is already trawl allocation, i.e. sablefish). Transferable cumulative catch limit management or monitoring only for all other groundfish and prohibited species and status quo prohibited species management.
>
> Alternative 3 (IFQ for OY Species). All groundfish species with an OY (with separate types of IFQ for each of the whiting sectors). Transferable cumulative catch limit management or monitoring only for non-OY species and status quo prohibited species management.
>
> Alternative 4 (IFQ for All Groundfish and IBQ for Selected Prohibited Species) All groundfish species would be covered by an IFQ, in some cases IFQ would be aggregated, particularly for

species that are currently not managed with cumulative limits or quotas. IBQ for halibut and possibly other prohibited species.

Table 2.1-1 lists the species and species groups for which the Council currently sets OYs and controls harvest. Each column in the table specifies an alternative by indicating the management approach that would be used for the species listed in the rows, based on the above guidelines. There is more than one row for species or species groups for which area management has been established or for which there is a division of harvest among trawl sectors (Pacific whiting). At some future point, the Council may wish to specify IFQ types which distinguish between fish delivered for at-sea and shoreside processing, regardless of whether the processing takes place in the context of the whiting or some other groundfish fishery (fish dressed and iced at-sea would not be considered processed at-sea and fish frozen at-sea would be considered processed at-sea).

TIQC recommendations for additional options for the management systems under these alternatives are provided in Table 2.1-2. Some of these details include

- when OYs are set very low due to rebuilding schedules, a provision to switch the management measures to ICAs with catch rates controlled with nontransferable cumulative catch limits (Alternative 2 and 3)
- use of ICAs for bycatch species in the whiting fishery under Alternative 2.
- limitations on whiting-nonwhiting and between whiting sector transfers of IFQ (Alternatives 2, 3 and 4).
- allow retention of prohibited species landed with trawl IBQ (i.e. convert the IBQ for prohibited species to IFQ).

Rationale for TIQC recommendations: The TIQC spent an extensive amount of time discussing a system under which some species would be managed using IFQ and others would be managed with more traditional management measures. The primary concern was the control of harvest of the non-IFQ species under an alternative in which not all species would be managed with IFQs.

In discussing the nonIFQ management measures to be used, it was agreed that the principle of individual accountability and responsibility should guide the design of management measures. On this basis, the TIQC found it appropriate to support a regime that focuses on catch limits rather than landing limits, such that individuals are held accountable for their discards.

Vessel cumulative catch limits could lead to difficult situations for some vessels, therefore consideration of transferable cumulative catch limits is recommended. Concern was expressed for the effect of “disaster tows” on the individual. Cumulative catch limits would likely be based on incidental catch rates, derived from averages that reflect fleet performance. However, individual vessel performance is likely to vary from the average, to some degree on the basis of skill but also on the basis of chance. Under catch limits, vessels that are unlucky enough to experience a high bycatch tow for a species for which there is a low limit could be forced to stop fishing (under the current landing limits system the vessel discards catch in excess of limits and continues to fish). Transferability of catch opportunity (cumulative catch limits) might allow the vessel to be able to continue fishing while still limiting fleet catch to the desired level.

The potential for a disaster tow also lead to consideration of management with ICAs. may also be of major concern for a whiting fishery managed with IFQs and for situations where the OYs for IFQ species would be very low, such as for an overfished species. In both cases the concern is that a vessel may have a disaster tow and be forced to stop fishing or bear a substantial financial burden, as no other vessel would be very willing to sell IFQ until it was sure it would be able to take all of its target species without encountering a disaster tow of its own. As a possible means of addressing this concern, the TIQC recommended inclusion of an option under which some species would not be managed with IFQs but would be pooled and managed as an ICA for the fleet as a whole.

2.1.3 Within Trawl Sector Allocation (Excluding Initial IFQ Allocation)

Allocation Between and Among Whiting and Nonwhiting Sectors

The types of IFQ may distinguish between fish subject to processing at-sea and fish delivered for shoreside processing. In the whiting fishery, incidental catch species may be managed differently from the nonwhiting fishery (managed with ICAs instead of IFQs). In either case, an between whiting and nonwhiting sectors and among the whiting sectors may need to be addressed. Thus far, one approach for allocating between sectors has been suggested:

> One of the principles on which the following allocation approach is based is to not reward individuals or sectors which have historically had higher incidental catch rates than other individuals or sectors.
>
> 1. Establish an incidental catch rate for the whiting fishery as a whole. This rate would be established by determining the incidental rate for each year of the allocation period and determining the average of the annual incidental rates. Annual incidental rates would be calculated by summing the estimated catch of incidental species for all whiting sectors and dividing by the sum of whiting catch for all whiting sectors.
>
> 2. To establish the whiting fishery allocation of a nonoverfished incidental species in any particular year, multiply the incidental rate from Step 1 by the nontribal directed whiting sector OY. For overfished species a set-aside would be determined by the Council.
>
> 3. Allocate the incidental catch species among the three whiting sectors (catcher processors, vessels delivering to motherships and vessels delivering shoreside) based on the formula used to allocate whiting between these sectors (i.e. shoreside 34%, catcherprocessor 42%, motherships 24%).
>
> A policy call will need to be made as to whether to use only landings/deliveries or to include estimated incidental in the catch history for purpose of allocation. Some additional allocation decisions may be needed with respect to crediting sectors with catch history accounted for by permits bought back in the buyback program.

Trawl Allocation Taken By Trawl Vessels Using Open Access Gears

Current Allocation Accounting Rules

Under the allocation accounting system of the license limitation program, all groundfish taken by vessels with limited entry permits count against the limited entry groundfish quota, regardless of the gear used. Limited entry vessels may use open access gears in fisheries that target groundfish or harvest groundfish incidental to the harvest of nongroundfish species. For example, directed groundfish catch by limited entry vessels using longline and fishpot gear under open access regulations counts against the limited entry allocation. Additionally, if a vessel with a limited entry trawl permit participates in nongroundfish fisheries, such as pink shrimp or California halibut, and lands groundfish as incidental catch, the landed incidental groundfish catch counts against the limited entry allocation.

Provision with Possible Impacts on Open Access Sector

The coverage of the IFQ program needs to be reconciled with the current allocation accounting rules (see Section A.1.0 of the appendix). This allocation issue primarily affects the trawl sector but some options that would address this issue may affect the open access fishery. In specifying the scope of the IFQ program, the Council may decide to consider the separation, and possible reallocation to the open access sector, of the portion of the limited entry allocation typically taken by limited entry trawl vessels using open access gears. Such consideration will be needed if the scope of the IFQ program will not include catch by limited entry trawl vessels using directed or incidental open access gears (such catch is currently counted against the limited entry gear allocation).

Two issues affecting the open access fishery may be involved.

> The first issue is whether or not to change the catch accounting rules and make a reallocation between the limited entry trawl and open access fishery. This issue would be addressed as part of this EIS; and additional committee level work on the issue and recommendations to the Council will be developed by the Allocation Committee.
>
> The second issue is the amount which would be reallocated. This issue would also be handled by the Allocation Committee but would be addressed as part of the second step of this process and analyzed in the allocation EIS (see Section 1.1, “Two Decision Stages”).

2.2 Types of Environmental Impacts for Consideration

One purpose of the public scoping process is to solicit comment on environmental impacts that should be considered. Comments may be aimed at adding to the list or suggesting possible mechanisms of impact that should be evaluated. The following categories of impacts have thus far been identified.

2.2.1 Habitat and Ecosystem

Changing impact on habitat due to gear changes.
Potential changes in ecosystem dynamics if regional or localized depletion occurs.

Potential changes in the mix of species harvested with changes in fishing tactics, seasonality or gear.

2.2.2 Fishery Resources

- Changes in accuracy of total mortality estimates.
    - Incentives for unreported highgrading.
    - Incentives to underreport landings.
    - Improved monitoring.
- Changes in total mortality.
    - Incentives to minimize take of incidental catch species to avoid IFQ costs.
- Changes in size and maturity of fish taken.

2.2.3 Socio-Economic Environment

- Production Value - harvesters and processors
    - Mix of species and products
    - Product quality
    - Market timing (special orders)
    - Allowable catch (reduced uncertainty about discards with proper monitoring)
- Production Costs - harvesters
    - Harvest flexibility
        - opportunity to better scale harvest activities to improve operational efficiency
    - Gear flexibility
    - Timing flexibility
    - Opportunity for more efficient investment in capital
    - Asset values (permit and vessel)
- Production Costs - buyers and processors
    - Product recovery rates
    - Operational planning
    - Storage costs
    - Opportunity for more efficient investment in capital
    - Asset values (facilities)
- Safety and Personal Security
    - Vessel maintenance, repair and replacement
    - Avoidance of bad weather
    - Personal financial and employment security
- Community Impacts
    - Local income
    - Employment
    - Tax base and municipal revenues
    - Cost recovery for fishery related public works projects
    - Cultural heritage.
- Fairness and Equity
    - Effects on groups involved and dependent on the fishery (income and employment) for crew, skippers, vessel owners, processor labor and management, support industries

- Effects on small entities (businesses, local governments, organizations)
  - Effects on low income and minority populations
  - Effects on asset value (quotas, permits, vessels)
  - Effects on adjacent fisheries
- Nonconsumptive Values
  - Nonconsumptive Use
  - Existence Value
- Initial Program Development and Implementation Costs
- Ongoing Administrative Costs
- Enforcement and Compliance Monitoring Costs
- Research and Performance Monitoring Costs

References

National Research Council. 1999. “Sharing the Fish: Toward a National Policy on Individual Fishing Quotas.” Ocean Studies Board, Commission on Geosciences, Environment, and Resources, National Research Council. National Academy Press. Washington, D.C.

TABLE 2.1-1. Trawl catch, management regime alternatives (INITIAL/ PRELIMINARY TIQC RECOMMENDATIONS) and acceptable biological catches (ABCs) and total catch optimum yields (OYs) (mt) for 2003 and 2004. (Overfished stocks in CAPS) (page of 2).

Stock	**2004 ABCs/OYs**		**Alternative Management Regimes**						
	(mt)						Deliveries for At-Sea Processing (NOTES 1&2)		
	ABC	**OY**	**Alt 1 - Status Quo**	**Alt 2**	**Alt 3**	**Alt 4**	Alt2	Alt 3	Alt 4
LINGCOD	1,385	735	CL	CL/ICA	IFQ	IFQ			IFQ
Pacific Cod (Vanc-Col OY, Eur-Mont-Conc catch counts toward the "Other Fish" OY)	3,200	3,200	No Lim	IFQ	IFQ	IFQ			
PACIFIC WHITING (Coastwide)	188,000	250,000							
Shoreside			Season & CL	IFQ	IFQ	IFQ	IFQ	IFQ	IFQ
Mothership			Season	IFQ	IFQ	IFQ	IFQ	IFQ	IFQ
Catcherprocessor			Season	IFQ	IFQ	IFQ	IFQ	IFQ	IFQ
Sablefish (Coastwide) b/	8,487	7,786	CL						
North of Conception	8,185	7,510	CL	IFQ	IFQ	IFQ	ICA	ICA	IFQ
Conception area	302	276	CL	IFQ	IFQ	IFQ			
PACIFIC OCEAN PERCH	980	444	N-CL; S-CLgrp	IFQ	IFQ	IFQ	ICA	ICA	IFQ
Shortbelly Rockfish	13,900	13,900	No Lim	IFQ	IFQ	IFQ	ICA	ICA	IFQ
WIDOW ROCKFISH	3,460	284	Closure & CL	IFQ	IFQ	IFQ	ICA	ICA	IFQ
CANARY ROCKFISH c/	256	47	CL	CL/ICA	IFQ	IFQ	ICA	ICA	IFQ
Chilipepper Rockfish	2,700	2,000	N-CLgrp; S-CLgrp	IFQ	IFQ	IFQ	ICA	ICA	IFQ
BOCACCIO	400	250	S-Closure	CL/ICA	IFQ	IFQ	ICA	ICA	IFQ
Splitnose Rockfish	615	461	S-CL	IFQ	IFQ	IFQ	ICA	ICA	IFQ
Yellowtail Rockfish (north)	4,320	4,320	N-CL; S-CLgrp	IFQ	IFQ	IFQ	ICA	ICA	IFQ
Shortspine Thornyhead	1,030	983	CL	IFQ	IFQ	IFQ	ICA	ICA	IFQ
Longspine Thornyhead	2,461	2,443	CL	IFQ	IFQ	IFQ			
S. of Pt. Conception	390	195	CL	IFQ	IFQ	IFQ			
COWCOD N. Concep & Monterey)	5	2.4	Closure	CL/ICA	IFQ	IFQ			
S. Concep	19	2.4	Closure	CL/ICA	IFQ	IFQ			
DARKBLOTCHED	240	240	N-CLgrp; S-CLgrp	IFQ	IFQ	IFQ	ICA	ICA	IFQ
YELLOWEYE	53	22	N-CL, CLgrp; S-CLgrp	CL/ICA	IFQ	IFQ	ICA	ICA	IFQ
Nearshore Species									
Black WA	540	540	N-CLgrp; S-CLgrp	CL/ICA	IFQ	IFQ	ICA	ICA	IFQ
Black OR-CA	775	775	N-CLgrp; S-CLgrp	CL/ICA	IFQ	IFQ	ICA	ICA	IFQ
Minor Rockfish North (for management purposes split: nearshore, shelf and slope)	4,795	2,250 (ns=122, shlf=968, slp=1,160)		ns -CL/ICA shlf-IFQ slp-IFQ	IFQ-grp	IFQ or IFQ-grp (depending on spp)	ICA	ICA	IFQ-grp
Remaining Rockfish North	1,612	-							
Bocaccio	318	-	N-CLgrp	IFQ-grp	IFQ-grp	IFQ or IFQ-grp			
Chilipepper - Eureka	32	-	N-CLgrp	IFQ-grp	IFQ-grp	IFQ or IFQ-grp			
Redstripe	576	-	N-CLgrp	IFQ-grp	IFQ-grp	IFQ or IFQ-grp			

TABLE 2.1-1. Trawl catch, management regime alternatives (INITIAL/ PRELIMINARY TIQC RECOMMENDATIONS) and acceptable biological catches (ABCs) and total catch optimum yields (OYs) (mt) for 2003 and 2004. (Overfished stocks in CAPS) (page of 2).

Stock	**2004 ABCs/OYs**		**Alternative Management Regimes**						
	(mt)						Deliveries for At-Sea Processing (NOTES 1&2)		
	ABC	**OY**	**Alt 1 - Status Quo**	**Alt 2**	**Alt 3**	**Alt 4**	Alt2	Alt 3	Alt 4
Sharpchin	307	-	N-CLgrp	IFQ-grp	IFQ-grp	IFQ or IFQ-grp			
Silvergrey	38	-	N-CLgrp	IFQ-grp	IFQ-grp	IFQ or IFQ-grp			
Splitnose	242	-	N-CLgrp	IFQ-grp	IFQ-grp	IFQ or IFQ-grp			
Yellowmouth	99	-	N-CLgrp	IFQ-grp	IFQ-grp	IFQ or IFQ-grp			
Other Rockfish North	2,068	-	N-CLgrp by depth	IFQ-grp	IFQ-grp	IFQ-grp			
Minor Rockfish South (for management purposes split: nearshore, shelf and slope)	3,506	1,968 (ns=615, shlf=714, slp=639)		ns -CL/ICA shlf-IFQ slp-IFQ	IFQ	IFQ or IFQ-grp (depending on spp)			IFQ??
Remaining Rockfish South	854	-							
Bank	350	-	S-CLgrp	IFQ-grp	IFQ-grp	IFQ or IFQ-grp			
Blackgill	343	-	S-CLgrp	IFQ-grp	IFQ-grp	IFQ or IFQ-grp			
Sharpchin	45	-	S-CLgrp	IFQ-grp	IFQ-grp	IFQ or IFQ-grp			
Yellowtail	116	-	S-CLgrp	IFQ-grp	IFQ-grp	IFQ or IFQ-grp			
Other Rockfish South	2,558	-	S-CLgrp by depth	IFQ-grp	IFQ-grp	IFQ-grp			
Dover Sole	8,510	7,440	CL	IFQ	IFQ	IFQ			
English Sole	3,100	na	CLgrp	IFQ	IFQ	IFQ			
Petrale Sole	2,762	na	CL	IFQ	IFQ	IFQ			
Arrowtooth Flounder	5,800	na	CL	IFQ	IFQ	IFQ	ICA	ICA	IFQ
Other Flatfish	7,700	na	CLgrp	IFQ	IFQ	IFQ	ICA	ICA	IFQ
Other Fish	14,700	na	No Lim	**??**	**CL/ICA**	**IFQ**			
Halibut NOTE3			Prohib	Prohib	Prohib	IBQ	Prohib	Prohib	IBQ
Salmon NOTE3			Prohib	Prohib	Prohib	Prohib??	Prohib	Prohib	Prohib??
Crab NOTE3			Prohib	Prohib	ProhiT	Prohib??	Prohib	Prohib	Prohib??

KEY TO CODES FOR ALTERNATIVE MANAGEMENT REGIMES
Prefix N or S = measures used north or south of Cape Mendocino.
CL = species specific cumulative trip limits
-grp = harvest controlled under the IFQ or cumulative limit for a species group.
Season = opening with no cumulative limits
Closure = no retention allowed (any catch must be discarded)
Prohib = no retention every allowed in the groundfish fishery.
No Lim = harvest monitoring only, other limits have not been necessary to control harvest.

NOTE1: Substantial dog shark are caught in the whiting fishery (2,269 mt in the at-sea portion from 1992-2002)

NOTE2: At-sea species for management has not been discussed by the TIQC. The list of potential species provided here is based on a threshold of at-least 3 mt in the estimated at-sea deliveries for 1992-2002.

NOTE3: TIQC has not reviewed management options for prohibited species under Alternative 4.

Table 2.1-2. Management alternatives recommended for consideration by the TIQC.

	Species Groups to Which Tool Applies and Transfer Rules between Whiting and NonWhiting Fishery		
Management Tools to Be Applied	**Alt 2**	**Alt 3**	**Alt 4**
NonWhiting Fishery			
IFQ	Target Species and Species for Which There is a Trawl Allocation	OY Species	All Groundfish Species
Cumulative catch limit • Transferable cumulative catch limit between vessels *within period*. • Trawl share based on biennial council decision. • Any transfers between vessels are temporary.	Most Non IFQ Species (during initial allocation calculate an IFQ so it would be available for future use)	Species without OYs (nonIFQ species) (same as Alt 2)	Not Applicable
Monitoring Only	Species managed with monitoring only under status quo.	Same as Alt 2	Same as Alt 2
ICA (Collective cap). Managed as a pool. When pool is exhausted fishery shuts down. 100% mortality accounting. Retention allowances may vary based on annual management measure decisions. Harvest rate control measures: • Cumulative catch limit (nontransferable), when a vessel reaches its limit that vessel's operations shut down. • Sector/area caps, when sector reaches cap it shuts down. Other measures to keep bycatch rates low may stay in place (e.g. RCAs).	NonIFQ Species with Extremely Low OYs (rebuilding species) (establish a threshold at which point a species would switch from incidental catch management to "Low OY" management) (during initial allocation, calculate an IFQ so its available for future use)	IFQ Species with Extremely Low OYs (rebuilding species)	Not Applicable
Prohibited Species	Status quo	Status quo	IBQ for some (Suboption: Allow retention of IBQ when taken by gear legal for the prohibited species)
(Alt 1 = status quo, primarily cumulative landing limits)			
Whiting Fishery			
IFQ	Target Species (Whiting)	Target Species and Incidental Catch Species with OYs	Target Species and Incidental Catch
Collective Cap. Manage as a pool. When pool is exhausted sector shuts down. 100% mortality accounting.	Incidental Catch (NonWhiting Groundfish)	Not applicable, however, individuals could form a co-op and pool their IFQ.	Not applicable, however, individuals could form a co-op and pool their IFQ.
Monitoring Only	Species managed with monitoring only under status quo.	Same as Alt 2	Same as Alt 2
Whiting Nonwhiting Transfer Rules			
Whiting-Nonwhiting Access Privilege Transfer Rules	Roll-over any unused incidental catch from one whiting sector to the next as the year progresses. Allow one sector to buy from another sector's pool (requires establishing a co-op). Allow purchase of IFQ from nonwhiting vessels. Such IFQ would be placed in the pool for whiting vessels.	Do not allow transfer of nonwhiting IFQ between whiting and nonwhiting sectors.	Allow transfer of nonwhiting IFQ between whiting and nonwhiting sectors.
Under Alternatives 3 and 4, allocate incidental catch equally among vessels, see Section A.13. (Alt 1 = status quo, primarily season management)			

Appendix A: IFQ Program Elements and Analysis

Appendix A: IFQ Program Elements and Analysis

This appendix describes potential design elements and related options for a trawl IFQ program. These options will be grouped into program alternatives for the main analysis of the EIS (see Section 2.1.1). As the initial recommendations of TIQ advisory groups have been reviewed and incorporated into this document, questions have been identified as to exactly how some of the provisions would be implemented. These implementation questions are noted in italics and will be the subject of further discussion. <u>TIQC recommendations provided in this appendix are an initial set of options identified for scoping and do not necessarily represent the TIQCs preferred policy options.</u>

Incorporated in the discussion on each design element are references to relevant MS Act language and recommendations of a recent report from the National Research Council of the National Academy of Sciences (NRC, 1999). The NRC report was mandated by Congress. Section 303(d)(5) of the MS Act requires that "In submitting and approving any new individual fishing quota program . . . the Councils and the Secretary shall consider the report of the National Academy of Sciences and any recommendations contained in such report."

A.1.0 Portion of the LE Trawl Fleet Allocation for Which IFQs are Required

Under the allocation accounting system of the license limitation program, all groundfish taken by vessels with groundfish limited entry (LE) permits count against the LE groundfish quota, regardless of the gear used. LE vessels may use open access gears in fisheries that target groundfish or harvest groundfish incidental to the harvest of nongroundfish species. For example, directed groundfish catch by LE trawl vessels using longline and fishpot gear under open access regulations counts against the LE allocation. Additionally, if a vessel with an LE trawl permit participates in nongroundfish fisheries, such as pink shrimp, salmon or California halibut, and lands groundfish as incidental catch, the landed incidental groundfish catch counts against the LE allocation.

The coverage of the IFQ program needs to be reconciled with the current allocation accounting rules. If the current accounting rules are used and the IFQ program is to cover all of the LE trawl vessel allocation, LE trawl vessels making groundfish landings in nongroundfish fisheries would have to make those landings in compliance with tracking and monitoring rules for the IFQ program. As a mitigation measure, the possibility might be explored for having somewhat different tracking and monitoring rules when a vessel is using an open access gear. In considering this possibility, the effect on opportunities for noncompliance would have to be taken into account.

Ensuring LE trawl vessel compliance with IFQ tracking and monitoring rules while fishing with open access gear would result in additional costs for vessels and the tracking and monitoring system. Therefore, options might be considered that would not require IFQs when LE trawl vessels use open access gears. Subdividing the trawl allocation brings up issues of how to divide the allocation, the need to modify the catch accounting system to track progress toward taking the allocation, difficulties in managing what may be very small quotas and management responses when such nonIFQ LE trawl quotas are approached by the LE trawl fleet participating in directed or incidental open access fisheries. Options include subdividing the trawl allocation and/or of changing the LE catch accounting system. In the following table, Option 2 provides a set of logically complete approaches are outlined for a system in which IFQ is not required for groundfish catch by LE trawl vessels using open access gears. To date, no one has advocated Option 2, SubOption B. Changing the accounting system for LE trawl vessels would also bring up the issue of considering such a change for LE fixed gear vessels and treatment of vessels with LE permits for both trawl and fixed gears.

IFQ Program Scope - Option 1: Require IFQ for all Catch by LE Trawl Vessels. Require LE Trawl vessels to make landings in compliance with IFQ tracking and monitoring rules, even when using nontrawl open access gears (examples of directed and incidental gears that may take groundfish include longline, fishpot, shrimp trawl, California halibut trawl, and crab pots).	
SubOption A	Require that landings be made in compliance with open access fishery cumulative limit and other harvest regulations.
SubOption B	Allow landings in excess of open access fishery cumulative limits, so long as landings are completely covered by IFQ.
IFQ Program Scope - Option 2: Require IFQ Only for Groundfish Trawl Catch by LE Trawl Vessels	
SubOption A	• Split the trawl allocation between IFQ and nonIFQ harvest • Manage groundfish harvest by trawl vessels using open access gears to stay within the suballocation.
SubOption B	• Maintain the same LE allocation • Change the accounting system such that catch of LE trawl vessel's using open access gears counts against the open access allocation. • Determine whether or not to make similar changes with respect to LE longline and fishpot vessels.
SubOption C	• Reallocate a portion of the LE allocation • Change the accounting system such that catch of LE trawl vessel's using open access gears counts against the open access allocation. • Determine whether or not to make similar changes with respect to LE longline and fishpot vessels.

TIQC Recommendations:
The portion of the LE trawl allocation covered by the IFQ program includes:

Option 1. Any catch taken under a groundfish LE trawl permit regardless of gear used–e.g. when using pink shrimp trawl or any other open access gear. For those species covered by the program, IQ would be required for all catch counted against the LE trawl fishery under the current system.

Option 2. Groundfish taken with groundfish trawl gear under an LE trawl permit. A separate accommodation would be required to cover any landings made by vessels with an LE trawl permit that are not made with groundfish trawl gear.

TIQC Considered But Rejected Options: None identified.

Options from Public Comment Period: TO BE PROVIDED

A.2.0 Area Restrictions on IFQ

Area restrictions can be applied to IFQs

- to prevent regional depletion[1/] and set catch levels for areas that correspond to stock assessments
- to disperse economic benefits of catch along the coast
- to ensure that certain communities receive economic benefits

Any of these aims could be pursued through catch area or landing area restrictions. Catch area restrictions would most precisely meet needs to prevent regional stock depletion and would likely keep landings more geographically dispersed than might be the case without catch or landing restrictions. Landing area restrictions would more precisely meet objectives for distributing harvest benefits along the coast (or in particular communities) and would likely serve to keep ocean catch area more dispersed than might be the case without catch or landing restrictions.

Landing area restrictions might be achieved either by putting landing area endorsements on all IFQ or through a policy that allocates some IFQ to communities, similar to Alaskan CDQ programs. Catch area restrictions would most likely be achieved through the use of catch area endorsements.

TIQC Recommendation: Inclusion of catch area restrictions should be based solely on need to address stock conservation concerns.

TIQC Considered But Rejected Options: Landings area endorsements.

TIQ Enforcement Group Recommendations: If some IFQ are to be catch area specific, all landings should occur in ports within the catch area. This implies that a vessel would not be able to fish in two catch areas in the same trip. If the enforcement system includes VMS, compliance monitors, and full retention, it may be possible to allow vessels to fish in two areas on a single trip and separate the fish.

Options from Public Comment Period: TO BE PROVIDED

A.3.0 IFQ and LE Permit Holding Requirements

Determination of when the IFQ must be held has a substantial bearing on program enforceability and monitoring costs and on discard rates (bycatch). A program that requires IFQ be held earlier in the fishing trip would allow greater opportunity for ensuring compliance through the potential for enforcement activity during fishing or offloading activities. In such a case, enforcement

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[1/] "Regional" depletion is being used here to denote broader scale depletion of a segment of a stock and "localized" depletion is being reserved for concerns related to depletion of reefs or other relatively small geographic areas. IFQs established for INPFC management areas might prevent regional depletion but would not address localized depletion of biomass on a particular reef or in the area of a particular port.

officers in the field (USCG at-sea or state or NMFS agents on the dock) can determine whether there is sufficient IFQ to cover a particular landing. A program that allows IFQ to be acquired after offloading has been completed provides no opportunity for in-the-field deterrence of quota busting. In such case, greater reliance must be placed on the monitoring program, making it more necessary to have 100% at-sea monitoring and/or weigh master presence during offloading operations. On the other hand, allowing a vessel to cover its landing of IFQ after offloading has been completed reduces the incentive for at-sea discards (bycatch) or underreporting a landing for which insufficient IFQ is held. Additionally, if there is 100% at-sea and/or shoreside monitoring, the opportunity is substantially reduced for underreporting a landing for which sufficient IFQ is already held (the motive for such underreporting would be to preserve the IFQ for future use).

If the only requirement for landing groundfish with trawl gear is the possession of IFQ, the number of vessels participating in the fishery could potentially increase. In order to facilitate cost effective enforcement it may be useful to identify and limit the number of participants. This can be done through a requirement that IFQ be fished only from vessels with limited entry trawl permits.

TIQC Recommendation:

In order to be “fished,” quota pounds must be registered to a vessel. With respect to when the quota pounds must be held, the following options have been identified:

1. at time of landing
2. within 30 days of landing, no fishing until landing is covered.

These two options may be combined with a suboption that requires that some IFQ be held at the time a vessel departs from port. If such an option is developed, a threshold amount that must be held would need to be determined.

TIQC Considered But Rejected Options: Prior to departure from port.

TIQ Enforcement Group Recommendation:

A vessel may not fish until some quota is held (amount to be determined) and the vessel’s IFQ account does not have a deficit for any species. At the time of landing (or within 24 hours of landing) all fish must be covered. If a landing is not covered within the specified time limit, catch in excess of IFQ holdings (or, if there are carryover provisions, catch in excess of IFQ holdings plus carryover provisions) would be forfeited and additional enforcement actions possibly taken. Overages would be debited against a vessel’s IFQ account and show as a deficit balance until additional IFQ is acquired.

Options from Public Comment Period: TO BE PROVIDED

A.4.0 Transfer Rules

Transferability promotes economic efficiency but often the potential structural changes to the fishing industry and fishing communities accompanying transfers are perceived as a threat. These perceived threats include the concentration of quota shares, a lopsided distribution of economic gains, and a change in social relations among members of a community (NRC, 1999, pg. 208).

To further goals of economic efficiency and rapid downsizing, transferability should be as free as possible. Restrictions on transferability may be warranted to promote other goals such as protecting the owner-operator mode of production, preventing absentee ownership, or protecting fishery dependent coastal communities (NRC, 1999, pg. 208).

A.4.1 Transfer of IFQ to a Different Sector for Use

IFQ might be issued under sector specific allocation rules (Section 13.0) but might transferable between trawl sectors. Transferal to nontrawl sectors might also be considered, however, unless the nontrawl sectors are under an IFQ program, such transfers would expand program complexity and compliance and monitoring costs.

<u>TIQC Recommendation:</u>

IFQ options identified for further consideration:

1. IFQ must be used within the trawl sector for which it was issued.
2. IFQ may be traded between trawl sectors managed under the IFQ program.

Sector specific IFQs need to be considered for the following sectors and subdivisions

Trawl	Whiting	At Sea
		Shoreside
	Nonwhiting	
[redacted]		

IBQ options identified for further consideration:

1. Prohibit transfers outside the trawl sector.
2. Allow transfers to gears that are legal for the species and allow those gears to retain catch taken under IBQ when operating in compliance with the IBQ program.

<u>TIQC Considered But Rejected Options:</u> None identified.

<u>Options from Public Comment Period</u>: TO BE PROVIDED

A.4.2 Eligible Owners/Holders (Who May Own/Hold)

The NRC study notes that some communities may be heavily dependent on fishing for social, cultural, and economic values and/or are lacking in alternative economic opportunities; and recommends that Council's be permitted to "authorize communities to purchase, hold, manage and sell IFQs" (NRC, 1999, pg. 206). In making this recommendation the NRC states that Council's should determine the qualifying criteria for a community that is permitted to hold quota.

The potential for foreign ownership and control is another issue related to determination of the class of eligible owners. In this regard, the NRC recommended that Congress take the lead in determining eligibility of foreign individuals and companies to receive IFQ in an initial allocation. Because of foreign ownership interest in the existing fishery, limitations on foreign ownership could be problematic and discriminate against US co-owners and investors. Also, bearing on this issue are current trends toward the liberalization of direct foreign investment worldwide (NRC, 1999, 211). Groundfish LE permit ownership in the current license limitation system is controlled with provisions that prohibit ownership of permits by anyone not eligible to own a US documented fishing vessel.

Other potential groups to consider are crew members, skippers, vessel owners, permit owners, members of fishing communities, those that may wish to hold IFQ for their nonuse benefits (e.g. members of conservation organizations), individual members of the general public, those with security interest in the IFQ (e.g. a lender), any person (including business entities such as corporations).

TIQC Recommendations: These options apply to both QS and quota pounds.
Options identified for further consideration:

1. Anyone eligible to own a US documented vessel
2. Only stakeholders may own -
   a. Owners and lessees of LE permits or vessels
   b. Skipper/crew (a certain number of days at sea on a commercial fishing operation is required before IFQ can be purchased)
   c. Processors/buyers
   d. Communities

TIQC Considered But Rejected Options: None identified.

Options from Public Comment Period: TO BE PROVIDED

A.4.3 Leasing - Duration of Transfer

Leasing can allow fisheries to adapt to change and cover overages and incidental catch through the short term transfer of IFQ, rather than through discarding (NRC, 1999, pg. 208).[2/] One of the primary social concerns with leasing is the potential for absentee ownership in the fishery. Provisions that might be considered to restrict leasing (if such restriction is desirable) include limiting the proportion of the total quota which may be leased, the frequency of leasing, and taxing leases (NRC, 1999, pg, 208). The NRC recommends permanent transfers generally be allowed with restrictions on to whom or where the quota may be transferred, if necessary to address concerns about absentee ownership, geographic distribution of the fishery or other structural features of the industry.

<u>TIQC Recommendations:</u> These options apply to both QS and quota pounds.
Options identified for further consideration:

1. Permanent transfers only (no leasing or other kinds of temporary transfers)
2. Leasing and permanent transfers

A suboption might be to prohibit all permanent transfers (leasing only) during the first year of the program. The purpose of the moratorium on transfers of quota shares would be to allow fishers to get used to the program so that they might make better business decisions when buying and selling quota shares.

<u>TIQC Considered But Rejected Options:</u> None identified.

<u>Options from Public Comment Period</u>: TO BE PROVIDED

A.4.4 Time of Sale

One reason for considering a restriction on the time of sale is to simplify tracking IFQ, particularly if roll-over provisions for catch overages are to be applied to quota share or if the IFQ tracking system is not a real time electronic system.

<u>TIQC Recommendations:</u>

Quota share transfer options

1. Any time during the year
2. Transactions only at end of year

Quota pounds would be transferable any time during the year.

<u>TIQC Considered But Rejected Options:</u> None identified.

[2/] With 100% accounting of catch, using observers or other means of monitoring, discarding to avoid the need to cover catch with IFQ would not be an option.

TIQ Enforcement Group Recommendation: Quota shares should not be transferred from any account for which there is a deficit of quota pounds.

Question: If quota pounds have been leased out to a vessel, and a vessel has acquired quota pounds from numerous quota share accounts, how would it be determined which quota share account is in deficit?

Options from Public Comment Period: TO BE PROVIDED

A.4.5 Divisibility

Limited divisibility (blocked quota shares) combined with limits on the number of blocks that can be stacked was used in Alaska to try to preserve the character of the fishery. Greater divisibility of IFQ may increase the number of transactions and hence the governing costs.

TIQC Recommendations: Options -

1. QS: nearly unrestricted divisibility - “many decimal points”
2. Quota pounds:1 lb

TIQC Considered But Rejected Options: Blocked shares/pounds.

Options from Public Comment Period: TO BE PROVIDED

A.4.6 Liens

The NRC (1999, page 202) found that “Individuals who do not receive an initial allocation, or those who received a small quantity of quota, may find it difficult to obtain bank financing to purchase shares because they lack acceptable collateral.” Lenders have expressed concern that liens on IFQ might be passed on to IFQ purchasers without the purchasers knowledge. This situation may undermine the confidence of lenders, making it more difficult for potential new entrants or existing operations to gain the financing needed to purchase IFQ. The MS Act includes creation of a lien registry system, but none has been implemented to date.

TIQC Recommendations (Comment): Liens (Use as Collateral) - Pledging IFQs as collateral is a matter of private contract, independent of the government program. Placement of a lien would not affect the government’s ability to sanction or revoke the IFQ for violations.

TIQC Considered But Rejected Options: None identified.

Options from Public Comment Period: TO BE PROVIDED

A.4.7 Accumulation Limits

Accumulation limits may be used to promote equity by preventing a few IFQ holders from acquiring excessive market power and thereby adversely affecting other sectors such as crew and processors. Accumulation limits may also be an indirect way to encourage broader geographic distribution of quota shares. While some IFQ programs rely solely on antitrust law to prevent excessive concentration of shares, experience has shown this not been sufficient to prevent problems resulting from excessive concentration of IFQ (NRC, 1999, page 209). The NRC also notes that concentration limits may not be very effective if there are ways to circumvent them.

Section (d)(5)(c) of the MS Act requires that any new program "prevent any person from acquiring an excessive share of the individual fishing quotas issued . . ." The NRC has recommended that all IFQ programs define excessive shares, including specification of its measurement, and prevent the accumulation of "excessive shares" of IFQ (NRC, 1999, pg. 210).

TIQC Recommendations: Caps should be considered to limit the amount of IFQ held. The caps may be for individual species and/or total IFQ holdings. If an entity would be eligible to receive more than the cap as part of the initial allocation that entity would be allowed to receive and use the amount in excess. If a person has partial control of an IFQ account (for example, through a partnership) all IFQ under that account would count toward that person's cap.

Consider the need for separate caps for
- Ownership
- Control (ownership, lease or other business arrangements)
- Use by a vessel

The following cap options were recommended for consideration.

	Option 1	Option 2	Option 3
Nonwhiting Groundfish	1%	5%	10%
Whiting Fishery	5%	10%	25%

The TIQC discussed without resolution whether caps should be based on poundage or value. Under the BC system value equivalents are established, using Pacific Ocean Perch as a base unit.

TIQC Considered But Rejected Options: The following option was implicitly rejected from consideration. Require someone receiving an initial allocation of more than the cap to divest themself of the excess shares.

Options from Public Comment Period: TO BE PROVIDED

A.4.8 Vertical Integration Limit

Vertical integration occurs when a single entity operates at several levels in the harvest and distribution chain, e.g. owns both a catcher vessel and a processing facility.

TIQC Recommendations: No limits on vertical integration other than what is provided through the accumulation caps.

TIQC Considered But Rejected Options: Options to limit vertical integration were rejected.

Options from Public Comment Period: TO BE PROVIDED

A.5.0 Rollover (Carryover) to a Following Year

Allowing a fisher to land catch in excess of his or her IFQ allotment but counting it against the following year’s allotment is one means of penalizing fishers for exceeding their IFQ without creating large incentives for discarding the excess harvest (NRC, 1999, pg. 217). Similarly, allowing a fisher to carry over some portion of his or her unused IFQ allotment from one year to the next creates a situation in which there is less incentive for fishers to catch up to their full limit and hence risk exceeding the limit. While midseason transfers can facilitate coverage of any over catch, as the season progresses there would be less and less IFQ available for transfer.

<u>TIQC Recommendations:</u>

Rollover would allow unused quota pounds to be used in a subsequent year. A person might also be allowed catch in excess of the persons IFQ holdings with any overage being debited against quota pounds to be issued the following year. The amount that could be used in a subsequent year would be limited.
Options identified for consideration:

1. No rollover
2. 10% rollover (no rollover allowance for overfished species)
3. 20% rollover (5% rollover allowance for overfished species)
4. 30% rollover (full rollover allowance for overfished species)

<u>TIQC Considered But Rejected Options:</u> None identified.

<u>Options from Public Comment Period</u>: TO BE PROVIDED

Question: If quota pounds have been leased out to a vessel, and a vessel has quota pounds from numerous accounts, how would rollover provisions for overages be applied?

A.6.0 Use-or-Lose Provisions

Use-of-lose provisions would require that if IFQ is not used over a certain period of time it would expire or be revoked and reallocated.

<u>TIQC Recommendations:</u> Option identified for further consideration:

1. Include use-or-lose provisions (consider how to treat leases, medical exceptions, and partial use)
2. Do not include use-or-lose provisions

The use-or-lose provision would apply to the person owning the IFQ. A requirement that IFQ be used in three out of five years was considered. Curing TIQC discussions, several questions were raised for consideration:

- What portion of the IFQ would have to be used in order for this provision to be applied?
- How would it be determined which IFQ had been used and which not used?
- How would use-or-lose provisions be applied if part but not all IFQ were transferred from one account to another?

TIQC Considered But Rejected Options: None identified.

Options from Public Comment Period: TO BE PROVIDED

A.7.0 Entry Level Opportunities

Individuals who do not receive an initial allocation and lack collateral or credit history may have a difficult time acquiring IFQ, particularly in situations where IFQ price is overinflated (NRC, 1999, pg. 211). However, the NRC (1999, pg. 210) warns that measures to facilitate new entry could defeat the purpose of an IFQ system if they expand the quota share pool or hinder consolidation.

Section 303(d)(5)(c) of the MS Act requires that any new program "considers the allocation of a portion of the annual harvest in the fishery for entry-level fishermen, small vessel owners, and crew members who do not hold or qualify for individual fishing quotas." There are also provisions in the MS Act that allow for the creation of loan programs to finance small boat and entry level participation.

Section 303(d)(4) of the MS Act allows the dedication of 25% of fees collected for the IFQ program to be used to issue obligations to aid in financing:

(i) purchase of individual fishing quotas in that fishery by fishermen who fish from small vessels; and
(ii) first time purchase of individual fishing quotas in that fishery by entry level fishermen.

The criteria for qualifying under (i) and (ii) are to be included as part of the Council recommendations.

With respect to facilitating new entry, a central lien registry system could make loans more available (NRC, 1999, pg. 202) and taxing quota rents would reduce their price (NRC, 1999, pg 214), though at the same time it would reduce the revenue stream from the IFQ and the purchasers ability to recover investment in the purchase of IFQ. The NRC recommends consideration of a zero-revenue auction (NRC, 1999, pg. 211. Under such a system, some percent of the IFQ reverts back to government each year for auctioning, with the proceeds of the auction returning to those forced to give up their quota shares. The advantages cited for this auction are that it provides excellent information about prices (helpful both to fishermen and bankers) and it guarantees the presence of a steady flow of IFQs in the market, ensuring an opportunity for potential entrants to gain access (NRC, 1999, pg. 145). It might also provide price information for the purpose of determining taxes to be levied against the first transfer of IFQ.

TIQC Recommendations:

- An option for a loan program should be included as part of the analysis. (The question of qualification for low interest loans was left open.)
- If penalties result in revocation of quota shares (including use-or-lose provisions), some of the revoked shares might be used for new entry. (The question as to how individuals might qualify for reissuance of revoked shares was left open.)

The following are some provisions that would help ensure opportunity for new entry:

- providing unlimited divisibility in the size of share blocks traded
- providing a central lien registry to facilitate financing by ensuring more security in the collateral and therefore lower interest rates
- limiting ownership to individuals

TIQC Considered But Rejected Options: A zero revenue auction should not be considered as there would be sufficient trading to ensure the availability of quota on the market for purchase by a new entrant..

Options from Public Comment Period: TO BE PROVIDED

A.8.0 Tracking IFQ, Monitoring Landings, and Enforcement

The NRC report finds that compliance and self policing would be more likely if the process of establishing an IFQ program involves co-management schemes that allow fishermen to participate in the development and implementation of the IFQ program (NRC, 1999, pg. 216). This program is being developed and considered in an open Council process that provides substantial and significant opportunity for participation of members of industry, interest groups and the public.

Section 303(d)(5)(B) of the MS Act requires that any new program “provides for the effective enforcement and management of any such [new IFQ] program, including adequate observer coverage. . .”

A program that requires IFQ to cover bycatch must have some means by which to ensure that bycatch is not discarded without being accounted for.

TIQC Recommendations:

A compliance monitoring program my be needed to monitor harvest (catch and/or landings). Elements of the compliance monitoring program might include one or more of the following.

1. Onboard Compliance Observer (Compliance Monitors) (20% - 100%)
2. Dockside (Delivery Location) Compliance Monitor (20% - 100%)
3. Onboard and Dockside Monitor
4. 100% Hailing Requirement and Lesser % of Landings Monitored
5. Exemption for Smaller Vessels (from need to carrying monitors)
6. Video Monitoring System (Including all Components Necessary to Make Effective)

The skills of compliance monitors may or may not be different from those generally required for Federal fishery observers.

TIQC Considered But Rejected Options: None

TIQ Enforcement Group Recommendations:

The TIQ Enforcement Group developed the following goals and objectives for an enforcement program.

Goal: An effective enforcement system that ensures that the possible gains from violating rules does not exceed the risks of violation penalties and that the costs of enforcement are in balance with the final outcome

Objectives:

A. Develop reasonably enforceable regulations that are not overly complex
B. Ensure that catch, landings, and deliveries are properly recorded
C. Ensure that IFQ is held/acquired to cover landings and deliveries
D. Prevent and detect fraud
E. Conduct operations in a cost-effective manner
F. Facilitate joint Federal-state enforcement activities including the complete sharing of data between agencies

Initial Application Fraud Detection

PacFIN data should be used to determine the initial allocations. Any proposed revisions to fish tickets should go through enforcement review. Capability should be built into the data system to screen illegal landings from the fish tickets–possibly focus primarily on gross violators using a threshold value . Other landings that may not qualify toward IFQ should also be screened from use in the determination of catch history (e.g. landings over fleet limits taken by EFP vessels, compensation fish).

IFQ Program Operation

The following enforcement program design elements were used to develop five initial enforcement program options for consideration (Table A-1).

At-Sea Monitors ("Observers"). At-Sea Monitors would be obligated to share information with enforcement personnel in a timely fashion. A camera backup might be considered for at-sea monitors.

With partial at-sea monitoring, require a camera if there is no compliance monitor onboard. If cameras are used to monitor a vessel there can be no discards of any species (e.g. no discards of sea-stars). There are issues associated with chain of custody and costs of reviewing films that would need to be addressed with a camera system. If there is not a camera requirement for vessels not carrying at-sea monitors (i.e. some trips are completely unmonitored while at-sea), adjustments would need to be made to the OY to account for likely illegal discards. An accurate violation factor to apply to the OY would be difficult to assess and would be dependent on the officers ability to detect violations and comparison of observed and unobserved trips.

Retention Requirement. Under a full retention requirement, the role for at-sea monitors would be to ensure that no fish went overboard. Under a partial retention requirement the role for at-sea monitors would be to record information on any discards and ensure that information was entered into a discard recording system, to be debited against IFQ accounts.

Bycatch Reporting System: If at-sea discards are allowed and IFQ is required to cover catch, a bycatch recording system comparable to the landings reporting system would be required to match catch against IFQs.

Landings Tracking System: Either the current fish ticket system could be converted to an electronic system to record close to real time information, or a parallel reporting system could be developed. Reliance on the paper fish-ticket system might work but flexibility of the IFQ system and associated benefits would have to be substantially constrained. The TIQ Enforcement Group believes that landings should be debited against IFQ accounts based on the dock receipt and not what goes on the final fish ticket. How this would work for an electronic fish ticket system or if the paper fish ticket system is used needs to be addressed. If a parallel system for tracking landings is implemented, there would be inconsistencies between the fishticket system and what is reported as landed against IFQs. Under the current cumulative limit system, citations are issued on the basis of the dock receipt.

Shorebased Monitoring: Either 100% of the landings would have to be observed, or the opportunity to observe would have to be provided through an advance-notice-of-landing requirement.

Limited Landing Locations: Limited landing locations would enhance cost-effective enforcement. Enforcement costs would be substantially greater without such limits than with the limits. One way to limit landing locations would be to specify that landings be made only in certain ports. Another way would be to license specific landing sites. Licensing specific sites would ensure that all communities can participate while still gaining enforcement efficiency. There would be facilities standards applied for licensing sites (e.g. activities at the site would have to be arranged such that a shorebased monitor can observe the off-loading and weighing activity at the same time).

Electronic IFQ Tracking System: Regardless of other elements of the system, an electronic IFQ tracking system would be required such that an enforcement officer in the field can determine the current IFQ account balances for a particular vessel.

With only partial at-sea monitoring and no full retention requirement, the Enforcement Group's initial assessment is that compliance would start to break down. If the IFQ were specified to cover catch instead of landings, expected compliance would likely be similar to the current system, except instead of existing cumulative landings limits there would be IFQs.

Databases would need to be built and communication equipment provided to go with the personnel requirements of the enforcement program.

Options from Public Comment Period: TO BE PROVIDED

A.9.0 Cost Recovery/Sharing and Rent Extraction

Fees or taxes can be used for cost recovery and to capture for the public some of the value fishers gain through use of the public resource (rents). Fees and taxes on transfers should not be so large as to eliminate transfers and the attendant benefits derived from establishing a market for harvest privileges (NRC, 1999, pg. 213). Moreover, because such charges would affect the value at which IFQ trades in the market place, they should be established at the start of the program rather than added on at a later time after investments have already been made (NRC, 1999, pg. 213).

Section 303(d)(5)(b) of the MS Act requires that any new program "provides for . . . fees . . . to recover actual costs directly related to . . . enforcement and management [of the new IFQ program]."

Section 304(d)(2)(A)[3/] states that the "Secretary is authorized and shall collect a fee to recover the actual costs directly related to the management and enforcement of any–(i) individual fishing quota program; and (ii) community development quota program that allocates a percentage of the total allowable catch of a fishery to such a program." Such a fee is not to exceed 3 percent of the exvessel value of the fish harvested under the program. Section 304(d)(2)(C)(ii) allows a state to receive up to 33 percent of any fee collected in relation to a community development program to reimburse the state for related management and enforcement costs.

The 3% fee currently authorized under the MS Act may not be sufficient to recover all direct costs related to the IFQ program. The NRC (1999, pg. 214) recommends an increase in the cap to above 3%.

3/ Section 304(d)(1) states that "The Secretary shall by regulation establish the level of any fees which are authorized to be charged pursuant to section 303(b)(1). The Secretary may enter into a cooperative agreement with the States concerned under which the States administer the permit system and the agreement may provide that all or part of the fees collected under the system shall accrue to the States." Section 303(b)(1) authorizes the charging of fees for permits for fishing vessels, operators and processors (first receivers).

Noting that for many resources the government captures a significant portion of the rent above cost recovery (timber, oil, etc), the NRC recommends that MS Act be amended to allow such cost recover from fisheries and that the collected rents be placed in funds dedicated to improving the fisheries and the fishing communities dependent on them (NRC, 1999, pg. 215). One means of extracting such rents would be a tax on first transfer of the IFQ (NRC, 1999, pg. 214). The tax would serve a dual purpose of reducing the socially objectionable windfall and collecting rents.[4/] Another means of cost recover and collecting rents would be a two-fee system. Under such a system a per IFQ share fee might be levied to recover program costs and a tax per pound of landing charged to recover rents (NRC, 1999, pg. 215).

TIQC Recommendations: Options for further consideration

1. Landings Fee (max of 3% under current MS Act)
2. Privatization of Elements of the Management System
    - Monitoring IFQ Landings (e.g. industry pays for their own compliance monitors)
    - Fish Tickets
    - Stock Assessments

The TIQC discussed the potential of using an auction to provide for an initial influx of revenue to support program startup costs.

TIQC Considered But Rejected Options: None identified.

Options from Public Comment Period: TO BE PROVIDED

A.10.0 Penalties

The NRC report to Congress on IFQ programs recommends a set of graduated sanctions:

> "Administratively imposed sanctions should be established for minor violations with specified increase in penalties for each additional offense. Criminal penalties (jail sentences and/or seizure of catch, vessel, and equipment and forfeiture of quota) should be reserved for serious offenders and for intentional falsification of reports." (NRC, 1999, pg. 217)

Consideration needs to be given to the likely effect of a set of penalties on the incentive to commit more serious crimes. For example, a severe penalty on landing incidental catch for which no IFQ were held would create incentive for discards, whereas penalizing by deducting any overage from a subsequent year's IFQ would substantially reduce that incentive (NRC, 1999, pg. 217)

Civil penalties for MS Act violations are limited to $100,000 for each violation and permit restriction, denial, suspension or revocation (MS Act, Section 308). Criminal penalties are

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4/ A first transfer tax would have to be carefully structured so that mock transfers at lower than market values could not be used to minimize windfall payment. If a zero-rent auction were in place, prices from that auction might be used to determine taxes to be applied at first transfer.

punishable by a fine of not more than $100,000, or imprisonment for not more than 6 months unless such acts involve threats to observers or enforcement officers, in which case the penalties may reach $200,000 and 10 years imprisonment (MS Act, Section 309). Criminal penalties include knowingly and willfully submitting to a Council, the Secretary, or the Governor of a State false information regarding any matter that the Council, Secretary, or Governor is considering in the course of carrying the MS Act (MS Act, Section 307).

TIQC Recommendations: The TIQC was generally supportive of strong sanctions for violators.
TIQC Considered But Rejected Options: None identified.

TIQ Enforcement Group Recommendations: A situation should not be created in which it is cheaper to catch fish in a manner that violates the IFQ program and incur penalties than to acquire the IFQ needed to cover catch or otherwise comply with the program. Situation wherein a legal participant incurs greater operational costs than a violator are viewed as inequitable and reduce program compliance.

Illegal overages should be landed and forfeited and additional enforcement action possibly taken. Illegal overages should be debited against the IFQ holders account and fishing suspended until they are covered, thereby ensuring that compliance would have been less expensive than violating program rules (with respect to the trip on which the illegal overage occurred).

Options from Public Comment Period: TO BE PROVIDED

A.11.0 Procedures for Program Performance Monitoring, Review, and Revision (MS Act (d)(5)(A))

Section 303(d)(5)(A) of the MS Act requires that any new program "establishes procedures and requirements for the review and revision of the terms of any .. .[program], (including any revisions that may be necessary once a national policy with respect to individual fishing quota programs is implemented), and, if appropriate, for the renewal, reallocation, or reissuance of individual fishing quotas."

Noting the need for the nation to learn from its mistakes and successes in order to improve management, the NRC has recommended the promulgation of guidelines for monitoring IFQ program effectiveness (NRC, 1999, pg. 218). A monitoring and evaluation program for short- and long-term impacts should be included as part of the initial program design (NRC, 1999, pg. 198). The program should include a clear timetable, criteria to be used in evaluation, and steps to be taken if the programs do not meet these criteria (NRC, 1999, pg. 221). At a minimum, monitoring the effectiveness of an IFQ program should involve maintaining a central registry or shareholders and share transactions (including the value of such transactions); assessing the biological status of the stock, measuring economic performance and characteristics of commercial and recreational fisheries and subsistence patterns; assessing performance of the IFQ market; collecting data on administrative and enforcement costs, and monitoring translocational effects on other fisheries (NRC, 1999, pg. 218). Additionally, annual reports should be provided describing trends in the fishery and effects of the IFQ program (NRC, 1999, pg, 222).

The NRC report also recommends that to lay the groundwork for the impact review, a preliminary study be conducted of relevant socioeconomic aspects of a fishery prior to the design of the management program (NRC, 1999, pg. 198). Such information is contained in recent groundfish programmatic EISs, the EISs for annual specifications and rebuilding plans, and in baseline description documents such as the community description produced by the EFIN program of PSMFC.

Sunset provisions signify the need to reevaluate an existing law or policy after a period to ensure that they are best achieving program objectives. However, with respect to IFQ programs, the NRC report identifies that sunset provisions are fundamentally inconsistent with the nature of IFQs and may be counter productive to their purpose (NRC, 1999, pg. 201).

While sunset provisions are not recommended, it is recommended that consideration be given to the issuance of cascading fixed term entitlements. This system works by issuing IFQ for a long but limited duration (e.g. 30 years). The program is then reviewed and if adjustments are needed, new IFQ are defined with a different set of privileges and obligations. IFQ holders are given the option of switching over to the new IFQ prior to the expiration of their existing shares or waiting until their existing shares expire. If they switch prior to the expiration of their existing shares, the new shares would be valid for another 30 years commencing with the date on which they switch. The recommendation for consideration of this design feature is not a recommendation that this type of feature should necessarily be incorporated.

Criteria on which to base program performance need to be developed. Such criteria should probably be derived from program goals and objectives.

<u>TIQC Recommendations:</u> The program should include a review period, built in performance monitoring, and opportunity for adjustments to the program.

<u>TIQC Considered But Rejected Options:</u> The committee recommends that automatic sunset provisions for the program not be considered. Sunset provisions make the fishery less stable and make investment planning more difficult.

<u>Options from Public Comment Period</u>: TO BE PROVIDED

A.12.0 Data Collection

MS Act 303(a)(8) states that fishery management plans must assess and specify the nature and extent of scientific data which is needed for effective implementation of the plan. Section A.11.0 discusses the need for ongoing assessments of the status of the program and its impacts in order to monitor and make changes required to meet the original objectives. The NRC (1999, pg. 198) recommends these assessments be incorporated as part of the IFQ program design.

The NRC recommendations state that Councils and NMFS should ensure that long-term routine data collection and studies be initiated that are complementary to data collection for IFQ monitoring (NRC, 1999, pg. 218). Further, the NRC states that this data collection should occur separate from the consideration of specific management alternatives for a fishery and should facilitate evaluation of impacts of various allocation actions, including IFQs (NRC, 1999, pg. 199).

The issue of whether industry provision of data should be mandatory or voluntary will likely be addressed under this design element. Mandatory industry compliance provisions are included as part of the data collection provisions of the Alaska crab rationalization program. The Alaska program provisions are specific as to the data elements to be provided and include draft survey instruments.

The TIQ Analytical Team will be asked to develop specific recommendation for data collection elements to be included as options for the IFQ program.

TIQC Recommendations: None identified.
TIQC Considered But Rejected Options: None identified.

Options from Public Comment Period: TO BE PROVIDED

A.13.0 Initial IFQ Allocation

Section 303(d)(5)(C) of the MS Act requires that any new IFQ program "provides for a fair and equitable allocation of individual fishing quotas, . . ." Initial allocations are the most controversial aspect of IFQ programs. Over the long run, performance of the program does not depend substantially on the initial allocation. However, the initial allocation does distribute wealth. A substantial portion of a common opportunity (the capture of fish) is converted to private wealth through the creation of a marketable fishing privilege. Even though the IFQ is revocable without compensation, its function as the near equivalent of a private asset is evidenced by the value placed on it in the market place. When IFQ is awarded without charge, the initial recipient of IFQ receives an unearned asset and income upon sale or lease of that asset.[5/]

Within the context of current West Coast license limitation system, the creation of a IFQ would redistribute wealth through three mechanisms:

(1) the value of the asset received by the initial recipient (value in excess of any payment for IFQ issuance);
(2) the expenditure on IFQ that would be required of those who do not receive enough IFQ to enable them to maintain the stream of net revenue associated with current operations (or, if the choice is made not to acquire additional IFQ, the reduced net revenue stream); and
(3) a reduction in the value of the existing LE permits due to the separation, redefinition and reallocation of the bundle of fishing privileges previously associated with the permit.

[5/] This unearned income is regarded by many as an unfair windfall (recovery of windfall and extraction of rents is addressed in Section A.9).

In many cases, the same individual may be subject to changes in wealth through all three mechanisms. The greater the degree to which the initial distribution of IFQ does not match the existing distribution of human and physical capital that exists in the fishery, the greater the disruption costs associated with implementation of the program. However, these disruption costs would be a short-term phenomena which would not substantially affect the long-term performance of the program. In addition to disruption costs, there may be longer-term impacts on shifts of power between participants in the fishery, changing the composition of the stakeholders involved in managing the fishery. Initial recipients may be in a better position to obtain loans to buy additional quota than others in the fishery (NRC, 1999, pg. 202).

The NRC recommends that "the councils consider a wide range of initial allocation criteria and allocation mechanisms in designing IFQ program .. . " and more broadly consider ". . . (1) who should receive initial allocation, including crew, skippers, and other stakeholders (councils should define who are included as stakeholders); (2) how much they should receive; and (3) how much potential recipients should be required to pay for the receipt of initial quota (e.g. auctions, windfall taxes)." (NRC, 1999, pg. 203). Councils should "avoid taking for granted the option of 'gifting' quota shares to the present participants in the fishery, just as they should avoid taking for granted that vessel owners should be the only recipients and historical participation the only measure of what each deserves. Council's should consider using auctions, lotteries, or a combination of mechanisms to allocate initial shares of quota" (NRC, 1999, pg. 207).

A.13.1 Qualifying Criteria: Membership in an Eligible Group

The NRC reports notes that vessel owners are usually the recipients of initial allocation and makes the following recommendations with respect to allocation to other fishery participants (NRC, 1999, pgs. 202-207).

Groups (Other than Vessel Owners)	Summary of NRC Recommendation
Skippers and Crew Allocations	Consider where appropriate. Lack of detailed catch data is not a reason to forgo this option as equal allocation is an option. It may be less appropriate in industrial fisheries that do not involve crew members as co-venturers in the same sense as other fisheries.
Processor Allocation	No compelling reason to include or exclude processors from an initial allocation.
Communities	Consider initial allocations of IFQ to communities. Some communities may be heavily dependent on fishing for social, cultural, and economic values and/or are lacking in alternative economic opportunities.
Public	Consider auctions, lotteries or combinations of mechanisms to allocate initial shares. Avoid taking for granted the option of "gifting" IFQ.

Unless some common point system is developed that can be applied across groups, for each group to be included in the initial allocation there would need to be a determination of the amount of IFQ to be divided among members of the group.

TIQC Recommendations:

Options identified for further consideration:

1. Allocate IFQ to Current Permit Owners
2. Allocate IFQ to Vessel Owners
3. Allocate IFQs to Permit-Owners/Vessel-Owners/Processors (consider all combinations - allocate to ownership at the time of initial allocation, where relevant)
4. Allocate to High Bidder in Auction (eligibility rules for participation to be developed)

TIQC Considered But Rejected Options:

1. Allocate IFQ to those who owned the permit at time of landings
2. Allocate to lottery entrant (eligibility rules for participation to be developed)
3. Allocate to crew or skippers.
4. Allocate to communities.

Options from Public Comment Period: TO BE PROVIDED

A.13.2 Qualifying Criteria: Recent Participation

Recent participation requirements can be used to place more weight on recent participation and ensure that current participants benefit from allocations rather than those who may have left the fishery. To some extent, an allocation that places greater weight on recent participation than participation in the distant past may reduce disruptive effects of the initial allocation.

TIQC Recommendations:

The TIQC developed options that might apply to harvesters or processors in order to qualify for an initial allocation of IFQ.

Option identified for further consideration:

1. No recent participation requirement
2. Recent participation required to be eligible for an initial allocation.
   (All permits would still be eligible to fish IFQ acquired through transfer after initial IFQ issuance.)

A recent participation requirement necessitates establishing a recent participation qualification period. Options identified for further consideration:

2a. 1998-2003 (# of trips and/or # of yrs required, to be specified)
2b. 2000-2003 (small footrope period, # of trips and/or # of yrs required, to be specified)
Recent participation in either the shoreside or at-sea fisheries would suffice to meet minimum landing requirements for shoreside or at-sea IFQ, if such a distinction is made.

Number of Unfished Permits by Consecutive Period (NMFS NWR, 3/9/04):

Period	Number of Permits Not Fished During the Period	Year	Number of Permits Not Fished During the Year
1998-2003	5	1998	18
1999-2003	7	1999	14
2000-2003	13	2000	20
2001-2003	24	2001	32
2002-2003	33	2002	40
2003	40	2003	40

TIQC Considered But Rejected Options: None identified.

Options from Public Comment Period: TO BE PROVIDED

A.13.3 Allocation "Formula" (Size of Individual Allocations)

In determining the amount of initial allocation, the NRC report (1999, pg. 224) encourages consideration of stewardship and other potential criteria in addition to catch history. The TIQC developed some preliminary recommendations for elements of formulas to allocate IFQ among permits and processors (1st buyers). If other groups are to qualify, such as those described in Section 13.1, IFQ allocation formula would have to be developed for each group. Additionally, there would need to be an allocation of IFQ among the groups before it is subdivided within the groups

Vessel/Permit Related Allocation

TIQC Recommendations:

Options identified for further consideration

1. Determined in an auction.
2. Some mix of criteria that might include
    a. catch history (for certain species, consider allocating a portion based on an estimate of bycatch).
    b. equal sharing
        i. equally allocate QS represented by catch history of those vessels/permits bought back among those vessels/permits with catch history for the species.
        ii. equally allocate incidental catch species.
        iii. some other equal sharing basis.
3. Catch history only (for certain species, consider allocating a portion based on an estimate of bycatch).

TIQC Considered But Rejected Options: Vessel length.

Options from Public Comment Period: TO BE PROVIDED

Processor (1st Buyer) Allocation

<u>TIQC Recommendations:</u>

Options identified for further consideration:

1. 1st receiver purchase history of groundfish trawl landings (lbs)
2. Determined in an auction

   Note: Processors may also receive some IFQ based on their ownership of vessels (vertical integration).

<u>TIQC Considered But Rejected Options:</u> None identified.

<u>Options from Public Comment Period</u>: TO BE PROVIDED

A.13.4 Catch History: Species/Species Groups to Be Used for Allocation

For some species, species composition information would need to be applied to develop allocations based on the catch history. This would entail application of fleet average species compositions to categories of species taken by individual vessels (e.g. applying fleet average species compositions to landings recorded as "Slope Rockfish").[6/] The other apparent choice would involve allocating all species based on larger levels of catch aggregation (e.g. allocating each individual slope rockfish species based on a permit's catch history of all slope rockfish species combined; or in the extreme allocating each individual nonwhiting species based on a permit's catch history for all nonwhiting species combined).

<u>TIQC Recommendations:</u>

1. Allocate species IFQ based on relative total groundfish catch.
2. Allocate species IFQ based on relative catch of each species.

<u>TIQC Considered But Rejected Options:</u> None identified.

<u>Options from Public Comment Period</u>: TO BE PROVIDED

A.13.5 Catch History: Allocation Periods

If allocation is to be based on landings history a period would need to be used to define what landings count toward catch history.

<u>TIQC Recommendations:</u> The TIQC recommended options which would allow/require applicants to drop a number of worst years from their catch history. Option identified for further consideration:

6/ Such species composition information is often specific for a given area and time period.

Allocation Period Option	Number of Years in Allocation Period	Number of Worst Years to Drop from Catch History Option A	 Option B
1. 1994-2003	10	None	2
2. 1994-1999	6	None	1
3. 2000-2003	4	None	None
4. 1998-2003	6	None	1

The issue of how bycatch might be included in catch history and the impacts of including or not including it should be discussed in the analysis. Another consideration is the allocation of IFQ for overfished species. Allocating overfished species on the basis of landings would reward those vessels that have fished less cleanly than others.

If all years are weighted evenly, years when there was more fishing opportunity would have a greater influence on the amount of IFQ allocated than years with less fishing opportunity. Since there has been less fishing opportunity in recent years, recent years would have less influence than years in the more distant past. The TIQC recommends that an option be developed which would weight the catch history between years such that catch representing 0.05% of the landings in 1994 would receive a weight equal to catch representing 0.05% of the landings in 2003.

Groundfish landings in thousands of tons by all limited entry trawlers (buyback and nonbuyback) (NMFS NWR, 3/9/04)

	Shore					
Year	Nonwhiting	Whiting	Total	Mothership (Nontribal)	All Whiting	All Groundfish
1994	46	80	126	93	173	219
1995	50	75	125	41	115	166
1996	52	85	137	47	132	184
1997	47	87	135	50	138	185
1998	34	91	125	50	140	175
1999	33	87	120	48	135	167
2000	29	89	117	47	136	164
2001	25	73	99	36	109	135
2002	25	46	71	27	72	98
2003	22	55	78	26	81	104

The following is a discussion of the reasoning behind some of the years selected to delineate the catch history qualifying periods.

1994. The earliest year for the allocation period options was set at 1994 because this was the first year of the license limitation program. If the program is to allocate based on permit history, there would be no permit history before 1994 unless it is determined that permit history includes vessel history prior to that time. However, given the complexities of the qualification requirements for the original license limitation program, history prior to 1994 may be difficult to track and treat in an equitable fashion. For example, LE permits were issued to vessels that replaced qualifying vessels prior to the start of the license limitation program. Additionally, LE permits were granted to vessels under construction or conversion on a par with vessels that qualified with 1984-1988 catch history. The use of vessel catch history prior to 1994 may be viewed as inconsistent with the issuance of permits with equivalent rights for vessels under construction or conversion through 1994 and those with a 1984-1988 catch history, the former having had no opportunity to establish catch history.

1999/2000. Regulations prior to 2000 allowed extensive use of large and small footropes on trawl gear. In 2000, the imposition of restrictions on the use of large footropes shifted trawl effort away from reef and rocky bottom substrates. This substantially changed fishing opportunities and the mix of species landed. An allocation period that stops in 1999 would place more emphasis on the mix of opportunities that was available when small and large footropes could be used. The period after 2000 would reflect how vessels operated under the opportunities present in the most recent management regime.

1998. This year is used to establish a six year period (1998-2003) that includes an amount of time of sufficient length to allow vessels to demonstrate their level of activity in the fishery and landings mix. By shortening the allocation period it puts more emphasis on recent participation patterns. The license limitation program used a 4 year period for vessels to demonstrate a pattern of activities that would qualify them for a permit. The longer period that is created by using 1998 counts catch history that includes two years prior to the large footrope restrictions and four years under the large footrope restriction.

2003. In order to prevent speculative effort and the consequent exacerbated management problems, a control date of November 6, 2003 was announced. This announcement put fishery participants on notice that fishing after 2003would not be counted toward qualifying for IFQ. Since there was little fishing opportunity in the last 2 months of 2003, all of 2003 is being included in the allocation period.

<u>TIQC Considered But Rejected Options:</u> None identified.

<u>Options from Public Comment Period</u>: TO BE PROVIDED

A.13.6 Catch History: Combined Permits and Other Exceptional Situations

Under the Pacific Coast license limitation program, permits may be combined to create single permits with a larger vessel size endorsement. This is different from, and sometimes confused with, registration of multiple permits for a singe vessel (permit stacking). When permit stacking occurs, permits remain distinct from one another. For the fixed gear sablefish endorsement and tier qualification requirements, catch history was considered to be transferred with the permit; and, when multiple permits were combined to create a single permit with a larger size endorsement, the catch history of all of the combined permits were considered to accrue to the resultant permit.

Other categories of catch to be considered are:
  illegal catch
  catch in excess of trip limits authorized under an EFP
  compensation fish (fish taken as payment by vessels assisting in research)

TIQC Recommendations:

Option identified for further consideration:

1. Consider all catch history of the permits that have been combined to be part of the catch history of the permit resulting from the combination.
2. The combined permit would have only the catch history associated with its permit number (catch history of other permits with which it has been combined would not accrue to the combined permit).

The TIQC recommended illegal catch not be counted toward qualifying for a permit.

TIQC Considered But Rejected Options: None identified.

Options from Public Comment Period: TO BE PROVIDED

A.13.7 Initial Issuance Appeals Process

An appeals process may be needed to address disputes between permit applicants and the NMFS Limited Entry Permits office over landings records or other qualification criteria.

For the groundfish license limitation program there were numerous disputes over landings records and other qualifying criteria. For the license limitation program there were thresholds that had to be reached and, depending on whether that threshold was reached, a permit was or was not issued. As part of the appeals process, a Council Limited Entry Permit Review Board was convened composed of members of industry.

For the fixed gear tiered sablefish endorsement program there was also a threshold landing history that had to be reached to qualify for a particular tier. However, the only criteria considered was total landings and the thresholds were set at levels such there was a considerable gap between the permit with the highest catch history in the Tier 2 or Tier 3 group and the amount of catch history required to qualify for the next highest tier. There were no appeals associated with administration of this program.

For an IFQ program qualification requirement based on catch history, on the one hand any additional poundage that can be demonstrated through the challenge of a fish ticket would lead to some additional quota for the applicant, on the other hand the amount of benefit may be small relative to the cost of the appeal, unless there are a large number of landings records for the individual to dispute. The exception to this might be a recent participation requirement, which may be presented as a threshold amount of catch history that an applicant must demonstrate before being able to qualify for any IFQ. In this case, applicant coming close to the threshold but falling short may have considerable incentive to initiate appeals.

TIQC Recommendations: None identified.
TIQC Considered But Rejected Options: None identified.

TIQ Enforcement Group Recommendations: Require that any proposed revisions to fishtickets undergo review by state enforcement personal prior to finalization of the revisions.

Options from Public Comment Period: TO BE PROVIDED

A.14.0 Some Other Possible Provisions

The above categories were based on design elements that the TIQC identified for consideration. There may be other types of design elements for an IFQ program that are not covered in the above sections. This section is a placeholder for such provisions as may come forward in other parts of the scoping process. For example, owner-on-board provisions were rejected by the TIQC committee because they would be too complex, there are substantial numbers of trawl vessels for which owners are not on-board, and it would be difficult for processors that own permits and vessels. The TIQC's view was that there is no demonstrable conservation or economic benefit from such provisions and unclear social benefits. Design elements such as this, or other such elements that are brought forward during the public comment period, will be included here for Council consideration.

Options from Public Comment Period: TO BE PROVIDED

Table A-1. TIQ Enforcement Group preliminary scoping of possible enforcement programs.

	Program 1	Program 2	Program 3	Program 4	Program 5
At-Sea Monitoring	100% (Compliance Monitors)	100% (Compliance Monitors)	100% (Compliance Monitors or Camera)	Partial Compliance Monitor Coverage	None
Retention Requirement	Full Retention	Discards Allowed	Full if Camera, Discards Allowed if Compliance Monitor Present	Discards Allowed if Compliance Monitors Present	Full Retention (ABC held in reserve)
Bycatch Reporting System Comparable to Landing Tracking System	None	System Needed (electronic)	System Needed (electronic)	System Needed (electronic)	None
Landing Tracking System	Electronic	Electronic	Parallel Electronic Federal System (maintain paper fishtickets)	Parallel Electronic Federal System (maintain paper fishtickets)	Paper Fishticket
Shorebased Monitoring	100%	Monitoring Opportunity (Based on Notice)	Monitoring Opportunity (Based on Notice)	Monitoring Opportunity (Based on Notice)	Monitoring Opportunity (Based on Notice)
Vessel Provides Advance Notice of Landing	Yes	Yes	Yes	Yes	Yes
Limited Landing Locations	Site Licenses	Specified Ports	Site Licenses	Specified Ports	Specified Ports
Electronic IFQ Reporting	Yes	Yes	Yes	Yes	Yes

VMS is an assumed component of the enforcement environment.

Small vessel provision: small vessels may apply for an exemption and carry a camera instead of an compliance monitors.

Appendix B - Determining Environmental Significance of NOAA Actions

NOAA 216-6 Guidelines
SECTION 6. INTEGRATING NEPA INTO NOAA LINE OFFICE PROGRAMS.

.01 Determining the Significance of NOAA's Actions. As required by NEPA Section 102(2)(C) and by 40 CFR 1502.3, EISs must be prepared for every recommendation or report on proposals for legislation and other "major Federal actions" significantly affecting the quality of the human environment. A significant effect includes both beneficial and adverse effects. Federal actions, including management plans, management plan amendments, regulatory actions, or projects which will or may cause a significant impact on the quality of the human environment, require preparation of an EIS. Following is additional explanation per the definitions used in determining significance.

a. "Major Federal action" includes actions with effects that may be major and which are potentially subject to NOAA's control and responsibility. "Actions" include: new and continuing activities, including projects and programs entirely or partly financed, assisted, conducted, regulated, or approved by NOAA; new or revised agency rules, regulations, plans, policies, or procedures; and legislative proposals. Refer to 40 CFR 1508.18 for additional guidance.

b. "Significant" requires consideration of both context and intensity. Context means that significance of an action must be analyzed with respect to society as a whole, the affected region and interests, and the locality. Both short- and long-term effects are relevant. Intensity refers to the severity of the impact. The following factors should be considered in evaluating intensity (40 CFR 1508.27):

1. impacts may be both beneficial and adverse -- a significant effect may exist even if the Federal agency believes that on balance the effect will be beneficial;

2. degree to which public health or safety is affected;

3. unique characteristics of the geographic area;

4. degree to which effects on the human environment are likely to be highly controversial;

5. degree to which effects are highly uncertain or involve unique or unknown risks;

6. degree to which the action establishes a precedent for future actions with significant effects or represents a decision in principle about a future consideration;

7. individually insignificant but cumulatively significant impacts;

8. degree to which the action adversely affects entities listed in or eligible for listing in the National Register of Historic Places, or may cause loss or destruction of significant scientific, cultural, or historic resources;

9. degree to which endangered or threatened species, or their critical habitat as defined under the Endangered Species Act of 1973, are adversely affected; and

10. whether a violation of Federal, state, or local law for environmental protection is threatened.

11. whether a Federal action may result in the introduction or spread of a nonindigenous species.

c. "Affecting" means will or may have an effect (40 CFR 1508.3). "Effects" include direct, indirect, or cumulative effects of an ecological, aesthetic, historic, cultural, economic, social, or health nature (40 CFR 1508.8).

d. "Legislation" refers to a bill or legislative proposal to Congress developed by or with the significant cooperation and support of NOAA, but does not include requests for appropriations (40 CFR 1508.17). The NEPA process for proposals for legislation significantly affecting the quality of the human environment shall be integrated with the legislative process of the Congress (40 CFR 1506.8).

e. "Human environment" includes the relationship of people with the natural and physical environment. Each EA, EIS, or SEIS must discuss interrelated economic, social, and natural or physical environmental effects (40 CFR 1508.14).

.02 Specific Guidance on Significance of Fishery Management Actions. The following specific guidance expands, but does not replace, the general language in Section 6.01 of this Order. When adverse impacts are possible, the following guidelines should aid the RPM in determining the appropriate course of action. If none of these situations may be reasonably expected to occur, the RPM should prepare an EA or determine, in accordance with Section 5.05 of this Order, the applicability of a CE. NEPA document preparers should also consult 50 CFR 600, Subpart D, for guidance on the national standards that serve as principles for approval of all FMPs and amendments. The guidelines follow.

a. The proposed action may be reasonably expected to jeopardize the sustainability of any target species that may be affected by the action.

b. The proposed action may be reasonably expected to jeopardize the sustainability of any non-target species.

c. The proposed action may be reasonably expected to cause substantial damage to the ocean and coastal habitats and/or essential fish habitat as defined under the Magnuson-Stevens Act and identified in FMPs.

d. The proposed action may be reasonably expected to have a substantial adverse impact on public health or safety.

e. The proposed action may be reasonably expected to adversely affect endangered or threatened species, marine mammals, or critical habitat of these species.

f. The proposed action may be reasonably expected to result in cumulative adverse effects that could have a substantial effect on the target species or non-target species.

g. The proposed action may be expected to have a substantial impact on biodiversity and ecosystem function within the affected area (e.g., benthic productivity, predator-prey relationships, etc).

h. If significant social or economic impacts are interrelated with significant natural or physical environmental effects, then an EIS should discuss all of the effects on the human environment.

i. A final factor to be considered in any determination of significance is the degree to which the effects on the quality of the human environment are likely to be highly controversial. Although no action should be deemed to be significant based solely on its controversial nature, this aspect should be used in weighing the decision on the proper type of environmental review needed to ensure full compliance with NEPA. Socio-economic factors related to users of the resource should also be considered in determining controversy and significance.

Appendix C - FMP Goals, Objectives and National Standards

Table of Contents

Groundfish FMP Goals and Objectives

FMP Goals and Objectives (Including Limited Entry) from Pacific Coast Groundfish Fishery Management Plan For the California, Oregon and Washington Groundfish Fishery As Amended Through Amendment [14]

General FMP Goals and Objectives

2.1 Goals and Objectives for Managing the Pacific Coast Groundfish Fishery

The Council is committed to developing long-range plans for managing the Washington, Oregon, and California groundfish fisheries that will promote a stable planning environment for the seafood industry, including marine recreation interests, and will maintain the health of the resource and environment. In developing allocation and harvesting systems, the Council will give consideration to maximizing economic benefits to the United States, consistent with resource stewardship responsibilities for the continuing welfare of the living marine resources. Thus, management must be flexible enough to meet changing social and economic needs of the fishery as well as to address fluctuations in the marine resources supporting the fishery. The following goals have been established in order of priority for managing the West Coast groundfish fisheries, to be considered in conjunction with the national standards of the Magnuson-Stevens Fishery Conservation and Management Act (Magnuson-Stevens Act).

Management Goals.

Goal 1 - Conservation. Prevent overfishing by managing for appropriate harvest levels and prevent any net loss of the habitat of living marine resources.

Goal 2 - Economics. Maximize the value of the groundfish resource as a whole.

Goal 3 - Utilization. Achieve the maximum biological yield of the overall groundfish fishery, promote year-round availability of quality seafood to the consumer, and promote recreational fishing opportunities.

Objectives. To accomplish these management goals, a number of objectives will be considered and followed as closely as practicable:

Conservation.

Objective 1. Maintain an information flow on the status of the fishery and the fishery resource which allows for informed management decisions as the fishery occurs.

Objective 2. Adopt harvest specifications and management measures consistent with resource stewardship responsibilities for each groundfish species or species group.

Objective 3. For species or species groups which are below the level necessary to produce maximum sustainable yield (MSY), consider rebuilding the stock to the MSY level and, if necessary, develop a plan to rebuild the stock.

Objective 4. Where conservation problems have been identified for nongroundfish species and the best scientific information shows that the groundfish fishery has a direct impact on the ability of that species to maintain its long-term reproductive health, the Council may consider establishing management measures to control the impacts of groundfish fishing on those species. Management measures may be imposed on the groundfish fishery to reduce fishing mortality of a nongroundfish species for documented conservation reasons. The action will be designed to minimize disruption of the groundfish fishery, in so far as consistent with the goal to minimize the bycatch of nongroundfish species, and will not preclude achievement of a quota, harvest guideline, or allocation of groundfish, if any, unless such action is required by other applicable law.

Objective 5. Describe and identify essential fish habitat (EFH), adverse impacts on EFH, and other actions to conserve and enhance EFH, and adopt management measures that minimize, to the extent practicable, adverse impacts from fishing on EFH.

Economics.

Objective 6. Attempt to achieve the greatest possible net economic benefit to the nation from the managed fisheries.

Objective 7. Identify those sectors of the groundfish fishery for which it is beneficial to promote year-round marketing opportunities and establish management policies that extend those sectors fishing and marketing opportunities as long as practicable during the fishing year.

Objective 8. Gear restrictions to minimize the necessity for other management measures will be used whenever practicable.

Utilization.

Objective 9. Develop management measures and policies that foster and encourage full utilization (harvesting and processing) of the Pacific coast groundfish resources by domestic fisheries.

Objective 10. Recognizing the multispecies nature of the fishery and establish a concept of managing by species and gear or by groups of interrelated species.

Objective 11. Strive to reduce the economic incentives and regulatory measures that lead to wastage of fish. Also, develop management measures that minimize bycatch to the extent practicable and, to the extent that bycatch cannot be avoided, minimize the mortality of such bycatch. In addition, promote and support monitoring programs to improve estimates of total fishing-related mortality and bycatch, as well as those to improve other information necessary to determine the extent to which it is practicable to reduce bycatch and bycatch mortality.

Objective 12. Provide for foreign participation in the fishery, consistent with the other goals to take that portion of the optimum yield (OY) not utilized by domestic fisheries while minimizing conflict with domestic fisheries.

Social Factors.

Objective 13. When conservation actions are necessary to protect a stock or stock assemblage, attempt to develop management measures that will affect users equitably.

Objective 14. Minimize gear conflicts among resource users.

Objective 15. When considering alternative management measures to resolve an issue, choose the measure that best accomplishes the change with the least disruption of current domestic fishing practices, marketing procedures, and the environment.

Objective 16. Avoid unnecessary adverse impacts on small entities.

Objective 17. Consider the importance of groundfish resources to fishing communities, provide for the sustained participation of fishing communities, and minimize adverse economic impacts on fishing communities to the extent practicable.

Objective 18. Promote the safety of human life at sea.

[Amended; 7, 11, 13]

Amendment 6: License Limitation Goals and Objectives

14.1.2 Goals and Objectives for Groundfish Limited Entry

The following are the goals and objectives for limited entry adopted by the Council in April 1990. The primary objective directly addresses the overcapacity problem, and the secondary objectives address the ways the Council hopes limited entry will promote achievement of the Council's goals and objectives for the groundfish fishery.

Goals. The goals for the West Coast groundfish fishery limited entry program are to improve stability and economic viability of the industry while recognizing historic participation, meet groundfish management objectives and provide for enforceable laws.

Primary Objective. The primary objective of the limited entry program will be to limit or reduce harvest capacity in the West Coast groundfish fishery.

Secondary Objectives. In pursuit of the primary objective, the following secondary objectives will be addressed:

Economic

- Promote long-term economic stability.
- Increase net returns from the fishery.
- Allow flexibility for combination vessels.

Management

- Stabilize management regimes by reducing need for frequent inseason changes.
- Reduce the cost of management.
- Reduce by-catch and waste.
- Encourage effort in underutilized species fisheries.

Enforcement

- Promote cost-effective enforcement by reducing need for frequent changes and tight trip limits.
- Promote logistically viable enforcement by minimizing need to use regulations such as trip limits or subarea closures which are more difficult to enforce.

Social

- Recognize and accommodate historical participation of those investing their life and resources in the fishery.
- Maintain a mechanism for fishery entrance/exit and flexibility for change in the fleet.
- Reduce conflicts between user groups by limiting or reducing effort competition for the same resource.
- Provide a stable supply of groundfish to the public at a reasonable price.

National Standards from the Magnuson-Stevens Act

EXCERPTS from
Public Law 94-265
As amended through October 11, 1996

TITLE III -- NATIONAL FISHERY MANAGEMENT PROGRAM
SEC. 301. NATIONAL STANDARDS FOR FISHERY 16 U.S.C. 1851
CONSERVATION AND MANAGEMENT

(a) IN GENERAL.--Any fishery management plan prepared, and any regulation promulgated to implement any such plan, pursuant to this title shall be consistent with the following national standards for fishery conservation and management:
98-623
(1) Conservation and management measures shall prevent overfishing while achieving, on a continuing basis, the optimum yield from each fishery for the United States fishing industry.
(2) Conservation and management measures shall be based upon the best scientific information available.
(3) To the extent practicable, an individual stock of fish shall be managed as a unit throughout its range, and interrelated stocks of fish shall be managed as a unit or in close coordination.
(4) Conservation and management measures shall not discriminate between residents of different States. If it becomes necessary to allocate or assign fishing privileges among various United States fishermen, such allocation shall be (A) fair and equitable to all such fishermen; (B) reasonably calculated to promote conservation; and (C) carried out in such manner that no particular individual, corporation, or other entity acquires an excessive share of such privileges.
104-297
(5) Conservation and management measures shall, where practicable, consider efficiency in the utilization of fishery resources; except that no such measure shall have economic allocation as its sole purpose.
(6) Conservation and management measures shall take into account and allow for variations among, and contingencies in, fisheries, fishery resources, and catches.
(7) Conservation and management measures shall, where practicable, minimize costs and avoid unnecessary duplication.
104-297
(8) Conservation and management measures shall, consistent with the conservation requirements of this Act (including the prevention of overfishing and rebuilding of overfished stocks), take into account the

importance of fishery resources to fishing communities in order to (A) provide for the sustained participation of such communities, and (B) to the extent practicable, minimize adverse economic impacts on such communities.

104-297

(9) Conservation and management measures shall, to the extent practicable, (A) minimize bycatch and (B) to the extent bycatch cannot be avoided, minimize the mortality of such bycatch.

104-297

(10) Conservation and management measures shall, to the extent practicable, promote the safety of human life at sea.

Additional Magnuson-Stevens Act Considerations (303(b)(6))

The following must be taken into account in designing limited access systems:

(A) present participation in the fishery
(B) historical fishing practices in, and dependence on, the fishery
(C) the economics of the fishery
(D) the capability of fishing vessels used in the fishery to engage in other fisheries,
(E) the cultural and social framework relevant to the fishery and any affected fishing communities, and
(F) any other relevant considerations.
MS Act 303(b)(6)

Appendix D - Ad Hoc Individual Quota Committee

Membership:

Dave Hanson-PSMFC-Chair
Steve Bodner-Trawler
Alan Hightower-Trawler
Marion Larkin-Trawler
Pete Leipzig-Trawl Rep
Brad Pettinger-Trawler
Richard Young-Trawler
Chris Garbrick-Whiting Trawler
Dave Jincks-Whiting Trawler
Jan Jacobs-Whiting Catcher-Processor
Dale Myer-Whiting Mothership
Joe Plesha-Whiting Processor
Jay Bornstein-Processor
Frank Dulcich-Processor
Steve Joner-Tribal
Dorothy Lowman-Environmental
Dayna Matthews -Enforcement

Appendix E - IQ Control Date

1563-1564 Federal Register / Vol. 69, No. 6 / Friday, January 9, 2004 / Proposed Rules

DEPARTMENT OF COMMERCE

National Oceanic and Atmospheric Administration

50 CFR Part 660

[Docket No. 031230329–3329–01; I.D.120903B]RIN 0648–AR82

Fisheries Off West Coast States and inthe Western Pacific; Pacific CoastGroundfish Fishery; Advance Notice ofProposed Rulemaking regarding a Trawl Individual Quota Program and to Establish a Control Date

AGENCY: National Marine Fisheries Service (NMFS), National Oceanic and Atmospheric Administration (NOAA), Commerce.

ACTION: Advance notice of proposed rulemaking; notice of control date for the Pacific Coast groundfish fishery; request for comments.

SUMMARY: The Pacific Fishery Management Council (Council) is considering implementing an individual quota (IQ) program for the Pacific Coast groundfish limited entry trawl fishery off Washington, Oregon and California. The trawl IQ program would change management of harvest in the trawl fishery from a trip limit system with cumulative trip limits for every 2–month period to a quota system where each quota share could be harvested at any time during an open season. The trawl IQ program would increase fishermen’s flexibility in making decisions on when and how much quota to fish. This document announces a control date of November 6, 2003, for the trawl IQ program. The control date for the trawl IQ program is intended to discourage increased fishing effort in the limited entry trawl fishery based on economic speculation while the Pacific Council develops and considers a trawl IQ program.

DATES: Comments may be submitted in writing by February 9, 2004.

ADDRESSES: Comments may be mailed to Don Hansen, Chairman, Pacific Fishery Management Council, 7700 NE Ambassador Place, Suite 200, Portland, OR 97220–1384.

FOR FURTHER INFORMATION CONTACT: The Pacific Fishery Management Council at 866–806–7204; or Bill Robinson at 206–526–6140; or Svein Fougner at 562–980–4000.

SUPPLEMENTARY INFORMATION: The Pacific Fishery Management Council (Pacific Council) established under section 302(a)(1)(F) of the Magnuson- Stevens Fishery Conservation and Management Act (16 U.S.C. 1852(a)(1)(F)) is considering implementing an individual quota (IQ) program for the Pacific Coast groundfish limited entry trawl fishery off Washington, Oregon and California. The Pacific Coast groundfish limited entry trawl fishery is managed under the Pacific Coast Groundfish Fishery Management Plan (FMP) approved on January 4, 1982 (47 FR 43964, October 5, 1982), as amended 15 times. Implementing regulations for the FMP and its amendments are codified at 50 CFR part 660, subpart G. Additional implementing regulations can be found in the specifications and management measures for the Pacific Coast groundfish fishery published in the Federal Register, as amended through inseason actions. If the Pacific Council recommends and NMFS adopts a trawl IQ program, the program would be implemented through a proposed and final rulemaking, and possibly an FMP amendment.

The trawl IQ program would change management of harvest in the trawl fishery from a trip limit system with cumulative trip limits per vessel for every 2 month period to a quota system where each quota share could be harvested at any time during an open season. The trawl IQ program would increase fishermen’s flexibility in making decisions on when and how much quota to fish.

With the lapse of the moratorium on new individual fishing quotas (IFQs) in October 2002, the Regional Fishery Management Councils may propose new IFQs and the Secretary of Commerce will review them for consistency with the Magnuson-Stevens Fishery Conservation and Management Act (Magnuson-Stevens Act), in particular section 303(d).

In advance of a rulemaking on the trawl IQ program, this document announces a control date of November 6, 2003, for the trawl IQ program. The control date for the trawl IQ program is intended to discourage increased fishing effort in the limited entry trawl fishery based on economic speculation while the Pacific Council develops and considers a trawl IQ program. This control date will apply to any person potentially eligible for IQ shares. Persons potentially eligible for IQ shares may include vessel owners, permit owners, vessel operators, and crew. The control date announces to the public that the Pacific Council may decide not to count activities occurring after the control date toward determining a person’s qualification for an initial allocation or determining the amount of initial allocation of quota shares. Groundfish landed from limited entry trawl vessels after November 6, 2003, may not be included in the catch history used to qualify for initial allocation in the trawl IQ program.

Implementation of any management measures for the fishery will require amendment of the regulations implementing the FMP and may also require amendment of the FMP itself. Any action will require Council development of a regulatory proposal with public input and a supporting analysis, NMFS approval, and publication of implementing regulations in the Federal Register. The Pacific Council has established an ad-hoc Groundfish Trawl Individual Quota Committee to make recommendations on the development of IQs in the groundfish fisheries. Meetings of this committee are open to the public. Interested parties are urged to contact the Pacific Council office to stay informed of the development of the planned regulations. Fishers are not guaranteed future participation in the groundfish fishery, regardless of their date of entry or level of participation in the fishery.

This advance notice of proposed rulemaking has been determined to be not significant for purposes of Executive Order 12866.

Authority: 16 U.S.C. 1801 *et seq.*

Dated: January 6, 2004.

Rebecca Lent,

Deputy Assistant Administrator for Regulatory Programs, National Marine Fisheries Service.

[FR Doc. 04–464 Filed 1–8–04; 8:45 am]

BILLING CODE 3510–22–S

Appendix F - Notice of Intent to Prepare an Environmental Impact Statement

Billing Code 3510-22-S
DEPARTMENT OF COMMERCE
National Oceanic and Atmospheric Administration
50 CFR Part 660
[I.D. 051004B]
Pacific Fishery Management Council; Notice of Intent

AGENCY: National Marine Fisheries Service (NMFS), National Oceanic and Atmospheric Administration (NOAA), Commerce.

ACTION: Notice of intent to prepare an environmental impact statement (EIS); request for comments; preliminary notice of public scoping meetings.

SUMMARY: NMFS and the Pacific Fishery Management Council (Pacific Council) announce their intent to prepare an EIS in accordance with the National Environmental Policy Act (NEPA) of 1969 to analyze proposals that provide dedicated access privileges for participants in the non-tribal Pacific Coast groundfish trawl fishery.

DATES: Public scoping meetings will be announced in the Federal Register at a later date. Written comments will be accepted at the Pacific Council office through August 2, 2004.

ADDRESSES: You may submit comments, on issues and alternatives, identified by [i.d. number] by any of the following methods:

- E-mail: TrawlAccessEIS.nwr@noaa.gov. Include [I.D. number] and enter "Scoping Comments" in the subject line of the message.
- Federal eRulemaking Portal: http://www.regulations.gov.
- Fax: 503-820-2299.
- Mail: Dr. Donald McIsaac, Pacific Fishery Management Council, 7700 NE Ambassador Pl., Suite 200, Portland, OR, 97220.

FOR FURTHER INFORMATION CONTACT: Steve Freese, (Northwest Region, NMFS) phone: 206-526-6113, fax: 206-526-6426 and email: steve.freese@noaa.gov; or Jim Seger, Pacific Fishery Management Council, phone: 503-820-2280, fax: 503-820-2299 and email: jim.seger@noaa.gov.

SUPPLEMENTARY INFORMATION:

Electronic Access

This Federal Register document is available on the Government Printing Office's website at: www.gpoaccess.gov/fr/index/html.

Description of the Proposal

The proposed alternatives to the status quo, which will be the subject of the EIS and considered by the Pacific Council for recommendation to NMFS, are programs that provide dedicated access privileges for participants in the non-tribal Pacific Coast groundfish trawl fishery. The main dedicated access privilege alternative the Pacific Council is considering is an individual fishing quota (IFQ) program for the Pacific Coast groundfish limited entry trawl fishery off Washington, Oregon and California. A trawl IFQ program would change management of harvest in the trawl fishery from a trip limit system with cumulative trip limits for every 2-month period to a quota system where each quota share could be harvested at any time during an open season. A trawl IFQ program would increase fishermen's flexibility in making decisions on when and how much quota to fish. Status quo (no action) will also be considered along with dedicated access privilege and other reasonable alternatives that may be proposed to address issues identified in the problem statement.

At the request of the Pacific Council, NMFS published an Advance Notice of Proposed Rulemaking regarding a Trawl Individual Quota Program and to Establish a Control Date (69 FR 1563, January 9, 2004). This control date for the trawl IQ program is intended to discourage increased fishing effort in the limited entry trawl fishery based on economic speculation while the Pacific Council develops and considers a trawl IQ program. Although the control date notice discussed the development of the trawl IQ program, NMFS and the Pacific Council also plan to consider other dedicated access alternatives.

General Background

The Council implemented a Pacific Coast Groundfish Fishery Management Plan (FMP) in 1982. Groundfish stocks are harvested in numerous commercial, recreational, and tribal fisheries in state and Federal waters off the West Coast. The non-tribal commercial seafood fleet taking groundfish is generally regulated as three sectors: Limited entry trawl, limited entry fixed gear, and directed open access. Groundfish are also harvested incidentally in non-groundfish commercial fisheries, most notably fisheries for pink shrimp, spot and ridgeback prawns, Pacific halibut, California halibut, and sea cucumbers (incidental open access fisheries).

Despite the recently completed buyback program, management of the West Coast groundfish trawl fishery is still marked by serious biological, social, and economic concerns; and discord between fishermen and managers and between different sectors of the fishery, similar to those cited in the U.S. Commission on Ocean Policy's April 2004 preliminary report. The trawl fishery is viewed as economically unsustainable given the current status of the stocks and the various measures to protect these stocks. One major source of discord and concern stems from the management of bycatch, particularly of overfished species as described in the draft programmatic bycatch DEIS. The notice of availability of the DEIS was published in the FEDERAL REGISTER on February 27, 2004 (69 FR 9314). The DEIS is available from the Pacific Council office ((see ADDRESSES). After reviewing the draft programmatic bycatch DEIS the Pacific Council adopted a preferred alternative for addressing bycatch that included IFQ programs. The alternatives to status quo to be evaluated in the dedicated access EIS are amendments to the FMP and associated regulations to address these concerns through the use of dedicated access privileges. The concerns are described in more detail in the following problem statement:

As a result of bycatch problems, considerable harvest opportunity is being forgone in an economically stressed fishery. The trawl groundfish fishery is a multispecies fishery in which fishers exert varying and limited control of the mix of species in their catch. The optimum yields (OYs) for many overfished species have been set at low levels that place a major constraint on the industry’s ability to fully harvest the available OYs of the more abundant target species that occur with the overfished species, wasting economic opportunity. Average discard rates for the fleet are applied to projected bycatch of overfished species. These discard rates determine the degree to which managers must constrain the harvest of targeted species that co-occur with overfished species. These discard rates are developed over a long period of time and do not rapidly respond to changes in fishing behavior by individual vessels or for the fleet as a whole. Under this system, there is little direct incentive for individual vessels to do everything possible to avoid take of species for which there are conservation concerns, such as overfished species. In an economically stressed environment, uncertainties about average bycatch rates become highly controversial. As a consequence, members of fishing fleets tend to place pressure on managers to be less conservative in their estimates of bycatch. Thus, in the current system there are uncertainties about the appropriate bycatch estimation factors, few incentives for the individual to reduce bycatch rates, and an associated loss of economic opportunity related to the harvest of target species.

The current management regime is not responsive to the wide variety of fishing business strategies and operational concerns. For example, historically the Pacific Council has tried to maintain a year-round groundfish fishery. Such a pattern works well for some business strategies in the industry, but there has been substantial comment from fishers who would prefer being able to pursue a more seasonal groundfish fishing strategy. The current management system does not have the flexibility to accommodate these disparate interests. Nor does it have the sophistication, information, and ability to make timely responses necessary to react to changes in market, weather, and harvest conditions that occur during the fishing year. The ability to react to changing conditions is key to conducting an efficient fishery in a manner that is safe for the participants.

Fishery stock depletion and economic deterioration of the fishery are concerns for fishing communities. Communities have a vital interest in the short- and long-term economic viability of the industry, the income and employment opportunities it provides, and the safety of participants in the fishery.

In summary, management of the fishery is challenged with the competing goals of: controlling bycatch, taking advantage of the available allowable harvests of more abundant stocks (including conducting safe and efficient harvest activities in a manner that optimizes net benefits over the short- and long-term), increasing management efficiency, and responding to community interest.

In consideration of this statement of the problem, the following goals have also been identified for improving conditions in the groundfish trawl fishery.

- Provide for a well-managed system for protection and conservation of groundfish resources.
- Provide for a viable and efficient groundfish industry.
- Increase net benefits from the fishery.
- Provide for capacity rationalization through market forces.
- Provide for a fair and equitable distribution of fishery benefits.
- Provide for a safe fishery.

Preliminary Identification of Alternatives

NEPA requires preparation of an EIS for major Federal actions significantly affecting the quality of the human environment. The Pacific Council and NMFS are seeking information from the public on the range of alternatives and on the environmental, social, and economic issues to be considered.

Based on the above problem statement, goals and objectives, and consistent with the Pacific Council’s preferred alternative in the programmatic bycatch EIS, the Pacific Council has identified IFQs for the trawl fishery as one of the main types of alternatives to status quo that it will consider. The Pacific Council has begun developing specific provisions for IFQ alternatives. Under IFQs, total harvest mortality is controlled by allocating an amount to individual fishers and holding those individuals responsible for ensuring that their harvest or harvest mortality does not exceed the amount they are allocated.

The EIS will identify and evaluate other reasonable and technically feasible alternatives that might be used to simultaneously address capacity rationalization and the other problems and goals specified here. The Pacific Council is interested in public comment on alternatives to dedicated access privilege programs that address the problems surrounding and goals for this issue. The Pacific Council is also interested in receiving comments on different types of dedicated access privilege programs that should be considered and specific provisions that should be included in the alternatives.

According to the U.S. Commission on Ocean Policy's April 2004 preliminary report (pp. 232-236), there are several different types of dedicated access privileges:

IFQs allow each eligible fisherman to catch a specified portion of the total allowable catch. When the assigned portions can be sold or transferred to other fishermen, they are called individual transferable quotas.

Community quotas grant a specified portion of the allowable catch to a community. The community then decides how to allocate the catch.

Cooperatives split the available quota among the various fishing and processing entities within a fishery via contractual agreements.

Geographically based programs give an individual or group dedicated access to the fish within a specific area of the ocean.

There are also systems that allocate the right to buy fish. Such systems are often referred to as individual processing quotas (IPQs). The Magnuson-Stevens Fishery Conservation and Management Act (Magnuson-Stevens Act) does not allow NMFS to implement IPQs. Congress has also prohibited the Department of Commerce and the Councils, via the Department's 2004 appropriations bill, from establishing or even considering IPQs (except in crab fisheries off Alaska). Therefore, they will not be considered in this EIS.

Not included in the proposed scope for this action are the two other nontribal commercial seafood harvester sectors: the limited entry fixed gear fleet and the open access fleets. The limited entry fixed gear fleet already operates under an IFQ program for sablefish, a species that dominates the groundfish economic activity for most vessels in this fleet. Including consideration of the fixed gear fleet in the development of a trawl IFQ program could increase the complexity of developing the program. The directed open access fleet has yet to be well identified. Identification of this fleet will likely be a major and controversial task in its own right, even without concurrent inclusion of the fleet under an umbrella IFQ program covering all sectors of the West Coast commercial seafood harvesting industry. However, this notice does not preclude further consideration of IFQ for other sectors of the fleet (open access and fixed gear).

At the end of the scoping process and initial Pacific Council deliberations, the Pacific Council may recommend specific alternatives and options for analysis. Depending on the alternatives selected, Congressional action may be required to provide statutory authority to implement a specific alternative preferred by the Council. Lack of statutory authority to implement any particular alternative does not prevent consideration of that alternative or option in the EIS (40 CFR 1502.14(2)).

Preliminary Identification of Environmental Issues

A principal objective of this scoping and public input process is to identify potentially significant impacts to the human environment that should be analyzed in depth in the dedicated access privilege EIS. Pacific Council and NMFS staff conducted an initial screening to identify potentially significant impacts resulting from implementing one of the proposed alternatives to status quo, as well as the continuation of status quo, no action. These impacts relate to the likelihood that there will be a substantial shift in fishing strategies, the configuration of the groundfish fleet, and fishery management and enforcement activities as a result of the implementation of a program meeting the specified goals. Impacts on the following components of the biological and physical environment may be evaluated (1) Essential fish habitat and ecosystems; (2) protected species listed under the Endangered Species Act and Marine Mammal Protection Act and their critical habitat; and (3) the fishery management unit, including target and non-target fish stocks. Socioeconomic impacts are also considered in terms of the effect changes will have on the following groups: (1) Those who participate in harvesting the fishery resources and other living marine resources (for commercial, subsistence or recreational purposes); (2) those who process and market fish and fish products; (3) those who are involved in allied support industries; (4) those who rely on living marine resources in the management area; (5) those who consume fish products; (6) those who benefit from non-consumptive use (e.g. wildlife viewing); (7) those who do not use the resource but derive benefit from it by virtue of its existence, the option to use it, or the bequest of the resource to future generations; (8) those involved in managing and monitoring fisheries; and (9) fishing communities. Analysis of the effects of the alternatives on these groups will be presented in a manner that allows the identification of any disproportionate impacts on low income and minority segments of the identified groups and impacts on small entities.

Related NEPA Analyses

Certain complementary and closely related actions are likely to be required to implement a dedicated access privilege program. As described herein, implementation of an IFQ program or an alternative dedicated access privilege program for the trawl fishery will be a two-step process. The first step is to design the basic program and its major elements (e.g. allocation of shares among participants, monitoring and reporting requirements, needed species to be allocated, etc.). With this notice, the Council and NMFS are seeking comments on this first step. The second step is to determine the amounts of each species that are to be allocated to the trawl and other sectors. Such allocations would be evaluated in a separate but related process supported by a separate but connected NEPA analysis.

Implementation of an IFQ alternative would require an allocation of available harvest between the commercial trawl fisheries and other fishing sectors (inter-sector allocation). This allocation would be needed to annually set the amount of fish that would be partitioned between participants in the trawl IFQ fishery. An inter-sector allocation may be based on an allocation formula or on a determination of the needs of a fishery for each management cycle. The only species now allocated between trawl and other sectors is sablefish. For a trawl IFQ program to succeed, the Council may need to quantify allocations for other species between the trawl sector and other fishing sectors. Allocation questions raise issues beyond developing a dedicated access privilege program. Thus, a second but related NEPA analysis will be undertaken, particularly as intersector allocations may be useful for managing the fishery even if an IFQ program is not adopted. This second NEPA analysis will be about the potential costs and benefits to all fisheries from developing specific commercial and recreational allocations and, within the commercial allocations, developing specific sub-allocations to the open access, trawl, and fixed gear fisheries.

The Council's Allocation Committee will be meeting to discuss the need for intersector allocations and criteria for making such allocation decisions. These meetings will be open to the public and announced in a separate Federal Register document. At approximately the time the Council approves a set of alternatives to be analyzed in the dedicated access privileges EIS, it will likely initiate formal scoping for a NEPA document to cover the intersector allocation issue. In the meantime, comments on the intersector allocation issue should be addressed to the Council office pfmc.comments@noaa.gov (enter "Intersector Groundfish Allocation" in the subject line). Potential outcomes of the allocation decision and impacts of that decision on the IFQ program would be considered in the cumulative effects section of the EIS on dedicated access privileges for the trawl fishery.

Scoping and Public Involvement

Scoping is an early and open process for determining the scope of issues to be addressed and for identifying the notable issues related to proposed alternatives (including status quo). A principal objective of the scoping and public input processes is to identify a reasonable set of alternatives that, with adequate analysis, sharply define critical issues and provide a clear basis for distinguishing among those alternatives and selecting a preferred alternative. The public scoping process provides the public with the opportunity to comment on the range of alternatives and specific options within the alternatives. The scope of the alternatives to be analyzed should be broad enough for the Pacific Council and NMFS to make informed decisions on whether an alterative should be developed and, if so, how it should be designed, and to assess other changes to the FMP and regulations necessary for the implementation of the alternative, including necessary intersector allocations.

Some preliminary public scoping of IFQ alternatives has been conducted through the Council process. Such preliminary scoping is consistent with the Council on Environmental Quality guidelines (46 FR 18026, 51 FR 15618). The results of this preliminary scoping are being used to develop a scoping document that will help focus public comment. Public scoping conducted thus far includes Council meetings held September 2003 (68 FR 51007) and November 2003 (68 FR 59589), and Ad Hoc Trawl Individual Quota Committee meetings held in October 2003 (68 FR 59358) and March 2004 (69 FR 10001). To provide additional preliminary information for the public scoping document, a group of enforcement experts will meet in Long Beach, CA, May 25 and 26, 2004, and a group of analysts will meet in Seattle WA, June 8 and 9, 2004. Times and locations for these meetings will be announced in the Federal Register and posted on the Council website (www.pcouncil.org). The public scoping document will be completed and released at least 30 days prior to the end of the scoping period. Copies will be available from the Council office (see ADDRESSES) or from the Council website (www.pcouncil.org).

Written comments will be accepted at the Council office through July 31, 2004 (see ADDRESSES).

Public scoping meetings will be announced in the Federal Register at a later date and posted on the Council website. There will be a public scoping session held June 13, 2004, in Foster City CA, in conjunction with the June 2004 Council meeting. The exact time and location for the meeting will be provided in the Federal Register notice announcing the June 2004 Council meeting.

Authority: 16 U.S.C. 1801 et seq.

Dated: May 18, 2004.

Galen R. Tromble,
Acting Director,
Office of Sustainable Fisheries,
National Marine Fisheries Service.

Exhibit C.9.a
Supplemental Attachment 3
June, 2004

PROCESS FOR CONSIDERATION OF TRAWL INDIVIDUAL QUOTA (IQ) PROGRAMS

The Council will address consideration of a trawl IQ program (dedicated access privilege program) in two pieces: one is the design of the program, the other is the establishment of allocations of groundfish between the limited entry trawl and other groundfish fisheries. These two issues will be dealt with in separate but related EISs, as reflected in the attached table showing the phases of the process and milestones to be achieved. The Council has complete the Phase I preliminary scoping process for dedicated access privilege alternatives and has moved forward to the Phase I public scoping .

There are numerous groups involved in the process and substantial opportunity for public comment and involvement. An important component of the process design is the division of responsibilities between the Ad Hoc Groundfish Trawl Individual Quota Committee (TIQ Committee) and the Council's standing Allocation Committee. The TIQ Committee will deal with those design elements of individual quota program alternatives that are primarily internal to the trawl fishery, the Council Allocation Committee will deal with those issues directly affecting other sectors (e.g. allocation between trawl and other sectors). Another important aspect of the process is the limited scope of the TIQ Committee task. The TIQ Committee is tasked with helping the Council with preliminary scoping and design of a trawl IQ program alternative for analysis in the EIS based on the expertise and knowledge of the participants on the committee. In weighing the TIQ Committee recommendation, the Council will need to take into account the interests represented on the committee. Other Council groups and the public will have a significant role in the design and review of alternatives to be developed for the EIS (Table 2).

The second part of the situation paper (Exhibit C.9) describes details of the process that will take the Council up through selection of a set of alternatives for preliminary analysis. The attached figure provides a schematic representation of that process and its continuation through the first two steps of Phase II. Time goes from top to bottom. The first column (squares) is for the public scoping process and Council meetings. The second column (diamonds) shows meetings of the TIQ Committee. The third column (ovals) shows meetings and work by the TIQ Analytical Team and contractors. The fourth column (rounded squares) shows meetings of the Independent Experts Panel. The last column (hexagons) shows meetings of the TIQ Enforcement Group, Allocation Committee, and efforts of a consultant working on data system design issues. The shaded shapes represent that portion of the effort for which funding has not been secured.

Table 1. Process for consideration of trawl individual quota (dedicated access) programs.

Subproject Phase and Milestones	Phase I			Phase II				
Consideration of Dedicated Access Alternatives	Preliminary Alternative Development			EIS Drafting and Finalization				
	Preliminary Scoping	Public Scoping	Alternative Development and Preliminary Analysis	Alternatives for Draft EIS Selected	Draft EIS Development	Pref Alt Selection	Public Comment Period and Final Decision	Finalize EIS
Intersector Allocation	Preliminary Scoping: Assessment of scope of allocation issue to be addressed			Public Scoping		Alternative Development and Preliminary Analysis	Alternatives for Draft EIS Selected	

Subproject Phase and Milestones	Phase III				Phase IV
Consideration of Dedicated Access Alternatives	NMFS Final Decision and Initial Implementation Steps				Final Implementation
Intersector Allocation	EIS Drafting and Finalization				NMFS Final Decision and Implementation
	Draft EIS Development	Pref Alt Selection	Public Comment Period and Final Decision	Final EIS	

Table 2. Council groups involved in consideration of trawl individual quota (dedicated access) programs.

	Group	Representation	Lead Role	Other Review of Components of Products from Lead Group (Column 1)	Public Comment Opportunity
1	Ad Hoc Groundfish Trawl Individual Quota (TIQ) Committee	Trawlers, Processors, Tribes, Environmental, Enforcement, PSMFC	IFQ Alternative Development (excluding intersector allocation issues)	2, 3, 4, 6, 7, 8, Council	Comment on committee reports at Council meetings, some opportunity to comment to committees during committee meetings.
2	TIQ Enforcement Group	State and Federal (NMFS, USCG) Enforcement, NOAA General Council (GC), NMFS NWR	Scoping Enforcement Issues, Developing Enforcement Programs and Assessing Enforcement Costs	1, 3, 4, 6, 7, 8, Council	
3	TIQ Independent Experts Panel	University Experts (fishery management biology, economics, and human dimensions experts)	Independent Review of Impacts and Identification of Reasonable Options for Council Consideration	1, 4, 6, 7, 8, Council	
4	TIQ Analytical Team	NMFS, CDFG, Consultants	Development of Analysis	1, 2, 3, 4, 5, 6, 7, 8, Council	
5	Allocation Committee	Council Chair, State Agencies, NMFS, NOAA GC	Intersector Allocation Alternative Development	1, 4, 6, 7, 8, Council	
6	Scientific and Statistical Committee	States, NMFS Science Centers, Tribes, at-large	Technical Review	Council	
7	Groundfish Advisory Subpanel (GAP)	Commercial and Recreational Groundfish Industry, Tribes, and Environmental Interest	Constituent Advice to Council on Groundfish Issues	Council	
8	Groundfish Management Team	State, Federal and Tribal Management Agencies	Management Advice to Council on Groundfish Issue	Council	
	Council	Voting Members: State, Federal and Tribal Management Agencies and Secretarial Appointees	Policy Decisions/ Recommendations	NMFS	Direct comment to Council during scoping and at decision points. Direct comment to NMFS

Figure: Trawl IQ Process: Phase I through 1st Steps of Phase II

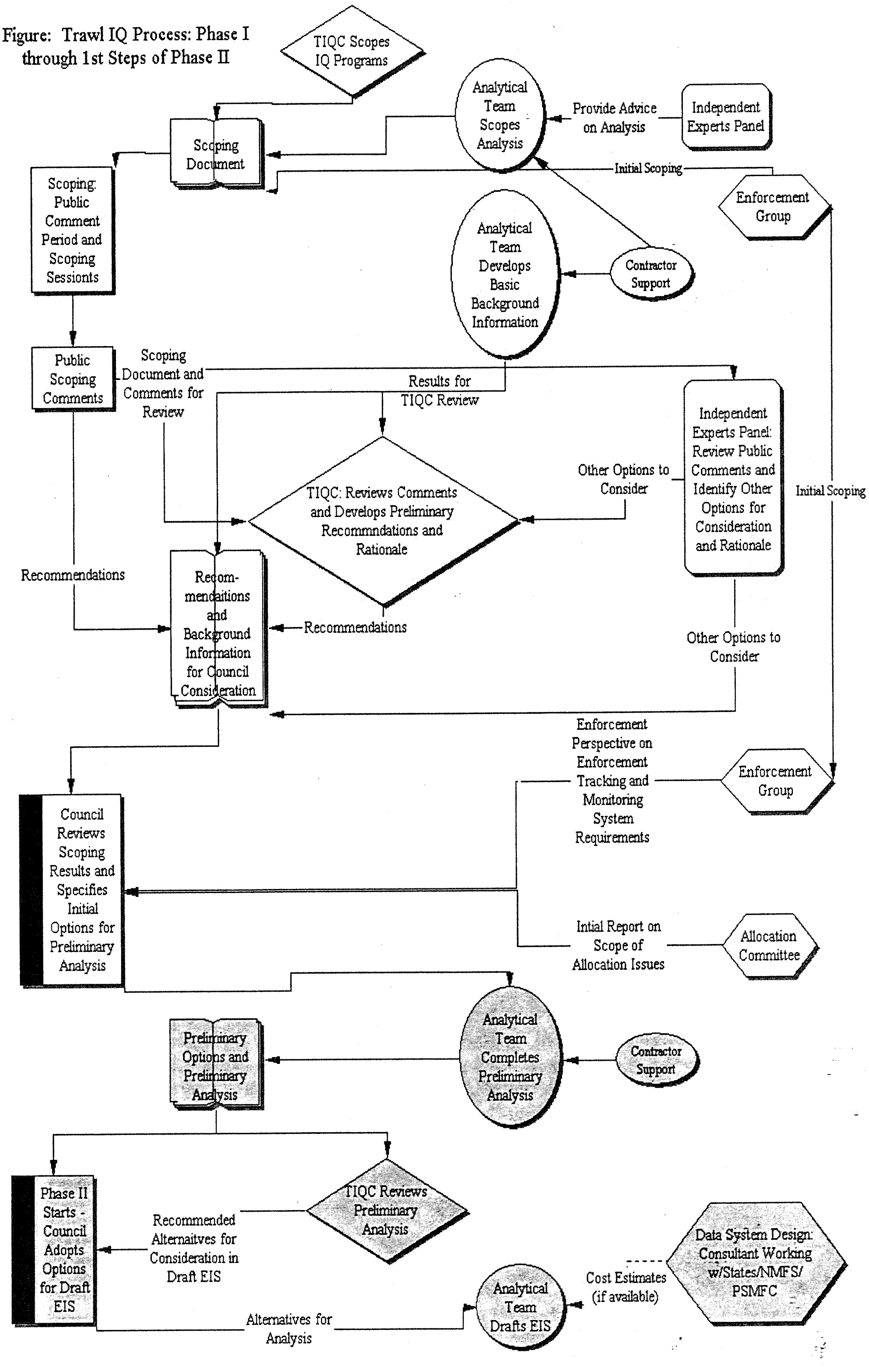

Exhibit C.9.b
Supplemental GAP Report
June 2004

GROUNDFISH ADVISORY SUBPANEL STATEMENT ON UPDATE ON TRAWL INDIVIDUAL QUOTA PROGRAM

The Groundfish Advisory Subpanel (GAP) met to discuss the Council's Trawl Individual Quota (TIQ) process and the draft scoping document being considered by the Council.

In regard to the TIQ process, the GAP focused on three issues: how the TIQ development and implementation should interface with inter-sector allocations; representation on the TIQ committee; and whether the TIQ process should be deferred until other actions such as development of national IQ standards and completion of a programmatic groundfish environmental impact statement took place.

On the first issue, there was general consensus that inter-sector allocations should be expedited so all parties and all fisheries sectors can know what they are dealing with. The GAP and members of the public voiced their concern that the existing Council Ad Hoc Allocation Committee seemed to spend more time on Council management issues than on dealing with inter-sector allocations. There were suggestions the committee might need to be restructured, but no specific recommendations on what a new structure would look like.

Regarding representation on the Ad Hoc Groundfish TIQ Committee, the majority of the GAP believed that existing representation was satisfactory, that the public had ample opportunity to comment, and that too large a committee would be unworkable. A minority of the GAP agreed the size of the committee should remain the same, but that membership should be broadened.

Regarding deferral of action, a minority of the GAP recommended the Council should wait until Congress acts on national IQ standards before proceeding further with the TIQ process. The majority of the GAP recommended the process should continue.

The GAP unanimously agreed to accept the draft scoping document with one change: on page 1-2, wording should be added to reflect the GAP's concern that inter-sector allocations should be expedited, so they can be completed prior to final implementation of a TIQ system.

PFMC
06/17/04

Exhibit C.9.c
Public Comment
June 2004

-------- Original Message --------
Subject: Public comment on TIQ
Date: Tue, 25 May 2004 17:29:59 -0700
From: Peter Huhtala <peter@pmcc.org>
To:<pfmc.comments@noaa.gov>

Council staff:

Attached find public comment related to item C.9.d, Update on Trawl Individual Quote (TIQ) Program. Please include this in the June briefing book.

Thank you!

Peter Huhtala
Senior Policy Director
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Astoria, Oregon 97103
phone (503) 325-8188
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cell (503) 440-3211
www.pmcc.org

Pacific Marine Conservation Council

May 25, 2004

Donald K. Hansen, Chairman
Pacific Fishery Management Council
7700 NE Ambassador Place, Suite 200
Portland, OR 97220-1384

Re: Trawl Individual Fishing Quota public scoping document

Dear Chairman Hansen,

The Pacific Marine Conservation Council (PMCC) is a public-benefit, non-profit corporation that works with fishermen, marine scientists, conservationists, and the general public. PMCC seeks to ensure that needed steps are taken to rebuild and sustain depleted groundfisheries along the West Coast, as well as to balance healthy marine ecosystems with viable fishing community economies.

PMCC is very concerned that the development of an individual transferable quota (ITQ) system for the trawl sector of the groundfish fishery is moving forward with inadequate forethought. The haste in which the Pacific Fishery Management Council (Pacific Council) is being asked to approve a public scoping document to support this development is objectionable, and commencing scoping for a trawl ITQ environmental impact statement (EIS) is, in itself, inappropriate and premature.

The Pacific Council should decline to approve a public scoping document for a trawl ITQ-EIS, and should instead recommend that NOAA Fisheries proceed with the issuance of a Notice of Intent (NOI) to prepare a comprehensive programmatic EIS that will facilitate an open public process for planning for the future of the groundfish fishery as a whole. Within this programmatic EIS process, scientific investigation should occur which examines the biological, social, and economic implications of instituting various forms of dedicated access privileges within the West Coast groundfish fishery – including the possibility of ITQs in the trawl sector. The Pacific Council could, through the programmatic EIS process, also draw on the expertise of their Science and Statistical Committee (SSC) to attempt to reconcile divergent scientific points of view on this controversial subject. This process would assist the Council in deciding whether or not to move forward with an EIS regarding a specific IFQ program – based on a credible scientific foundation.

A comprehensive programmatic EIS must be completed for the West Coast groundfish fishery *prior* to consideration of options for new forms of dedicated access privileges specific to the trawl sector of this fishery.

PMCC has consistently cautioned against moving forward with a major management change such as a trawl ITQ program, and its associated allocations, before taking stock of the major changes that have already occurred in the groundfish fishery in recent years. These include several overfished species with rebuilding plans under development, large areas of the continental shelf closed to certain types of fishing effort, the buyback of 91 trawl permits and the subsequent transfer of at least 17 latent permits, and environmental impact statements under development for both bycatch and essential fish habitat. PMCC has called for analysis of these major changes and linkage between the various National Environmental Policy Act (NEPA) initiatives. This would require an open, public process, where informed decisions can be made about a vision for the future of the groundfish fishery – a comprehensive programmatic EIS.

Prior to taking the radical step of seriously considering ITQ-based management, it is essential to review and analyze the impacts of recent changes to the groundfish fishery, and important new information that is now available. NEPA (at 40 C.F.R. § 1502.9(c)) requires preparation of supplemental [programmatic] EIS when "the agency makes substantial changes in the proposed action that are relevant to environmental concerns;" or when "there are significant new circumstances or information relevant to environmental concerns and bearing on the proposed action or its impacts." The groundfish fishery certainly qualifies on both accounts, and it would be entirely appropriate for the Pacific Fishery Management Council to urge NOAA Fisheries to begin work on a programmatic EIS as soon as possible, both for the utility of the process and to comply with the law.

The willingness of NOAA Fisheries to fund the trawl ITQ-EIS process should raise concern in light of a statement made by Bill Robinson of the Northwest Region at the June 2003 Council meeting, when development of a comprehensive programmatic EIS was abandoned in order to focus more narrowly on bycatch. From page 34 under B.12.b of the NMFS report: *"Mr. Robinson wanted to point out to the Council that the concept of a broader programmatic EIS is still alive as far as NMFS is concerned. But the resources available didn't allow preparing three major EIS's simultaneously. The EFH EIS and bycatch reduction are mandated by the Court so they take precedence. Hopefully, NMFS can prepare a programmatic EIS in the future once resources were made available."* Yet, resources were apparently found for developing a trawl ITQ, instead.

The Notice of Intent (NOI) to prepare an EIS regarding implementation of dedicated access privileges in the groundfish trawl fishery is deficient, and some premises set forth in this NOI can be considered misleading.

Providing exactly 21 days of notice of the only Pacific Council meeting-associated scoping session, as is here the case, for an EIS which would herald a major departure for Council-system management is outrageous. When taken along with a promise to provide a draft public scoping document *at the time* of the session, outrage must turn to grief for the insult to public process that this represents. This is an issue that affects people's lives, their livelihood, our ocean environment, and is integral to the future management of West Coast marine fisheries. This is not an isolated instance where the timing of notice limited the ability for the public to be involved with this process. The October 2003 meeting of the Ad Hoc Trawl Individual Quota committee was held after providing just 14 days advance notice in the Federal Register, the exact minimum notice required under the Magnuson-Stevens Act. Only 15 days Federal Register notice was provided for this committee's second meeting in March 2004.

Frankly, I'm surprised that this NOI was pushed to publication in the Federal Register, since I'm still not sure where the funding for this EIS might come from. Mr. Chairman, we have all heard about the attempt to access for this purpose the remaining $550,000 or so in California's share of the groundfish disaster relief funds. The irony is clear: take funds that were intended to help the fishing community cope with the economic hardship of a fisheries disaster, then use that money to set up a system from which a few people will profit while putting many times more out of a job.

The authors of the NOI seized upon a phrase used by the U.S. Commission on Ocean Policy: "dedicated access privileges," perhaps as a euphemism for the vilified "individual fishing quotas." In fairness, the new term broadens the concept somewhat. However, there is a big problem here in that the NOI authors selectively take the work of the U.S. Commission out of context, completely omitting the commission's recommendation to enact national standards for implementation of dedicated access privileges – to guide processes like that being placed before the Pacific Council. (Please see page nine of these comments for a list of the U.S. Commission on Ocean Policy recommendations for minimum standards.)

It would seem that those developing this trawl ITQ would either rather not wait for Congress to enact standards such as those proposed by the U.S. Commission on Ocean Policy, or perhaps they just don't like those particular standards. Judging from the ITQ proponents' opposition to setting quota shares for limited durations, or even allowing participants in a fishery to vote in a referendum as to whether an ITQ system should be established, to name two standards, I the latter is likely the case.

The authors of the NOI also engage in an unfortunate misappropriation of the Bycatch Program EIS and the Pacific Council's choice of a preferred alternative. The Bycatch EIS is an important document designed to help guide the Pacific Council's program for bycatch monitoring and reduction over the next few years. The Pacific Council's preferred alternative moves toward sector-based bycatch caps, while making explicate the status quo efforts to quantify and minimize bycatch. Support for potential "future IFQ programs in appropriate sectors of the fishery" was mentioned, but not explained. The Pacific Council specifically *did not* choose an alternative in the Bycatch EIS that would have centered around "rights-based" management, even though this option was presented to the Council as an alternative. To use the Bycatch EIS in any way to form a programmatic nest for a trawl ITQ is worse than a stretch, it would be utterly misleading and disingenuous.

This is not to say that IFQ systems could not have a beneficial impact on bycatch reduction. Apparently most have not, though, and many IFQ systems have exasperated bycatch problems. Since the NOI highlights bycatch and the constraints imposed by encounters with overfished species as major problems in the West Coast groundfish fishery, it will be interesting to see how the offered public scoping document proposes to reduce bycatch over the status quo, if in fact this is attempted. If peer-reviewed science is offered that is contrary to much of the current literature, this could be useful within the scientific review process discussed earlier, in the context of a comprehensive programmatic EIS, including consideration by the SSC.

In any event, the Bycatch Program EIS needs to lead in short order to a Fishery Management Plan Amendment that fully addresses bycatch monitoring and reduction, in a legally-compliant fashion. A hypothetical trawl ITQ years in the future is not going to fulfill this requirement, any more than the Bycatch EIS lays the foundation for a trawl ITQ.

Again, it comes back to a reasonable mandate: the Pacific Council and NOAA Fisheries should fully engage in developing a comprehensive programmatic EIS, linking disparate efforts in a thoughtful, measured way, and fully engaging the public. This step could go a long way toward improving a management system that has too often been crisis-driven.

The process leading to the public scoping document has been severely flawed, inherently tainting the material offered to the Council.

When the Pacific Council's Trawl Individual Quota Committee (TIQC)) met in March 2004, the TIQC continued to develop recommendations for *how* a trawl ITQ would function, working to create a public scoping document to "focus" public comment during scoping for an EIS that would support development of a trawl ITQ system. The committee report to the April Council meeting states: "Public scoping sessions are not a required part of the scoping process, however, because of the controversial nature of individual quotas and the scoping effort that has already occurred through the Trawl IQ Committee meetings, such sessions may be warranted. An open process that 'invites broad participation by stakeholders' is one of the recommendations contained in the National Research Council report produced pursuant to the Sustainable Fisheries Act."

PMCC continues to maintain that an open process is needed *before* considering moving forward with developing a specific IFQ program. Systematically attempting to narrow the scope of alternatives for the groundfish fishery by presuming that a trawl ITQ system (or even trawl "dedicated access privileges) is the public's preferred general direction is premature. Spending federal resources to support the TIQC's development of specific recommendations which may further prejudice public scoping (because recommendations have been agreed to by a Pacific Council-appointed committee, and now potentially approved by the members of the Pacific Council) raises eyebrows – especially when interested stakeholders from recreational, fixed gear, open access, and other potentially impacted fisheries have been deliberately excluded – along with conservation groups that support the agenda of the Marine Fish Conservation Network (a coalition of over 170 conservation groups, commercial and recreational fishing organizations, and marine science groups), that new IFQ programs should not be established until after Congress enacts national standards that protect fishermen, coastal communities, and the environment from the many potentially harmful effects of this type of management.

The preliminary motion creating the TIQC, made by trawl fisherman and Pacific Council member Ralph Brown, specifically named eight trawl fishery and three processor representatives as the primary representation. Although the official motion was modified to describe representation rather than individuals, the same people ended up appointed (along with a tribal representative, a representative from enforcement, and, later, another processor). The named individuals also included a contractor with Environmental Defense (ED) as a "conservation" seat. It is well known that ED is very unusual in the conservation community as proponents of rights-based management; the staff of ED had been strongly advocating in support of IFQs, and the organization has since contributed money to support the Pacific Council's development of a trawl ITQ system.

Mr. Brown as well as several individuals who were appointed to this committee, which is primarily supported by public dollars, stand to see substantial financial benefit if a trawl ITQ is enacted, while other commercial and recreational fishermen excluded from the development process may lose market share, or even their businesses, depending on how the ITQ might be implemented. This situation argues strongly for legislation that would require council members to recuse themselves from votes which would have a direct financial implication upon their business. As it now stands, Mr. Brown did not violate any law by acting to support his personal financial self-interest.

But even conflict-of-interest reforms at the council level would not ameliorate the inherent flaws in setting up a committee designed to avoid dissenting opinions, other than the tensions of negotiating power between trawlers and processors. This is an insider, backrooms game that excludes adjacent commercial fisheries, the less-efficient trawl businesses, the entire recreational fishery, and the American public. There is no wonder that this process has inspired the widespread perception that what is going on here is a privatization of this country's ocean resources, a "theft of the commons."

For the Pacific Council to take the dramatic step of approving a scoping document for a trawl ITQ-EIS would be extraordinarily unwise, because this would quickly be interpreted as Council support for the basic idea that a trawl ITQ is desirable, and all that's left is to debate the precise structure and allocation of species. This would also be a rejection of the right of the public to have a voice in the future of West Coast groundfish.

Under objective criteria developed by the National Research Council, the West Coast groundfish trawl fishery is unlikely to be considered an appropriate fishery for implementation of an individual fishing quota system.

According to the National Research Council's <u>Sharing the Fish: Toward a National Policy on Individual Fishing Quotas</u>, *"IFQ programs will be more successful when the following conditions are met:*

1) *The total allowable catch can be specified with reasonable certainty.*
2) *The goals of economic efficiency and reducing the number of firms, vessels, and people in the fishery have a high priority.*
3) *Broad stakeholder support and participation is present.*
4) *The fishery is amenable to cost-effective monitoring and enforcement.*

5) *Adequate data exist. Because of the long-term impacts and potential irreversibility of IFQ programs, it is important that sufficient date are available to assess and allow the mitigation of, insofar as possible, the potential social and economic impacts of IFQs on individuals and communities.*
6) *The likelihood for spillover of fishing activities into other fisheries is recognized and provision is made to minimize its negative effects.*

Certainly a situation exists (1) in groundfish where the allowable catch for each managed species or group of species is *specified* each year, although most of these species have not undergone a complete stock assessment. I think the intent here is to point out the difficulty inherent in setting up IFQs for populations of exceptionally variable biomass, such as Dungeness crab or pink shrimp. However, implementation of IFQs can also be problematic in multi-species fisheries that include depleted populations with a low biomass. The need to rebuild the populations of these species demands a higher priority than quota-holder access to their percentage of healthy stocks. Data reporting limitations in other fisheries (including recreational) that encounter the overfished species, and potential overages in these fisheries, can also contribute to considerable uncertainty regarding access to quota.

The capacity reduction feature of (2) seemed to have importance in the trawl fishery during advocacy for the buyback, even though the trawl industry and NOAA Fisheries preferred to leave a substantial number of latent and underused permits available for those who took the buyback money to re-enter the fishery or expand their businesses, or for processors to purchase in an attempt to replace lost delivery capacity.

So, I'm not sure that capacity reduction is really a high value. The buyback reduced some capacity, and a large number of skippers and deckhands were put out of work, and the business plans of some processing plants were challenged. Whether additional consolidation, efficiency, and unemployment are desirable would depend upon one's point of view. Less than optimally efficient businesses that support coastal families can provide a substantial benefit to our communities, and IFQ systems have been observed to destroy such businesses from British Columbia to Iceland.

As far as (3) goes, we don't really know whether there might be "broad stakeholder support and participation," because the Ad Hoc Trawl Individual Quota committee was set up specifically to limit participation. In addition, the public has been resoundingly excluded by the continuing resistance to a comprehensive programmatic EIS process. Additionally, in September 2003, the Pacific Council heard testimony *against* inclusion of a referendum where participants in the fishery might vote on whether they wanted to develop and implement IFQs. On all accounts the Pacific trawl ITQ process fails this condition; this is clearly an insider play by those who would gain the most.

To suggest that airing these issues within the council process accommodates sufficient public involvement is inaccurate. Even the voting body of the Pacific Council itself does not include a fair and balanced cross-section of all sectors of the fishery and the public interest. This is not the fault of the Council, but rather a subject requiring national reforms. But the point is that the Pacific Council is an inadequate forum to ensure broad public participation.

On the other hand, there are many stakeholders who participate in the Council process – and discuss issues among themselves – who would be limited in their involvement in this scoping process, as the comment period, after an adopted scoping document is provided, does not include a Council meeting.

Number (4) is interesting, considering the long-time resistance of many in the trawl fleet to at-sea observers. Will industry now be willing to pay for 100% observer coverage, even with catch levels constrained by encounters with overfished species? Or will the public be expected to foot the bill, even as public resources are "gifted" to the private sector? Meanwhile, enforcement personnel are already strained with current tasks, as well as with national security.

We have huge problems with (5) because of lack of data in the biological, economic, and social realms. As mentioned earlier, most of the managed groundfish populations have not been fully assessed – there are not enough data available to assess many of them. The status of non-managed marine life is, in many cases, even more difficult to evaluate. As we move toward a more ecosystem-based management approach, the concept of operating a system of single species-based IFQs seems incompatible, if not outright bizarre. It gets worse if we consider the adaptive management consequences of in-season adjustments which attempt to ensure that total catch by species in the groundfish fishery as a whole stays within allowable levels, particularly those involving overfished species or bycatch species on a reduction plan; the IFQ setup might actually create a race-for-fish, driven by the fear that the accelerated mortality of constraining species might shut the fishery.

The social and economic impacts of (5) are also challenging. Useful new tools, such as the Groundfish Fleet Restructuring Information and Analysis (GFR) project, undertaken as a proof-of-concept by Ecotrust and PMCC, demonstrate that there are the means to look at the likely effects of IFQ-driven consolidation, unemployment, loss of infrastructure, reduction in diversity, concentration of fishing effort, deleterious impacts to the recreational fleet, and the adverse consequences suffered by communities. This argues for careful evaluation of these types of effects, their possible mitigation, and any offsetting benefits of IFQ programs, within the larger context of a comprehensive programmatic EIS.

This is a complex subject that needs to be informed by both biological and social scientists. The information to be provided by the analytical team is a start, but it would be prudent to have a substantial amount of data, which *could* be made available, provided to the SSC, the Pacific Council, and the public, *before* a decision is made to proceed with a trawl ITQ-EIS. The situation here involves approving a scoping document to go forward with this EIS without scientific foundation, based instead on self-interest and politics. This would, of course, bolster the case often made by critics of the council process, that scientific decisions – biological, sociological, and economic – should be insulated from the political realm, leaving only advice on allocation matters to the regional fishery management councils.

Finally, there should be no problem in recognizing the spillover probabilities (6) of a trawl ITQ, both due to increased capitalization and more flexible business planning. The Dungeness crab fishery in

Oregon, for example, saw a tremendous influx of pots this year, in part due to the capital infusion from the groundfish buyback. Many of the same individuals who took the profits of the buyback and expanded operations in other fisheries stand to also gain financial advantage through ITQs, and would likely continue expansion. We could run some sociological and economic analysis and make reasonable projections of expected behavior – and we should -- *before* we decide whether to commit to the development of a trawl ITQ-EIS.

These are just a few criteria for evaluating whether a fishery might be a candidate for IFQ management, as posed by the National Research Council. There are a number of other biological, social and economic factors that can be examined in evaluating whether a fishery is appropriate for IFQs. NOAA Fisheries has begun some of this work by looking at IFQs in multi-species fisheries internationally. A draft of these findings was made available to the TIQC, but apparently went no farther within the council system. It is only reasonable to expect the fisheries service to present these findings as completely as possible, along with the other material discussed earlier, through a comprehensive programmatic EIS, with vetting before the SSC, before encouraging the Pacific Council to move blindly on a path from which return would be difficult at best.

The Pacific Council deserves full information and adequate opportunity for deliberation, rather than a rush for approval of a scoping document. Certainly at the present it appears that the West Coast groundfish trawl fishery is not an appropriate candidate for IFQ management.

The way in which exploration of possible use of individual fishing quota systems in the Pacific Region has transformed into a headlong rush to implement a trawl ITQ, demonstrates clearly the vital need for Congress to enact strong national standards to protect marine ecosystems, commercial and recreational fishermen, our coastal communities, and the public trust from potentially substantial deleterious impacts of individual fishing quota systems. If Congress cannot act swiftly to pass standards legislation, such as HR 2621, then a moratorium on new IFQ systems should be established until national standards are adopted.

PMCC supports the national agenda of the Marine Fish Conservation Network (MFCN) regarding IFQs, including the following:

The Magnuson-Stevens Act should be amended to:

- *Acknowledge that marine fish are publicly owned and that IFQs are not property rights;*
- *Ensure that IFQ programs enhance fish conservation;*
- *Protect fishing communities from excess consolidation;*
- *Limit IFQs to no more than five years, after which they may be renewed if conservation is enhanced; and*
- *Recover all administrative costs*

The PMCC board of directors adds these additional requisite standards:

- *Any IFQ must have a community component that results in appropriate harvest in the full fishing ranges of traditional coastal communities.*
- *Any IFQ allocation should provide incentives for use of gear which has the least bycatch and the least adverse impacts on habitat.*
- *No provisions that allow for the transfer of bycatch quota (including non-target marine life and overfished or Endangered Species Act-listed species) will be allowed.*

More details about the need for national standards, and about the impacts of IFQ systems worldwide, can be found at www.FairIFQs.org.

The U.S. Commission on Ocean Policy also understands the compelling need to establish national standards, if dedicated access privilege systems are to be considered. The Commission recommended on page 235 of their Preliminary Report:

At a minimum, the national guidelines should require dedicated access programs to:

- *specify the biological, social, and economic goals of the plan; recipient groups designated for the initial quota shares; and data collection protocols.*
- *provide for periodic reviews of the plan to determine progress in meeting goals.*
- *assign quota shares for a limited period of time to reduce confusion concerning public ownership of living marine resources,*
- *allow managers flexibility to manage fisheries adaptively, and provide stability to fishermen for investment decisions.*
- *mandate fees for exclusive access based on a percentage of quota shares held. These user fees should be used to support ecosystem-based management. Fee waivers, reductions or phase-in schedules should be allowed until a fishery is declared recovered or fishermen's profits increase.*
- *include measures, such as community-based quota shares or quota share ownership caps, to lessen the potential harm to fishing communities during the transition to dedicated access privileges.*
- *hold a referendum among all permitted commercial fishermen after adequate public discussion and close consultation with all affected stakeholders, to ensure acceptance of a dedicated access plan prior to final Regional Fishery Management Council approval.*

Conclusions:

It is clear from the information presented in this letter that it would be decidedly inappropriate to approve a public scoping document for trawl dedicated access privileges at this time, or in any way to encourage NOAA Fisheries to develop an EIS solely for a trawl ITQ system. Nor should Pacific Council staff time continue to be diverted to this effort.

The appropriate, valuable, and legally-required course of action is for the Pacific Council and NOAA Fisheries to forthrightly begin scoping for, and development of a comprehensive programmatic EIS for the commercial and recreational groundfish fishery. This is the proper vehicle to fully assess the efficacy and impacts of the Rockfish Conservation Areas; decipher the actual impacts of the buyback program; create linkages between rebuilding overfished populations, assessing and reducing bycatch, and protecting essential fish habitat; investigate how to better implement ecosystem-based management; and…evaluate whether types of dedicated access privileges might be appropriate tools for some sectors of this fishery.

Seeking the best work in the biological and social sciences, including worldwide experiences with forms of dedicated access privileges, to incorporate into the analysis within a comprehensive programmatic EIS is a wise way to proceed. After this science is reviewed by the SSC, and general policy alternatives are selected for the future directions of the West Coast groundfish fishery, only then might it be appropriate to begin development of an EIS to support dedicated access privileges in a particular sector.

Respectfully,

Peter Huhtala
Senior Policy Director

Subject: public comment on federal register of 5/24/04 vol 69 no 100 pg 29482
From: Bk1492@aol.com
Date: Wed, 26 May 2004 18:42:51 EDT
To: TrawlAccessEIS.nwr@noaa.gov, rodney.frelinghuysen@mail.house.gov
CC: steve.freese@noaa.gov, jim.seger@noaa.gov

us doc noaa 50 cfr part 660 id 051004B - pacific fish

how is the public protected from fishermen who will keep lying to the council and pressuring as long as you let them to take out every fish in the ocean for their own financial profit? Meanwhile, they'll be making illegal catch all they want.

The general public says that in the face of pressure by fish profiteers the council has to stand up for the interests of the general public. Turn away special segments who beg for the whole pie, when the whole pie belongs to the whole american public. That is the job of the council. Tell that to the fishermen.

I do not want a large quota in a short season, because then the fish profiteers will go to another area and overfish in that area, which is not a good idea. Let's reduce the number of fishermen - that is a good beginning.

cut quotas 50% this year and by l0% every year thereafter. Establish marine sanctuaries.

comment on page 4 - I thoroughly oppose providing for capacity rationalization through market forces - that is completely inappropriate.

I do not think "community" quotas are a good idea. The fish are not a "community" resource - they belong to the entire american public. Letting comunity quotas be established would mean rich powerful would get the whole quota.

comment on page 5 - We have to set up limits for these financial profiteers so that there is fish left in the ocean. It is quite clear that fish profiteers will take every single fish in the ocean for their own profit, and forget about any obligations to the general american good.

comment on page 6 - the largest issue here is putting the commercial fish profiteers in their place, since compared with american population which needs protection of fish stocks, the profiteers will take everything for their own financial wealth.

As if fully set forth herein at length, I hereby make the Pew foundation report on overfishing part of this comment, as well as the well known Pew Foundation report on councils and how they have been commandeered by the commercial fish industry to stop protecting the general american public.

b. sachau
15 elm street
florham park nj 07932

-------- Original Message --------
Subject:ITQ letter of concern
Date: Mon, 24 May 2004 16:16:59 EDT
From: SwordsTuna@aol.com
To: Donald.McIsaac@noaa.gov
CC:tomghio@excite.com

Dear Don McIsaac:

I am writing out of concern for the Individual Transferable Quota process that came about as a result of forming an ITQ committee. Both fixed gear and open access have been excluded from the process. There are still concerns about allocation of species of concern. Tom Ghio has expressed the same opinion as mine and asked that I include him in this letter. I hope there can be some asssistance to us in making this a more open process before going forward with a fully functioning ITQ system.

Thank you,
Sincerely,

Kathy Fosmark

--
Donald O. McIsaac, Ph. D.
Executive Director
Pacific Fishery Management Council
7700 NE Ambassador Place, Suite 200
Portland, Oregon 97220-1384
Phone: (503) 820-2280
Fax: (503) 820-2299
Web: http://www.pcouncil.org

Exhibit C.9.c
Supplemental Public Comment 2
June 2004

Subject: Public comment under C.9.c
Date: Fri, 4 Jun 2004 08:46:44 -0700
From: Peter Huhtala <peter@pmcc.org>
To: <pfmc.comments@noaa.gov>
CC: <Donald.McIsaac@noaa.gov>

Dear Dr. McIsaak,

It appears to me that the description of the Pacific Fishery Management Council decisions regarding individual fishing quotas (IFQ) may have been misrepresented in the Situation Summary for C.9. As I recall, the Council authorized the Chair, in September 2003, to appoint members of an Ad Hoc committee to explore the possibilities for a groundfish trawl IFQ program. Then, in November 2003, the Council moved to ask NOAA Fisheries to publish a control date for both a trawl IFQ and processor quotas, and asked staff to prepare a plan for further development, including funding options.

What I don't recall is the action as described in the Situation Summary: "the Council voted unanimously to move forward with consideration of a dedicated access privilege program of individual quotas for the groundfish trawl fishery, via preparation of an EIS." Perhaps there was a de facto Council endorsement of a working document that planned for preparation of an EIS for dedicated access privileges? Maybe going forward with such an EIS was the unanimous intent of the Council?

I know that other members of the public share this concern. Certainly, public comment may have been affected if it was clear that development of such an EIS was the central matter under consideration. With only written reports provided to the Council in March and April, the opportunity of the public to talk with the Council about this matter has been limited. And of course, complaints about the exclusion of recreational, fixed gear and open access representation in the process have been consistent.

The central question, though, of exactly how the Council voted to move forward with an EIS for trawl dedicated access privileges should be easily cleared up if you were to provide the Council with a transcript of the unanimously-adopted motion that authorized this action.

Sincerely,

Peter Huhtala
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June 4, 2004

Dr. Don McIssac
Pacific Fishery Management Council
7700 NE Ambassador Place, Suite 200
Portland, OR 97220

Re: Public Comment on IFQ development process for limited entry trawl groundfish fishery

Dear Dr McIssac:

We would like to offer some comments on the development of a potential IFQ program for the limited entry trawl sector of the groundfish fishery that the Council manages.

Our overarching observation is that with all of the recent management changes in this fishery (the buyback, rockfish conservation area, footrope restrictions) as well as the forthcoming EFH management, a comprehensive programmatic EIS of groundfish management would be necessary prior to additional management measures.

Assuming that the Council does move forward with the IFQ development, we have the following comments.

- Implementing this IFQ program with the lack of national standards for the sets a potentially fractious precedent and could greatly expand the amount of future management work the Council might have to do in implementing IFQ's in other sectors of the groundfishery and other fisheries that the Council manages.

- The Council should assess in advance, the consequences of an IFQ program on:
    - profitability of fishing operations,
    - incomes, employment, and communities,
    - the overall fishing effort
    - concentration of ownership over time
    - management costs (including complete observer and enforcement)

- The Organization for Economic Development and Cooperation (OECD) which concluded, based on their review of some 42 IFQ fisheries in OECD member countries, including the United States, that IFQ's are relatively ***less*** effective in a) multi-species/mixed stock fisheries, and b) fisheries with trip limit management (Toward Sustainable Fisheries: Economic Aspects of the Living Marine Resources, Paris, OECD, 1997)

- Other fisheries with IFQ's in US (Alaska black cod and halibut) are organized by species not by gear type. There should be no enshrinement of gear types as a permanent fixture of a fishery. Economic stability is important, but fixing a gear type is a disincentive for both the fishery and the council to adopt cleaner fishing techniques and technologies. This will be difficult to undo and restricts the Council's options in the future, especially to respond to increasing consumer demand for certified fishery products, e.g. bycatch free table fish.

- One singular approach to the way an IFQ program is implemented in this fishery would appear to limit the options for successfully managing the full suite of issues in the groundfish fishery. Aside from the essential controls such as consolidation caps, limited time frame (e.g. 5 year holding limits) there should be quota reserves for community development that cannot be traded away from a certain geography or community economic trust.

- We suggest that this moment is a huge opportunity to implement fishing "performance standards" (bycatch, high-grading controls, 100% coverage for information gathering) the cost of which should be ultimately borne by the quota holders.

- A groundfish IFQ program should be a full retention fishery to address high-grading, with a "real-time" inter-boat trading system to ensure complete control of the TAC.

- There appears to be a need to address the definition of an IFQ from a legal property rights perspective. Holders, managers, and analysts of quotas treat them as private property rights defined or not. Is the Council prepared to "take them back" or reduce the TAC to zero for conservation purposes should the need arise? This will be very difficult if "rights" are assigned "in perpetuity" or in a de-facto manner that is essentially the same.

- Tools for analyzing the community impacts for IFQ allocations exist with the Groundfish Fleet Restructuring Project held by the Pacific States Marine Fisheries Commission.

- Further, the Council should be prepared to assess (perhaps with an independent body such as the General Accounting Office) the efficacy of its regulations to control the amount of quota that can be controlled by an individual, a corporation, or linked corporations.

Thank you for the opportunity to provide comment on the IFQ issues before the Pacific Fishery Management Council. We look forward to providing further comments in the process of the NEPA scoping that the Council has announced.

Edward H. Backus, Vice President, Fisheries
Dr. Astrid J. Scholz, Senior Resource Economist

Ecotrust
721 NW Ninth Avenue, Suite 200
Portland, OR 97209

Exhibit C.10
Situation Summary
June 2004

FINAL ADOPTION OF 2005-2006 GROUNDFISH MANAGEMENT MEASURES

Situation: This is the final step of three at this meeting (C.6 and C.8 being the other two) in the process to adopt final 2005-2006 groundfish management measures that will be recommended to the U.S. Secretary of Commerce.

Council Action:

1. **Adopt final optimum yield for canary rockfish and 2005-2006 groundfish management measures.**

Reference Materials:

None.

Agenda Order:

a.	Agendum Overview	John DeVore
b.	GMT Analysis of Impacts	Michele Robinson
c.	Reports and Comments of Advisory Bodies	
d.	Agency and Tribal Comments	
e.	Public Comment	
f.	**Council Action:** Adopt final optimum yield for canary rockfish and 2005-2006 groundfish management measures. (***Motion in Writing***)	

PFMC
05/25/04

Exhibit C.10.b
Supplemental GMT Report
June 2004

GROUNDFISH MANAGEMENT TEAM (GMT) REPORT ON FINAL ADOPTION OF 2005-06 GROUNDFISH MANAGEMENT MEASURES

ITEMS TENTATIVELY APPROVED

Under agenda items C.6. and C.8., the Council tentatively adopted the following groundfish management measures for 2005 and 2006:

1. *CANARY ROCKFISH OY CALCULATION*

After estimated mortalities for canary rockfish in all fisheries (groundfish directed, non-groundfish, research and EFPs) have been totaled, there is a residual amount of the OY that is not assigned to a particular fishery. The canary rockfish OY is then calculated by determining how harvest is divided between the commercial and recreational fisheries, less any remaining residual amount. A catch sharing of 50/50 for commercial and recreational fisheries is then applied to the residual amount. If more than 50% of that residual amount is used to account for an overage in the recreational fisheries, the entire amount may not be available to those fisheries because of the greater per pound impact of the recreational fisheries on meeting rebuilding obligations.

2. *OTHER FLATFISH ABC AND OY*

An ABC for the other flatfish complex of 6,781 mt, and an OY of 4,909 mt.

3. *OTHER FISH ABC AND OY*

An ABC for the other fish complex of 14,600 mt and an OY 7,300 mt.

4. *DOVER SOLE ABC*

The Council gave the GMT the latitude to update the Dover sole ABC presented in the ABC/OY table when the information becomes available from the stock assessment author.

5. *CREATION OF NEW MANAGEMENT LINES*

Establish the following new management lines in federal regulations for groundfish management:

- A depth management line for the area south of 42° N. lat. (OR/CA border) at 40 fms
- A latitudinal management line at Pigeon Point (37°11'N. lat.) off California
- Latitudinal management lines off Washington at: Cape Alava, Queets River, and Leadbetter Point.

- Latitudinal management lines off Oregon at: Cape Falcon (45°46'00 N. lat.); Cascade Head (45°03'50" N. lat.); Heceta Head (44°08'18" N. lat.); Cape Arago (43°20'50" N. lat.); Humbug Mountain (42°40'30" N. lat.); and Mack Arch (42°13'40" N. lat.).

- Specifications of the 100-fm depth contour around Cordell Bank in California, defined by coordinates to replace the 5 nm radius currently in place.

6. *CATCH SHARING AND HARVEST GUIDELINES*

- Black Rockfish Sharing Between Oregon and California - A black rockfish catch sharing of 58% to Oregon and 42% to California within the southern OY, with those values specified as harvest guidelines in the federal regulations for the respective states.

- Recreational Harvest Guidelines for Canary Rockfish - Two regional harvest guidelines, North (OR and WA) and South (CA), which would be divided at the OR/CA border (42° N lat.). The harvest guidelines for both 2005 and 2006 would be:

  North = 8.5 mt
  South = 9.3 mt

- Recreational Harvest Guidelines for Lingcod - Two regional harvest guidelines, North (OR and WA) and South (CA), which would be divided at the OR/CA border. As the stock assessment area was divided at Cape Blanco, Oregon (43° N. latitude) and the OR/CA border is at 42° N. latitude, apply the GMT-recommended formula based on the CPUE data from the Resource Assessment and Conservation Engineering (RACE) survey from 1995-2001 to account for the amount of lingcod that should be transferred from the southern area to the northern area to account for the line shift. The recreational harvest guidelines would be:

2005	2006
North = 206 mt	North = 239 mt
South = 422 mt	South = 422 mt

- Recreational Harvest Guidelines for Yelloweye Rockfish - Two regional harvest guidelines, North (OR and WA) and South (CA), which would be divided at the OR/CA border. The harvest guidelines for both 2005 and 2006 would be:

  North = 6.7 mt
  South = 3.7 mt

7. *CONVERSION OF EXEMPTED FISHING PROVISIONS INTO FEDERAL REGULATIONS*

- Implement the use of Selective Flatfish Trawl gear in the area north of 40°10' N. lat. in 2005 and 2006.

- For south of 40°10' N. lat., consider applying the Selective Flatfish Trawl provisions off California, pending results of the EFP in this area, inseason in 2005 or 2006.

- Direction provided to move forward with consideration of converting the Arrowtooth Trawl EFP into federal regulations through an EA tiered from the 2005-06 specifications EIS.

8. *COMMERCIAL MANAGEMENT MEASURES*

- Limited Entry Trawl Whiting Fisheries - Approval to include a placeholder of 7.3 mt of canary rockfish in the bycatch scorecard for whiting fisheries; and establishment of an inseason mechanism to allow NMFS to implement an inseason closure of the whiting fishery as part of routine management in response to bycatch concerns which may arise inseason.

- Limited Entry Trawl Non-Whiting Fisheries - Approval of the limited entry trawl trip limits contained in Attachment 1, Table 1; and direction to specify a canary rockfish value of 8.0 mt in the bycatch scorecard to account for uncertainties in the GMT bycatch model. Most of the other trip limits for limited entry trawl for 2004, including the inseason adjustments adopted by the Council at this meeting, would remain in effect in 2005 and 2006; the GMT has a few recommended changes addressed later in this statement.

- Limited Entry Fixed Gear and Open Access - Approval of the status quo trip limits, management measures, and non-trawl RCA boundaries (100 fms north of 40°10' and 150 fms south of 40°10') for the limited entry fixed gear and open access fisheries coastwide for 2005 and 2006, including the following sablefish tier limits:

	2005	2006
Tier 1	64,000 lbs	63,000 lbs
Tier 2	29,100 lbs	28,600 lbs
Tier 3	16,600 lbs	16,400 lbs

  Approval of the status quo trip limits for the sablefish daily trip limit (DTL) fishery for limited entry fixed gear and open access at 300 lbs/day; 900 lbs/week; not to exceed 3600 lbs/2 mo. in 2005 and 2006. All other trip limits for limited entry fixed gear and open access for 2004, including the inseason adjustments adopted by the Council at this meeting, would remain in effect for 2005 and 2006.

- Tribal Fisheries - Approval of the tribal management measures as presented in Exhibit C.6.c, Supplemental Proposed Treaty Indian Management Measures, June 2004.

9. EFP SET ASIDES

- Approval of EFP set asides for 2005 as presented in the state EFP applications under agenda item C.5., except revise the canary rockfish set aside for the Washington Arrowtooth Flounder EFP to 1.75 mt.

- Approval of a placeholder for 2006 EFP set asides in the bycatch scorecard of 2.9 mt for canary rockfish.

10. RECREATIONAL MANAGEMENT MEASURES

- General - Designate state recreational regulations as routine management measures in the federal regulations to allow adoption of federal conforming regulations as inseason actions.

- Washington - Approval of the Washington Department of Fish and Wildlife's proposed status quo regulations for its recreational fisheries in 2005 and 2006. These regulations are:

    - 15 aggregate bottomfish bag limit
    - 10 rockfish sublimit with no retention of canary or yelloweye rockfish
    - 2 lingcod sublimit, with a minimum size limit of 24" and a status quo season
    - Continuation of "C-Shaped" Yelloweye Rockfish Conservation Area off North Coast

  If the recreational harvest guideline for canary, yelloweye, or lingcod specified for the Washington/Oregon area is projected to be exceeded, the Washington Department of Fish and Wildlife will consult with the Oregon Department of Fish and Wildlife, and may take action inseason to close all or portions of the recreational fishery deeper than 30 fms, or adjust seasons, bag limits, or size limits, as needed. For purposes of consistency and clarification, the action taken by the Washington Department of Fish and Wildlife would be specified in federal regulations.

- Oregon - Approval of the Oregon Department of Fish and Wildlife's proposed status quo regulations for its recreational groundfish fisheries in 2005 and 2006, except that Pacific halibut will not be included in the 10 marine fish bag limit. The proposed regulations are:

  Season: Open all year at all depths except closed outside of the 40 fathom curve from June 1 through September 30. Possession of groundfish prohibited in waters deeper than the 40 fathom curve during the June through September offshore closure period (consistent with current Oregon state regulations).

Daily Bag Limit: 10 marine fish including rockfish, greenling, cabezon, and other species, not including salmon species, lingcod, Pacific halibut, perch species, sturgeon, sand dabs, striped bass, tuna, and bait fish (herring, smelt, anchovies and sardines). A two fish daily bag limit for lingcod. No retention of yelloweye rockfish and canary rockfish.

Minimum Length Limits:
* Lingcod: 24 inches
* Cabezon: 16 inches
* Greenling species: 10 inches

If the recreational harvest guideline for canary, yelloweye, or lingcod specified for the Washington/Oregon area is projected to be exceeded, the Oregon Department of Fish and Wildlife will consult with the Washington Department of Fish and Wildlife, and may take action inseason to close all or portions of the recreational fishery deeper than 20 or 30 fms, or adjust seasons, bag limits, or size limits, as needed. For purposes of consistency and clarification, the action taken by the Oregon Department of Fish and Wildlife would be specified in federal regulations.

11. OTHER CALIFORNIA MANAGEMENT ISSUES

- <u>Retention of Other Flatfish with Sanddab Gear</u> - Allow the retention of other flatfish when fishing with approved gear for sanddabs in the California recreational and commercial fisheries.

- <u>Ridgeback Prawn Trawl Exemption</u> - Provide an exemption to allow the ridgeback prawn trawl fishery to fish within the trawl RCA out to 100 fms when the trawl RCA shallow boundary is at 75 fms south of 40°10' N. lat.

REMAINING ITEMS FOR CONSIDERATION

The GMT has identified the following remaining items for consideration and makes these recommendations:

CANARY ROCKFISH OY AND CATCH SHARING

The GMT has calculated the canary rockfish OY and the residual amount with 8.0 mt as a placeholder for the limited entry trawl fishery, as well as the commercial/recreational catch sharing. The GMT recommends the following canary rockfish OYs for 2005 and 2006:

2005			**2006**		
OY	Comm	Rec	OY	Comm	Rec
46.8	59.8%	40.2%	47.1	60.7%	39.3%

COMMERCIAL MANAGEMENT MEASURES

The GMT had a few remaining commercial management issues which we addressed and make the following recommendations:

LIMITED ENTRY TRAWL

Widow Rockfish in the Whiting Fishery

The GMT has calculated the amount of widow rockfish which would be available for the whiting fishery after estimated impacts for non-whiting fisheries have been accounted for; they are 225.2 mt for 2005 and 244.2 mt for 2006. The GMT recommends that this amount be used in the scorecard as a placeholder for the whiting fishery until the 2004 bycatch data is available in March 2005.

N. of 40°10'

- For large footrope, change the trip limit for yellowtail rockfish to 300 lbs/2 mo. year-round to accommodate incidental catches
- For SFFT gear, change the trip limit for yellowtail rockfish by removing the % of flatfish restriction and change the trip limit from 1,000 lbs/mo. to 2,000 lbs/2 mo. year-round

LIMITED ENTRY FIXED GEAR

Coastwide

- Change the lingcod trip limit from 400 lbs/mo. to 800 lbs/2 mo. in May through October to accommodate incidental catches in the sablefish fishery (Note: The discard rates of lingcod in the sablefish fishery are not being accommodated by the current trip limit as a large portion of the tiered fishery achieves their tier limits in one trip; converting the monthly limit to a bi-monthly limit helps address this.)

S. of 40°10' to Border

- Change the trip limit for minor slope rockfish to 40,000 lbs/2 mo. and the trip limit for splitnose to 40,000 lbs/2 mo. year-round to have limited entry fixed gear trip limits match up to limited entry trawl limits for this area.
- Change the trip limit for longspine thornyhead to 19,000 lbs/2 mo. and the trip limit for shortspine thornyhead to 4,200 lbs/2 mo. year-round to have limited entry fixed gear trip limits match up to limited entry trawl limits for this area.

CALIFORNIA RECREATIONAL

California Department of Fish and Game staff have prepared an analysis (using the GMT-endorsed model) of the state’s preferred option for recreational management measures, which is presented in Attachment 2. The specific measures for consideration include:

1. Status quo regulations unless otherwise specified.

2. Regulations apply to groundfish (with sanddab fishery exception) and associated state-managed species (rock greenling, CA sheephead, and ocean whitefish).

3. Closures and depth restrictions apply to all recreational fishing modes except shore-based anglers and divers.

4. Fishing allowed for shore-based anglers and divers in all months.

5. Notwithstanding other fishing opportunities for groundfish, lingcod may not be retained during January, February, March, and December.

6. Months/areas closed to all fishing modes (other than shore-based anglers and divers) are indicated by gray shading for rows labeled “North”, “N-Central and northern S-Central”, “southern S-Central”, and “South”. Months closed to all fishing modes (other than shore-based anglers and divers) for CA scorpionfish in “South” area are gray shaded in row labeled “South Scorpionfish”.

7. In non-shaded months/areas, open depths are indicated in fathoms.

8. Lingcod size limit = 24 or 26 inches; daily bag limit = 2 fish.

9. Combined Rockfish+Cabezon+Greenling (RCG Complex) daily bag limit = 10 fish.

10. Boundaries for Rockfish and Lingcod Management Areas as follows:
    <u>North</u>: CA/OR Boundary to 40 deg. 10 min. N. at (Cape Mendocino).
    <u>N-Central</u> <u>and northern S-Central</u>: 40 deg. 10 min. N. at (Cape Mendocino) to 36 deg. 00 min. (Lopez Pt.).
    <u>Southern S-Central</u>: 36 deg. 00 min. (Lopez Pt.) to 34 deg. 27 min. (Pt. Conception).
    <u>South</u>: 34 deg. 27 min. (Pt. Conception) to US/Mexico International Boundary.

<u>Inseason Management Response</u>
The California Department of Fish and Game (CDFG) is proposing status quo for some portions of its recreational regulations (e.g., rockfish-cabezon-greenling (RCG) bag limit is 10 fish, management is tailored to regional needs), with several non-status quo options for 2005-06 due to projections that reflect the need to restrict take of canary rockfish, lingcod, black rockfish and minor nearshore rockfish. Depth-based management will continue in 2005-06.

If the recreational harvest guideline for canary rockfish, yelloweye rockfish, or lingcod specified for California is projected to be exceeded, or if the state harvest guideline for black rockfish is projected to be exceeded when combining recreational harvest projections and annual commercial projections, the CDFG may take action to close all or part of the recreational fishery in all or part of the state regions in all or part of the remainder of the year. Any closure may pertain to closure of specific groundfish species or specific depths in different regions to achieve catch limitation.

In the northern RLMA (North of 40°10' N. lat to the Oregon/California border), in the case of canary or yelloweye rockfish, the CDFG would take action to close all or part of the recreational fishery deeper than the 30-fm depth contour as approximated by a series of lat/long coordinates.

UPDATED BYCATCH SCORECARDS

The GMT has updated the bycatch scorecards for 2005 and 2006, as presented in Tables 1 and 2, respectively in Attachment 3. These scorecards include harvest guidelines for the recreational fisheries for canary rockfish, lingcod, and yelloweye rockfish, and placeholders for canary and widow rockfish in the whiting fishery, canary in the non-whiting trawl fishery, and for EFPs in 2006; all other values represented are estimated impacts based on the GMT's best professional judgement. The comparison of harvest guidelines to actual estimated impacts for the recreational fisheries is contained in Table 3 in Attachment 3.

TRIP LIMIT TABLES

The GMT has developed draft trip limit tables for the limited entry trawl, limited entry fixed gear, and open access fisheries coastwide (Attachment 4). Minor changes have been made to accommodate incidental catches consistent with the Council's inseason action in June 2004. These changes are reflected in the attached tables. The GMT recommends that these draft trip limits be approved at this time and requests the latitude to correct these trip limit tables as necessary to reflect Council action.

GMT Recommendations

1. Confirm the approval of items tentatively adopted by the Council (1-11)
2. Approve the GMT recommended canary rockfish OY and catch sharing.
3. Approve the GMT recommendation of placeholders for of widow rockfish to be specified in the bycatch scorecard for the whiting fishery, as 225.2 mt for 2005 and 244.2 mt for 2006.
4. Approve the GMT recommended trip limit changes for limited entry trawl.
5. Approve the GMT recommended trip limit changes for limited entry fixed gear.
6. Approve the California recreational management measures and specify and lingcod minimum size limit.
7. Approve the draft trip limit tables attached to this report with some latitude to make any corrections and revise them as necessary to reflect Council action.

Attachment 1 Table 1. Different North / South Limits and 4 periods with 100 fathom inline

ESTIMATED MORTALITY

		North	South	Total
Rebuilding Species	Lingcod	94.2	30.0	124.2
	Canary	4.6	0.6	5.2
	POP	88.2	0.0	88.2
	Darkblotch	63.0	13.0	76.0
	Widow	1.8	0.1	1.9
	Bocaccio	0.0	51.2	51.2
	Y'eye	0.3	0.1	0.4
	Cowcod	0.0	0.5	0.5
Target Species	Sablefish	2,620	762	3,382
	Longspine	558	296	854
	Shortspine	610	284	894
	Dover	5,241	2,120	7,361
	Arrowtooth	2,504	210	2,714
	Petrale	2,398	263	2,661
	Other Flat & Eng. Sole	4,551	1,473	6,023
	Slope Rock	203	400	603

TRIP LIMITS AND RCA BOUDARIES

		RCA Boundaries									
SUBAREA	Period	INLINE	OUTLINE	Sablefish	Longspine	Shortspine	Dover	Other Flat & Eng.	Petrale	Arrowt'th	Slope Rock
N 40 10	1	75	150	9,500	15,000	3,500	69,000	110,000	No Limit	No Limit	8,000
	2	100	150	9,500	15,000	3,500	69,000	110,000	42,000	150,000	8,000
	3	100	150	17,000	23,000	4,900	30,000	110,000	42,000	150,000	8,000
	4	100	150	17,000	23,000	4,900	30,000	110,000	42,000	150,000	8,000
	5	100	150	17,000	23,000	4,900	30,000	110,000	42,000	150,000	8,000
	6	75	150	8,000	15,000	3,500	69,000	110,000	No Limit	No Limit	8,000
North Select Gear Limit	1	75	150	1,500	1,000	1,000	20,000	100,000	25,000	70,000	8,000
	2	100	150	10,000	1,000	1,000	35,000	100,000	35,000	70,000	8,000
	3	100	150	10,000	1,000	3,000	50,000	100,000	35,000	70,000	8,000
	4	100	150	10,000	1,000	3,000	50,000	100,000	35,000	70,000	8,000
	5	100	150	10,000	1,000	3,000	50,000	100,000	35,000	70,000	8,000
	6	75	150	1,500	1,000	1,000	20,000	100,000	25,000	70,000	8,000
38 - 40 10	1	75	150	14,000	19,000	4,200	50,000	110,000	No Limit	No Limit	40,000
	2	100	150	14,000	19,000	4,200	50,000	110,000	42,000	10,000	40,000
	3	100	150	14,000	19,000	4,200	50,000	110,000	42,000	10,000	40,000
	4	100	150	14,000	19,000	4,200	50,000	110,000	42,000	10,000	40,000
	5	100	150	14,000	19,000	4,200	50,000	110,000	42,000	10,000	40,000
	6	75	150	14,000	19,000	4,200	50,000	110,000	No Limit	No Limit	40,000
S. 38	1	75	150	14,000	19,000	4,200	50,000	110,000	No Limit	No Limit	40,000
	2	100	150	14,000	19,000	4,200	50,000	110,000	42,000	10,000	40,000
	3	100	150	14,000	19,000	4,200	50,000	110,000	42,000	10,000	40,000
	4	100	150	14,000	19,000	4,200	50,000	110,000	42,000	10,000	40,000
	5	100	150	14,000	19,000	4,200	50,000	110,000	42,000	10,000	40,000
	6	75	150	14,000	19,000	4,200	50,000	110,000	No Limit	No Limit	40,000

Table 1A. Estimated LE trawl vessel revenue under "4 periods with 100 fathom inline and different north / south limits"

Fleet/ Avg. 2003 revenue / Direction of change	< 20% change in projected revenue					> 20% change in projected revenue					All vessels				
	# of ves.	Avg. 2003 GF ($)	Proj. 2005 GF ($)	Average change in GF revenue $	Average change in GF revenue %	# of ves.	Avg. 2003 GF ($)	Proj. 2005 GF ($)	Average change in GF revenue $	Average change in GF revenue %	# of ves.	Avg. 2003 GF ($)	Proj. 2005 GF ($)	Average change in GF revenue $	Average change in GF revenue %
Non-whiting vessels															
$21 - $100,000															
Lower 2005 revenue	2	53,932	52,440	-1,492	-3.1%	2	63,871	47,435	-16,435	-25.8%	4	58,901	49,937	-8,964	-14.5%
Higher 2005 revenue	4	53,842	60,370	6,528	12.9%	36	49,275	113,439	64,164	777.0%	40	49,732	108,132	58,400	700.6%
Total	6	53,872	57,726	3,854	7.6%	38	50,043	109,965	59,922	734.7%	44	50,565	102,842	52,276	635.6%
> $100,000															
Lower 2005 revenue	1	145,904	118,767	-27,136	-18.6%	2	336,635	242,132	-94,503	-28.1%	3	273,058	201,010	-72,048	-24.9%
Higher 2005 revenue	2	169,749	195,784	26,035	14.6%	41	161,233	257,151	95,918	60.2%	43	161,629	254,296	92,667	58.1%
Total	3	161,800	170,111	8,311	3.5%	43	169,391	256,452	87,061	56.1%	46	168,896	250,821	81,925	52.7%
All															
Lower 2005 revenue	3	84,589	74,549	-10,040	-8.3%	4	200,253	144,783	-55,469	-26.9%	7	150,683	114,683	-36,000	-18.9%
Higher 2005 revenue	6	92,478	105,508	13,030	13.5%	77	108,889	189,961	81,072	395.3%	83	107,703	183,856	76,153	367.7%
Total	9	89,848	95,188	5,340	6.2%	81	113,401	187,730	74,329	374.5%	90	111,046	178,476	67,430	337.6%
Whiting vessels															
$21 - $100,000															
Higher 2005 revenue	.	.	.	.	.	3	40,036	147,418	107,382	653.7%	3	40,036	147,418	107,382	653.7%
> $100,000															
Higher 2005 revenue	.	.	.	.	.	29	240,800	576,225	335,426	142.4%	29	240,800	576,225	335,426	142.4%
All															
Total	.	.	.	.	.	32	221,978	536,025	314,046	190.4%	32	221,978	536,025	314,046	190.4%
Aggregate															
$21 - $100,000															
Lower 2005 revenue	2	53,932	52,440	-1,492	-3.1%	2	63,871	47,435	-16,435	-25.8%	4	58,901	49,937	-8,964	-14.5%
Higher 2005 revenue	4	53,842	60,370	6,528	12.9%	39	48,564	116,053	67,488	767.5%	43	49,055	110,873	61,817	697.3%
Total	6	53,872	57,726	3,854	7.6%	41	49,311	112,705	63,394	728.8%	47	49,893	105,687	55,794	636.7%
> $100,000															
Lower 2005 revenue	1	145,904	118,767	-27,136	-18.6%	2	336,635	242,132	-94,503	-28.1%	3	273,058	201,010	-72,048	-24.9%
Higher 2005 revenue	2	169,749	195,784	26,035	14.6%	70	194,196	389,339	195,142	94.3%	72	193,517	383,962	190,445	92.1%
Total	3	161,800	170,111	8,311	3.5%	72	198,153	385,250	187,097	90.9%	75	196,699	376,644	179,945	87.4%
All															
Lower 2005 revenue	3	84,589	74,549	-10,040	-8.3%	4	200,253	144,783	-55,469	-26.9%	7	150,683	114,683	-36,000	-18.9%
Higher 2005 revenue	6	92,478	105,508	13,030	13.5%	109	142,089	291,557	149,468	335.2%	115	139,501	281,850	142,349	318.4%
Total	9	89,848	95,188	5,340	6.2%	113	144,148	286,362	142,214	322.3%	122	140,143	272,259	132,116	299.0%

Attachment 2

California Recreational Season and Depth Option
Revised based on C.6 and C.8 Council Motion on June 17, 2004

OPTION 5 (revised)

4 primary regions

shore-based/diver exemption to closures: shore-based and diving modes permitted in all months, except that lingcod may not be retained between December and March

lingcod closure (all modes) Jan-March and December

REGION		Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
North	OR/CA border to 40o10' N lat	▨	▨	▨	▨	▨	▨	< 40fm	< 40fm	< 40fm	< 40fm	▨	▨
NCentral and northern-SCentral	40o10' N lat. to 36o N. lat	▨	▨	▨	▨	▨	▨	< 20fm	< 20fm	< 20fm	< 20fm	< 20 fm*	▨
southern-SCentral	36o N. lat to 34o27' N. lat.	▨	▨	▨	▨	20-40 fm	20-40fm	20-40fm	20-40fm	20-40fm	▨	▨	▨
South	34o27' to CA/Mex border	▨	▨	30-60fm*	30-60fm	30-60fm	30-60fm	< 40fm	< 40fm	< 40fm	*	▨	▨
South Scorpionfish	34o27' to CA/Mex border	▨	▨	▨	▨	▨	▨	▨	▨	▨	< 40fm	< 40fm	< 20fm

*To provide for shore/diver exemption, November was changed from 30 fm to 20 fm depth in North-Central and northern South-Central; and October was exchanged for March in South

note: for 20-40 fm and 30-60 fm permit fishing only between the specified depths

Option 5 (revised) Impacts:

	Black	minor NS1	Canary	Ling 24"	Ling 26"	Bocaccio
Option 5 (rev) Total	175	471	8.3	348	242	43
2005 HG/Target	184	471	9.3	422	422	77
difference	9	0	1	74	180	34
Percent of HG/HT	95.1	100.0	89.2	82.5	57.4	55.8

1 - Minor nearshore includes shallow nearshore, deeper nearshore, and CA scorpionfish

KEY

▨	Groundfish closed in all waters
< 20 fm	Fishing permitted in waters less than 20 fm
< 40 fm	Fishing permitted in waters less than 40 fm
20-40 fm	Fishing permitted only between 20 fm and 40 fm
30-60 fm	Fishing permitted only between 30 fm and 60 fm

Attachment 3, Table 1. Estimated total mortality of overfished groundfish species under proposed 2005 management measures.

6/18/04 9:54

Fishery	Bocaccio a/	Canary	Cowcod	Dkbl	Lingcod	POP	Widow	Yelloweye
Limited Entry Groundfish								
Trawl- Non-whiting b/	51.2	**8.0**	0.5	76.0	124.2	88.2	1.9	0.4
Fixed Gear	13.4	0.9	0.1	1.2	20.0	0.4	0.5	2.5
Whiting c/								
At-sea whiting motherships		7.3		1.4	0.3	1.7	225.2	0.0
At-sea whiting cat-proc				7.6	0.4	10.1		0.4
Shoreside whiting				0.5	0.7	0.4		0.0
Tribal whiting				0.0	0.5	1.5		0.0
Open Access								
Groundfish directed	10.6	1.0	0.1	0.2	70.0	0.1		0.6
CA Halibut	0.1			0.0	2.0	0.0		
CA Gillnet d/	0.5			0.0		0.0	0.0	
CA Sheephead d/				0.0		0.0	0.0	0.0
CPS- wetfish d/	0.3							
CPS- squid e/								
Dungeness crab d/	0.0		0.0	0.0		0.0		
HMS d/		0.0	0.0	0.0				
Pacific Halibut d/	0.0		0.0	0.0		0.0	0.0	0.5
Pink shrimp	0.1	0.5	0.0	0.0	0.5	0.0	0.1	0.1
Ridgeback prawn	0.1	0.0	0.0	0.0	0.0	0.0	0.0	0.0
Salmon troll	0.2	1.6	0.0	0.0	0.3	0.0	0.0	0.2
Sea Cucumber	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
Spot Prawn (trap)								
Tribal								
Midwater Trawl		1.3		0.0	0.1	0.0	40.0	0.0
Bottom Trawl		0.5		0.0	9.0	0.0	0.0	0.0
Troll		0.5		0.0	1.0	0.0		0.0
Fixed gear		0.3		0.0	15.0	0.0	0.0	2.3
Recreational Groundfish f/								
WA		8.5			206.0			6.7
OR							1.4	
CA	43.0	9.3	0.6		422.0		0.9	3.7
Research: **Includes NMFS trawl shelf-slope surveys, the IPHC halibut survey, and expected impacts from SRPs and LOAs.**								
	0.4	**1.7**		**3.8**	**4.5**	**3.6**	**0.9**	**1.0**
Non-EFP Total	119.9	41.4	1.3	90.7	876.5	106.0	270.9	18.5
EFPs g/								
CA: Sel. FF trawl	10.0	0.5	0.5		20.0			0.5
OR: Sel. FF trawl		0.4		0.5	6.5	0.2		0.2
WA: AT trawl		**1.75**		3.0	4.5	18.0	5.5	0.5
WA: dogfish LL		0.1		0.5	2.0	8.5	0.5	1.0
WA: pollock		0.1					1.5	0.1
EFP Subtotal	10.0	2.9	0.5	4.0	33.0	26.7	7.5	2.3
TOTAL	129.9	44.3	1.8	94.7	909.5	132.7	285.0	20.7
2005 OY	307	46.8	4.2	269	2,414	447	285	26
Difference	177.1	2.5	2.4	174.3	1,504.5	314.3	0.0	5.3
Percent of OY	42.3%	94.6%	42.9%	35.2%	37.7%	29.7%	100.0%	79.7%
Key	▨	= either not applicable; trace amount (<0.01 mt); or not reported in available data						

a/ South of 40°10' N. lat.

b/ The species impacts are under the Council's preferred option. The 8.0 mt of canary rockfish includes a buffer against the uncertainty of predicting impacts using new selective flatfish trawl gear. The point estimate of canary rockfish impacts under this option is 5.2 mt.

c/ Estimated impacts for the 2005 whiting fisheries will be calculated in March 2005. The impacts in this scorecard are the 2004 impacts and are used as a placeholder with the exception of widow rockfish which is the residual yield after estimating impacts in non-whiting fisheries. The 7.3 mt of canary rockfish in this scorecard represents the placeholder for 2005 whiting fisheries adopted by the Council in

d/ Mortality estimates are not hard numbers; based on the GMT's best professional judgement.

e/ Bycatch amounts by species unavailable, but bocaccio occurred in 0.1% of all port samples and other rockfish in another 0.1% of all port samples (and squid fisheries usually land their whole catch). In 2001, out of 84,000 mt total landings 1 mt was groundfish. This suggests that total bocaccio was caught in trace amounts.

f/ Values for canary, lingcod, and yelloweye represent proposed harvest guidelines. California recreational estimates have yet to be

g/ Values are proposed EFP bycatch caps, not estimates of total mortality. The EFP is terminated inseason if the cap is projected to be attained early.

Attachment 3, Table 2. Estimated total mortality of overfished groundfish species under proposed 2006 management measures.

6/18/04 9:54

Fishery	Bocaccio a/	Canary	Cowcod	Dkbl	Lingcod	POP	Widow	Yelloweye
Limited Entry Groundfish								
Trawl- Non-whiting b/	51.2	**8.0**	0.5	76.0	124.2	88.2	1.9	0.4
Fixed Gear	13.4	0.9	0.1	1.2	20.0	0.4	0.5	2.5
Whiting c/								
At-sea whiting motherships	▨	7.3	▨	1.4	0.3	1.7	244.2	0.0
At-sea whiting cat-proc	▨		▨	7.6	0.4	10.1		0.4
Shoreside whiting	▨		▨	0.5	0.7	0.4		0.0
Tribal whiting	▨		▨	0.0	0.5	1.5		0.0
Open Access								
Groundfish directed	10.6	1.0	0.1	0.2	70.0	0.1	▨	0.6
CA Halibut	0.1	▨	▨	0.0	2.0	0.0	▨	▨
CA Gillnet d/	0.5	▨	▨	0.0	▨	0.0	0.0	▨
CA Sheephead d/	▨	▨	▨	0.0	▨	0.0	0.0	0.0
CPS- wetfish d/	0.3	▨	▨	▨	▨	▨	▨	▨
CPS- squid e/	▨	▨	▨	▨	▨	▨	▨	▨
Dungeness crab d/	0.0	▨	0.0	0.0	▨	0.0	▨	▨
HMS d/	▨	0.0	0.0	0.0	▨	▨	▨	▨
Pacific Halibut d/	0.0	▨	0.0	0.0	▨	0.0	0.0	0.5
Pink shrimp	0.1	0.5	0.0	0.0	0.5	0.0	0.1	0.1
Ridgeback prawn	0.1	0.0	0.0	0.0	0.0	0.0	0.0	0.0
Salmon troll	0.2	1.6	0.0	0.0	0.3	0.0	0.0	0.2
Sea Cucumber	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
Spot Prawn (trap)	▨	▨	▨	▨	▨	▨	▨	▨
Tribal								
Midwater Trawl	▨	1.3	▨	0.0	0.1	0.0	40.0	0.0
Bottom Trawl	▨	0.5	▨	0.0	9.0	0.0	0.0	0.0
Troll	▨	0.5	▨	0.0	1.0	0.0	▨	0.0
Fixed gear	▨	0.3	▨	0.0	15.0	0.0	0.0	2.3
Recreational Groundfish f/								
WA	▨	8.5	▨	▨	206.0	▨	▨	6.7
OR	▨		▨	▨		▨	1.4	
CA	43.0	9.3	0.6	▨	422.0	▨	0.9	3.7
Research: Includes NMFS trawl shelf-slope surveys, the NMFS triennial trawl survey, the IPHC halibut survey, and expected impacts from SRPs and LOAs.								
	0.6	**2.7**	▨	**5.2**	**7.2**	**4.6**	**1.0**	**1.0**
Non-EFP Total	120.1	42.4	1.3	92.1	879.2	107.0	290.0	18.5
EFPs g/								
OR: Sel. FF trawl	▨	0.4	▨	0.5	6.5	0.2	▨	0.2
EFP Set Aside	▨	**2.5**	▨	▨	▨	▨	▨	▨
EFP Subtotal	0.0	2.9	0.0	0.5	6.5	0.2	0.0	0.2
TOTAL	120.1	45.3	1.3	92.6	885.7	107.2	289.0	18.6
2006 OY	308	47.1	4.2	294	2,414	447	289	27
Difference	187.9	1.8	2.9	201.4	1,528.3	339.8	0.0	8.4
Percent of OY	39.0%	96.2%	31.0%	31.5%	36.7%	24.0%	100.0%	68.9%
Key	▨	= either not applicable; trace amount (<0.01 mt); or not reported in available data						

a/ South of 40°10' N. lat.

b/ The species impacts are under the Council's preferred option. The 8.0 mt of canary rockfish includes a buffer against the uncertainty of predicting impacts using new selective flatfish trawl gear. The point estimate of canary rockfish impacts under this option is 5.2 mt.

c/ Estimated impacts for the 2006 whiting fisheries will be calculated in March 2006. The impacts in this scorecard are the 2004 impacts and are used as a placeholder with the exception of widow rockfish which is the residual yield after estimating impacts in non-whiting fisheries.

d/ Mortality estimates are not hard numbers; based on the GMT's best professional judgement.
e/ Bycatch amounts by species unavailable, but bocaccio occurred in 0.1% of all port samples and other rockfish in another 0.1% of all port samples (and squid fisheries usually land their whole catch). In 2001, out of 84,000 mt total landings 1 mt was groundfish. This suggests that total bocaccio was caught in trace amounts.
f/ Values for canary, lingcod, and yelloweye represent proposed harvest guidelines. California recreational estimates have yet to be updated.
g/ Values are proposed EFP bycatch caps, not estimates of total mortality. The EFP is terminated inseason if the cap is projected to be attained early. The EFP Set Aside is a GMT-recommended set aside used to calculate the 2006 canary rockfish OY. The EFP Set Aside is determined to result in the same EFP subtotal as decided for 2005.

Attachment 3, Table 3. Proposed harvest guidelines and total mortality estimates of select overfished groundfish species during the 2005-2006 management period.

Species	Fishery	Option	Estimated Total Mortality (mt)	Harvest Guideline (mt)
Canary Rockfish	CA Rec.	Option 5 with shore/diver exemption	8.3	9.3
	OR-WA Rec.	All options	8.3 (1.7 in WA + 6.6 in OR)	8.5
	~~LE Trawl~~	~~Option 1~~	~~5.2~~	~~8.0~~
Lingcod	CA Rec.	Option 5 with shore/diver exemption and a 24" min. size limit	348	422
		Option 5 with shore/diver exemption and a 26" min. size limit	242	422
	OR-WA Rec.	All options	174.7 (65.0 in WA + 109.7 in OR)	206 in 2005 239 in 2006
Yelloweye Rockfish	CA Rec.	Option 5 with shore/diver exemption	1.7 ~~1.5~~	3.7
	OR-WA Rec.	All options	6.4 (3.5 in WA + 2.9 in OR)	6.7

ATTACHMENT 4

Table 3 (North). 2005-2006 Trip Limits and Gear Requirements[1/] for Limited Entry Trawl Gear North of 40°10' N. Latitude

Other Limits and Requirements Apply -- Read Sections IV. A. and B. NMFS Actions before using this table

062004

		JAN-FEB	MAR-APR	MAY-JUN	JUL-AUG	SEP-OCT	NOV-DEC
	Rockfish Conservation Area[10/] (RCA): North of 40°10' N. lat.	75 fm - 150 fm	100 fm - 150 fm				75 fm - 150 fm
	selective flatfish or midwater trawl gear is required shoreward of the RCA; all trawl gear (large footrope, midwater trawl, and selective flatfish trawl gear) is permitted seaward of the RCA.						
	A vessel may have more than one type of limited entry bottom trawl gear on board, but the most restrictive trip limit associated with the gear on board applies for that trip and will count toward the cumulative trip limit for that gear. A vessel that is trawling within the RCA (or other closed area) with trawl gear authorized for use within the RCA (or other closed area) may not have any other type of trawl gear on board. **See IV.A.(14)(b)(iv) and IV.B.(3)(c) for details.** North of 40°10 N. lat., midwater trawl gear is permissible only for vessels participating in the primary whiting season. On non-whiting trips, vessels with both large footrope and midwater trawl gear on board during a trip may access the large footrope limits while fishing with large footrope gear seaward of the RCA.						
1	**Minor slope rockfish[3/]**	8,000 lb/ 2 months					
2	**Pacific ocean perch**	3,000 lb/ 2 months					
3	**DTS complex**	Providing only large footrope gear is used to land any groundfish species during the entire limit period, then large footrope trawl trip limits apply. If selective flatfish trawl gear[7/] is used at any time in any area (North of 40°10' N. lat., shoreward or seaward of RCA) during the entire limit period, then selective flatfish trawl limits apply.					
4	Sablefish						
5	large footrope gear	9,500 lb/ 2 months		17,000 lb/ 2 months			8,000 lb/ 2 months
6	selective flatfish trawl gear[7/]	1,500 lb/ 2 months	10,000 lb/ 2 months				1,500 lb/ 2 months
7	Longspine thornyhead						
8	large footrope gear	15,000 lb/ 2 months		23,000 lb/ 2 months			15,000 lb/ 2 months
9	selective flatfish trawl gear[7/]	1,000 lb/ 2 months					
10	Shortspine thornyhead						
11	large footrope gear	3,500 lb/ 2 months		4,900 lb/ 2 months			3,500 lb/ 2 months
12	selective flatfish trawl gear[7/]	1,000 lb/ 2 months		3,000 lb/ 2 months			1,000 lb/ 2 months
13	Dover sole						
14	large footrope gear	69,000 lb/ 2 months		30,000 lb/ 2 months			69,000 lb/ 2 months
15	selective flatfish trawl gear[7/]	20,000 lb/ 2 months	35,000 lb/ 2 months	50,000 lb/ 2 months			20,000 lb/ 2 months
16	**Flatfish**	Providing only large footrope gear is used to land any groundfish species during the entire limit period, then large footrope trawl trip limits apply. If selective flatfish trawl gear[7/] is used at any time in any area (North of 40°10' N. lat., shoreward or seaward of RCA) during the entire limit period, then selective flatfish trawl limits apply.					
17	All other flatfish, Petrale sole, & Rex sole						
18	large footrope gear for All other flatfish[4/] & Rex sole	110,000 lb/ 2 months	All other flatfish, rex sole, and petrale sole: 110,000 lb/ 2 months, no more than 42,000 lb/ 2 months of which may be petrale sole				110,000 lb/ 2 months
19	large footrope gear for Petrale sole	Not limited					Not limited
20	selective flatfish trawl gear[7/]	100,000 lb/ 2 months, no more than 25,000 lb/ 2 months of which may be petrale sole.	100,000 lb/ 2 months, no more than 35,000 lb/ 2 months of which may be petrale sole.				100,000 lb/ 2 months, no more than 25,000 lb/ 2 months of which may be petrale sole.
21	Arrowtooth flounder						
22	large footrope gear	Not limited	150,000 lb/ 2 months				Not limited
23	selective flatfish trawl gear[7/]	70,000 lb/ 2 months					

Table 3 (North). Continued

24	**Whiting**[5/]	Before the primary whiting season: 20,000 lb/trip -- During the primary season: mid-water trawl permitted in the RCA. See IV.B.(3)(b) for season and trip limit details. -- After the primary whiting season: 10,000 lb/trip		
25	**Minor shelf rockfish**[3/] **& Widow rockfish**			
26	large footrope trawl	300 lb/ 2 months		
27	midwater trawl for Widow rockfish	Before the primary whiting season: CLOSED[6/] -- During primary whiting season: In trips of at least 10,000 lb of whiting, combined widow and yellowtail limit of 500 lb/ trip, cumulative widow limit of 1,500 lb/ month. Mid-water trawl permitted in the RCA. See IV.B.(3)(b) for primary whiting season and trip limit details. -- After the primary whiting season: CLOSED[6/]		
28	selective flatfish trawl gear [7/]for minor shelf & widow	300 lb/ month	1,000 lb/ month, no more than 200 lb/ month of which may be yelloweye rockfish	300 lb/ month
29	**Canary rockfish**			
30	large footrope trawl	CLOSED[6/]		
31	selective flatfish trawl gear [7/]	100 lb/ month	300 lb/ month	100 lb/ month
32	**Yellowtail**			
33	large footrope trawl	300 lb/ 2 months		
34	midwater trawl	Before the primary whiting season: CLOSED[6/] -- During primary whiting season: In trips of at least 10,000 lb of whiting: combined widow and yellowtail limit of 500 lb/ trip, cumulative yellowtail limit of 2,000 lb/ month. Mid-water trawl permitted in the RCA. See IV.B.(3)(b) for primary whiting season and trip limit details. -- After the primary whiting season: CLOSED[6/]		
35	selective flatfish trawl gear [7/]	2,000 lb/ 2 months		
36	**Minor nearshore rockfish**			
37	large footrope trawl	CLOSED[6/]		
38	selective flatfish trawl gear [7/]	300 lb/ month		
39	**Lingcod**[8/]			
40	large footrope trawl	500 lb/ 2 months		
41	selective flatfish trawl gear [7/]	800 lb/ 2 months	1,000 lb/ 2 months	800 lb/ 2 months
42	**Other Fish**[9/]	Not limited		

Table 3 (South). 2005-2006 Trip Limits and Gear Requirements[1/] for Limited Entry Trawl Gear South of 40°10' N. Latitude

Other Limits and Requirements Apply -- Read Sections IV. A. and B. NMFS Actions before using this table 062004

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		JAN-FEB	MAR-APR	MAY-JUN	JUL-AUG	SEP-OCT	NOV-DEC
	Rockfish Conservation Area[10/] (RCA):						
	40°10' - 34°27' N. lat.	75 fm - 150 fm (additional closure between the shoreline and 10 fm around the Farallon Islands)	100 fm - 150 fm (additional closure between the shoreline and 10 fm around the Farallon Islands)				75 fm - 150 fm (additional closure between the shoreline and 10 fm around the Farallon Islands)
	South of 34°27' N. lat.	75 fm - 150 fm along the mainland coast; shoreline - 150 fm around islands	100 fm - 150 fm along the mainland coast; shoreline - 150 fm around islands				75 fm - 150 fm along the mainland coast; shoreline - 150 fm around islands
	Small footrope gear is required shoreward of the RCA; all trawl gear (large footrope, midwater trawl, and small footrope gear) is permitted seaward of the RCA.						
	A vessel may have more than one type of limited entry bottom trawl gear on board. For vessels using more than one type of trawl gear during a cumulative limit period, limits are additive up to the largest limit for the type of gear used. A vessel that is trawling within the RCA (or other closed area) with trawl gear authorized for use within the RCA (or other closed area) may not have any other type of trawl gear on board. **See IV.A.(14)(b)(iv) and IV.B.(3)(c) for details.**						
1	**Minor slope rockfish[3/]**	40,000 lb/ 2 months					
2	**Splitnose**	40,000 lb/ 2 months					
3	**DTS complex**	If fishing North of 40°10' N. lat. at any time during the cumulative limit period, differential trip limits based on footrope size and crossover provisions will apply during the entire limit period. See Table 3 (North) and Section A. (12) for more details					
4	Sablefish	14,000 lb/ 2 months					
5	Longspine thornyhead	19,000 lb / 2 months					
6	Shortspine thornyhead	4,200 lb/ 2 months					
7	Dover sole	50,000 lb/ 2 months					
8	**Flatfish**	If fishing North of 40°10' N. lat. at any time during the cumulative limit period, differential trip limits based on footrope size and crossover provisions will apply during the entire limit period. See Table 3 (North) and Section A. (12) for more details					
9	All other flatfish[4/] & Rex sole	110,000 lb/ 2 months	All other flatfish plus petrale & rex sole: 110,000 lb/ 2 months, no more than 42,000 lb/ 2 months of which may be petrale sole				110,000 lb/ 2 months
10	Petrale sole	No limit					No limit
11	Arrowtooth flounder	No limit	10,000 lb/ 2 months				No limit
12	**Whiting[5/]**	Before the primary whiting season: 20,000 lb/trip -- During the primary whiting season: mid-water trawl permitted in the RCA. See IV.B.(3)(b) for season and trip limit details. -- After the primary whiting season: 10,000 lb/trip					
13	**Minor shelf rockfish, Widow, and Chilipepper rockfish[3/]**						
14	large footrope or midwater trawl for Minor shelf rockfish	300 lb/ month					
15	large footrope or midwater trawl for Chilipepper rockfish	2,000 lb/ 2 months		12,000 lb/ 2 months		8,000 lb/ 2 months	
16	large footrope or midwater trawl for Widow rockfish	CLOSED[6/]					
17	small footrope trawl[7/] for minor shelf, widow & chilipepper	300 lb/ month					
18	**Bocaccio**						
19	large footrope or midwater trawl	100 lb/ month			300 lb/ 2 months		
20	small footrope trawl[7/]	CLOSED[6/]					

Table 3 (South). Continued

21	**Canary rockfish**			
22	large footrope or midwater trawl	CLOSED[6/]		
23	small footrope trawl[7/]	100 lb/ month	300 lb/ month	100 lb/ month
24	**Cowcod**	CLOSED[6/]		
25	**Minor nearshore rockfish**			
26	large footrope or midwater trawl	CLOSED[6/]		
27	small footrope trawl[7/]	300 lb/ month		
28	**Lingcod[8/]**			
29	large footrope or midwater trawl	500 lb/ 2 months		
30	small footrope trawl[7/]	800 lb/ 2 months	1,000 lb/ 2 months	800 lb/ 2 months
31	**Other Fish[9/]**	Not limited		

Table 4 (North). 2005-2006 Trip Limits for Limited Entry Fixed Gear North of 40°10' N. Latitude[1/]

Other Limits and Requirements Apply -- Read Sections IV. A. and B. NMFS Actions before using this table

062004

		JAN-FEB	MAR-APR	MAY-JUN	JUL-AUG	SEP-OCT	NOV-DEC
	Rockfish Conservation Area[8/] (RCA):						
	North of 46°16' N. lat.	shoreline - 100 fm					
	46°16' N. lat. - 40°10' N. lat.	30 fm - 100 fm					
1	**Minor slope rockfish[4/]**	4,000 lb/ 2 months					
2	**Pacific ocean perch**	1,800 lb/ 2 months					
3	**Sablefish**	300 lb/ day, or 1 landing per week of up to 900 lb, not to exceed 3,600 lb/ 2 months					
4	**Longspine thornyhead**	10,000 lb/ 2 months					
5	**Shortspine thornyhead**	2,100 lb/ 2 months					
6	**Dover sole**	5,000 lb/ month					
7	**Arrowtooth flounder**						
8	**Petrale sole**						
9	**Rex sole**						
10	**All other flatfish[2/]**						
11	**Whiting[3/]**	10,000 lb/ trip					
12	**Minor shelf rockfish, widow, and yellowtail rockfish[4/]**	200 lb/ month					
13	**Canary rockfish**	CLOSED[5/]					
14	**Yelloweye rockfish**	CLOSED[5/]					
15	**Minor nearshore rockfish**	5,000 lb/ 2 months, no more than 1,200 lb of which may be species other than black or blue rockfish[6/]					
16	**Lingcod[7/]**	CLOSED[5/]		800 lb/ 2 months			CLOSED[5/]
17	**Other fish[9/]**	Not limited					

Table 4 (South). 2005-2006 Trip Limits for Limited Entry Fixed Gear South of 40°10' N. Latitude[1/]

Other Limits and Requirements Apply -- Read Sections IV. A. and B. NMFS Actions before using this table 062004

		JAN-FEB	MAR-APR	MAY-JUN	JUL-AUG	SEP-OCT	NOV-DEC
	Rockfish Conservation Area[7/] (RCA):						
	40°10' - 34°27' N. lat.	30 fm - 150 fm (also applies around islands, there is an additional closure between the shoreline and 10 fm around the Farallon Islands)		20 fm - 150 fm (also applies around islands, there is an additional closure between the shoreline and 10 fm around the Farallon Islands)		30 fm - 150 fm (also applies around islands, there is an additional closure between the shoreline and 10 fm around the Farallon Islands)	
	South of 34°27' N. lat.	60 fm - 150 fm (also applies around islands)					
1	**Minor slope rockfish[4/]**	40,000 lb/ 2 months					
2	**Splitnose**	40,000 lb/ 2 months					
3	**Sablefish**						
4	40°10' - 36° N. lat.	300 lb/ day, or 1 landing per week of up to 900 lb, not to exceed 3,600 lb/ 2 months					
5	South of 36° N. lat.	350 lb/ day, or 1 landing per week of up to 1,050 lb					
6	**Longspine thornyhead**	19,000 lb / 2 months					
7	**Shortspine thornyhead**	4,200 lb/ 2 months					
8	**Dover sole**	5,000 lb/ month When fishing for Pacific sanddabs, vessels using hook-and-line gear with no more than 12 hooks per line, using hooks no larger than "Number 2" hooks, which measure 11 mm (0.44 inches) point to shank, and up to 1 lb (0.45 kg) of weight per line are not subject to the RCAs.					
9	**Arrowtooth flounder**						
10	**Petrale sole**						
11	**Rex sole**						
12	**All other flatfish[2/]**						
13	**Whiting[3/]**	10,000 lb/ trip					
14	**Minor shelf rockfish, widow, and yellowtail rockfish[4/]**						
15	40°10' - 34°27' N. lat.	300 lb/ 2 months	CLOSED[5/]	200 lb/ 2 months		300 lb/ 2 months	
16	South of 34°27' N. lat.	CLOSED[5/]	2,000 lb/ 2 months				
17	**Chilipepper rockfish**	2,000 lb/ 2 months, this opportunity only available seaward of the nontrawl RCA					
18	**Canary rockfish**	CLOSED[5/]					
19	**Yelloweye rockfish**	CLOSED[5/]					
20	**Cowcod**	CLOSED[5/]					
21	**Bocaccio**						
22	40°10' - 34°27' N. lat.	200 lb/ 2 months	CLOSED[5/]	100 lb/ 2 months	300 lb/ 2 months		
23	South of 34°27' N. lat.	CLOSED[5/]	300 lb/ 2 months				
24	**Minor nearshore rockfish**						
25	Shallow nearshore						
26	40°10' - 34°27' N. lat.	300 lb/ 2 months	CLOSED[5/]	500 lb/ 2 months	600 lb/ 2 months	500 lb/ 2 months	300 lb/ 2 months
27	South of 34°27' N. lat.	CLOSED[5/]	300 lb/ 2 months				
28	Deeper nearshore						
29	40°10' - 34°27' N. lat.	500 lb/ 2 months	CLOSED[5/]	500 lb/ 2 months		400 lb/month	500 lb/ 2 months
30	South of 34°27' N. lat.	CLOSED[5/]	500 lb/ 2 months	600 lb/ 2 months			400 lb/ 2 months
31	California scorpionfish	CLOSED[5/]	300 lb/ 2 months		400 lb/ 2 months		300 lb/ 2 months
32	**Lingcod[6/]**	CLOSED[5/]		400 lb/ month, when nearshore open			CLOSED[5/]
33	**Other fish[8/]**	Not limited					

Table 5 (North). 2005-2006 Trip Limits for Open Access Gears North of 40°10' N. Latitude[1/]

Other Limits and Requirements Apply -- Read Sections IV. A. and C. NMFS Actions before using this table 062004

		JAN-FEB	MAR-APR	MAY-JUN	JUL-AUG	SEP-OCT	NOV-DEC
	Rockfish Conservation Area[8/] (RCA):						
	North of 46°16' N. lat.	shoreline - 100 fm					
	46°16' N. lat. - 40°10' N. lat.	30 fm - 100 fm					
1	**Minor slope rockfish[2/]**	Per trip, no more than 25% of weight of the sablefish landed					
2	**Pacific ocean perch**	100 lb/ month					
3	**Sablefish**	300 lb/ day, or 1 landing per week of up to 900 lb, not to exceed 3,600 lb/ 2 months					
4	**Thornyheads**	CLOSED[5/]					
5	**Dover sole**	3,000 lb/month, no more than 300 lb of which may be species other than Pacific sanddabs.					
6	**Arrowtooth flounder**						
7	**Petrale sole**						
8	**Rex sole**						
9	**All other flatfish[3/]**						
10	**Whiting**	300 lb/ month					
11	**Minor shelf rockfish, widow and yellowtail rockfish[2/]**	200 lb/ month					
12	**Canary rockfish**	CLOSED[5/]					
13	**Yelloweye rockfish**	CLOSED[5/]					
14	**Minor nearshore rockfish**	5,000 lb/ 2 months, no more than 1,200 lb of which may be species other than black or blue rockfish[6/]					
15	**Lingcod[6/]**	CLOSED[5/]		300 lb/ month			CLOSED[5/]
16	**Other Fish[7/]**	Not limited					
17	**PINK SHRIMP EXEMPTED TRAWL** *(not subject to RCAs)*						
18	North	**Effective April 1 - October 31, 2004:** groundfish 500 lb/day, multiplied by the number of days of the trip, not to exceed 1,500 lb/trip. The following sublimits also apply and are counted toward the overall 500 lb/day and 1,500 lb/trip groundfish limits: lingcod 300 lb/month (minimum 24 inch size limit); sablefish 2,000 lb/month; canary, thornyheads and yelloweye rockfish are PROHIBITED. All other groundfish species taken are managed under the overall 500 lb/day and 1,500 lb/trip groundfish limits. Landings of these species count toward the per day and per trip groundfish limits and do not have species-specific limits. The amount of groundfish landed may not exceed the amount of pink shrimp landed.					
19	**SALMON TROLL**						
20	North	Salmon trollers may retain and land up to 1 lb of yellowtail rockfish for every 2 lbs of salmon landed, with a cumulative limit of 200 lb/month, both within and outside of the RCA. This limit is within the 200 lb per month combined limit for minor shelf rockfish, widow rockfish and yellowtail rockfish, and not in addition to that limit. All groundfish species are subject to the open access limits, seasons and RCA restrictions listed in the table above.					

Table 5 (South). 2005-2006 Trip Limits for Open Access Gears South of 40°10' N. Latitude[1]

Other Limits and Requirements Apply -- Read Sections IV. A. and C. NMFS Actions before using this table 062004

		JAN-FEB	MAR-APR	MAY-JUN	JUL-AUG	SEP-OCT	NOV-DEC
	Rockfish Conservation Area[7] (RCA):						
	40°10' - 34°27' N. lat.	30 fm - 150 fm (also applies around islands, there is an additional closure between the shoreline and 10 fm around the Farallon Islands)		20 fm - 150 fm (also applies around islands, there is an additional closure between the shoreline and 10 fm around the Farallon Islands)		30 fm - 150 fm (also applies around islands, there is an additional closure between the shoreline and 10 fm around the Farallon Islands)	
	South of 34°27' N. lat.	60 fm - 150 fm (also applies around islands)					
1	**Minor slope rockfish[2]**						
2	40°10' - 38° N. lat.	Per trip, no more than 25% of weight of the sablefish landed					
3	South of 38° N. lat.	10,000 lb/ 2 months					
4	**Splitnose**	200 lb/ month					
5	**Sablefish**						
6	40°10' - 36° N. lat.	300 lb/ day, or 1 landing per week of up to 900 lb, not to exceed 3,600 lb/ 2 months					
7	South of 36° N. lat.	350 lb/ day, or 1 landing per week of up to 1,050 lb					
8	**Thornyheads**						
9	40°10' - 34°27' N. lat.	CLOSED[5]					
10	South of 34°27' N. lat.	50 lb/ day, no more than 1,000 lb/ 2 months					
11	**Dover sole**	3,000 lb/month, no more than 300 lb of which may be species other than Pacific sanddabs. When fishing for Pacific sanddabs, vessels using hook-and-line gear with no more than 12 hooks per line, using hooks no larger than "Number 2" hooks, which measure 11 mm (0.44 inches) point to shank, and up to 1 lb of weight per line are not subject to the RCAs.					
12	**Arrowtooth flounder**						
13	**Petrale sole**						
14	**Rex sole**						
15	**All other flatfish[3]**						
16	**Whiting**	300 lb/ month					
17	**Minor shelf rockfish, widow and chilipepper rockfish[2]**						
18	40°10' - 34°27' N. lat.	300 lb/ 2 months	CLOSED[5]	200 lb/ 2 months		300 lb/ 2 months	
19	South of 34°27' N. lat.	CLOSED[5]	500 lb/ 2 months				
20	**Canary rockfish**	CLOSED[5]					
21	**Yelloweye rockfish**	CLOSED[5]					
22	**Cowcod**	CLOSED[5]					
23	**Bocaccio**						
24	40°10' - 34°27' N. lat.	200 lb/ 2 months	CLOSED[5]	100 lb/ 2 months		200 lb/ 2 months	
25	South of 34°27' N. lat.	CLOSED[5]	100 lb/ 2 months				
26	**Minor nearshore rockfish**						
27	Shallow nearshore						
28	40°10' - 34°27' N. lat.	300 lb/ 2 months	CLOSED[5]	500 lb/ 2 months	600 lb/ 2 months	500 lb/ 2 months	300 lb/ 2 months
29	South of 34°27' N. lat.	CLOSED[5]	300 lb/ 2 months				
30	Deeper nearshore						
31	40°10' - 34°27' N. lat.	500 lb/ 2 months	CLOSED[5]	500 lb/ 2 months		400 lb/month	500 lb/ 2 months
32	South of 34°27' N. lat.	CLOSED[5]	500 lb/ 2 months	600 lb/ 2 months			400 lb/ 2 months
33	California scorpionfish	CLOSED[5]	300 lb/ 2 months		400 lb/ 2 months		300 lb/ 2 months

Table 5 (South). Continued

34	**Lingcod**[4/]	CLOSED[5/]	300 lb/ month, when nearshore open	CLOSED[5/]
35	**Other Fish**[6/]	Not limited		
36	**PINK SHRIMP EXEMPTED TRAWL GEAR** *(not subject to RCAs)*			
37	South	**Effective April 1 - October 31, 2004:** Groundfish 500 lb/day, multiplied by the number of days of the trip, not to exceed 1,500 lb/trip. The following sublimits also apply and are counted toward the overall 500 lb/day and 1,500 lb/trip groundfish limits: lingcod 300 lb/ month (minimum 24 inch size limit); sablefish 2,000 lb/ month; canary, thornyheads and yelloweye rockfish are PROHIBITED. All other groundfish species taken are managed under the overall 500 lb/day and 1,500 lb/trip groundfish limits. Landings of these species count toward the per day and per trip groundfish limits and do not have species-specific limits. The amount of groundfish landed may not exceed the amount of pink shrimp landed.		
38	**PRAWN AND, SOUTH OF 38°57'30" N. LAT., CALIFORNIA HALIBUT AND SEA CUCUMBER EXEMPTED TRAWL**			
39	**EXEMPTED TRAWL Rockfish Conservation Area**[7/] **(RCA):**			
40	40°10' - 34°27' N. lat.	75 fm - 150 fm (additional closure between the shoreline and 10 fm around the Farallon Islands)	100 fm - 150 fm (additional closure between the shoreline and 10 fm around the Farallon Islands)	75 fm - 150 fm (additional closure between the shoreline and 10 fm around the Farallon Islands)
41	South of 34°27' N. lat.	75 fm - 150 fm along the mainland coast; shoreline - 150 fm around islands	100 fm - 150 fm along the mainland coast; shoreline - 150 fm around islands	75 fm - 150 fm along the mainland coast; shoreline - 150 fm around islands
42		Groundfish 300 lb/trip. Trip limits in this table also apply and are counted toward the 300 lb groundfish per trip limit. The amount of groundfish landed may not exceed the amount of the target species landed, except that the amount of spiny dogfish landed may exceed the amount of target species landed. Spiny dogfish are limited by the 300 lb/trip overall groundfish limit. The daily trip limits for sablefish coastwide and thornyheads south of Pt. Conception and the overall groundfish "per trip" limit may not be multiplied by the number of days of the trip. Vessels participating in the California halibut fishery south of 38°57'30" N. lat. are allowed to (1) land up to 100 lb/day of groundfish without the ratio requirement, provided that at least one California halibut is landed and (2) land up to 3,000 lb/month of flatfish, no more than 300 lb of which may be species other than Pacific sanddabs, sand sole, starry flounder, rock sole, curlfin sole, or California scorpionfish (California scorpionfish is also subject to the trip limits and closures in line 33).		

Exhibit C.10.b
Supplemental GMT Report 2
June 2004

Economic information

Comparison of annual catch projections under the 2005-06 California Recreational Alternatives (mt)

No Action

	Boc	Can	Cowcod	LC	SNR	DNR	Scor	Black	Widow	YE	Total
N	0	0.5	0.0	36.0	0.0	0	0	95.5	0.0	0.1	132.1
C	1.7	8.2	0.4	259.5	79.4	314.7	0.0	69.2	0.3	1.4	734.8
S	50.1	0.0	0.0	38.8	10.4	31.2	43.0	6.9	0.0	0.0	180.4
Total	51.8	8.7	0.4	~~334.3~~ 387.7	89.8	345.9	43.0	171.6	0.3	1.5	1,047.3

Option 5 w/ 24" LC min size limit

	Boc	Can	Cowcod	LC		MNR a/		Black	Widow	YE	Total
N	0.0	0.5	0.0	34.4	---	---	---	87.0	0.0	0.1	122.0
C	0.3	7.2	0.3	278.0	---	403.0	---	88.0	0.3	1.6	778.6
S	43.2	0.5	0.3	35.7	---	68.0	---	0.0	0.7	0.0	148.4
Total	43.4	8.3	0.6	348.1	---	471.0	---	175.0	0.9	1.7	1,049.0

Option 5 w/ 26" LC min size limit

	Boc	Can	Cowcod	LC		MNR a/		Black	Widow	YE	Total
N	0.0	0.5	0.0	23.9	---	---	---	87.0	0.0	0.1	111.5
C	0.3	7.2	0.3	193.2	---	403.0	---	88.0	0.3	1.6	693.8
S	43.2	0.5	0.3	24.8	---	68.0	---	0.0	0.7	0.0	137.5
Total	43.4	8.3	0.6	241.9	---	471.0	---	175.0	0.9	1.7	942.9

a/ MNR includes SNR+DNR+Scor.

Exhibit C.10.c
Supplemental GAP Report
June 2004

GROUNDFISH ADVISORY SUBPANEL REPORT ON FINAL ADOPTION OF 2005/2006 MANAGEMENT MEASURES

The Groundfish Advisory Subpanel (GAP) offers the following comments on 2005/2006 management measures.

Except as noted, the GAP supports the Groundfish Management Team (GMT) recommendations which reflect the preferred alternatives adopted by the Council under agenda item C.6 and trawl option 1 tentatively adopted by the Council under agenda item C.8.

In regard to *OTHER FLATFISH ACCEPTABLE BIOLOGICAL CATCH (ABC) AND OPTIMUM YIELD (OY)*, the GAP supports the ABC calculation, but rejects the OY calculation as arbitrary and unreasonable in the case of Rex sole and sanddabs. As noted during Council discussion, considerable effort, time, and expense was directed towards developing selective trawl mesh which will avoid take of juvenile flatfish. The reduction in OY for these two species ignores this data. The reduction is being suggested because it is "Council policy." The Council has made exceptions to policy before, when doing so reflected common sense. We believe that common sense should again prevail.

The GAP again forwards the suggestion we made under agenda item C.6 that federal and state managers, including the Council and enforcement, work cooperatively with the whiting industry to develop a system of closures that can be tailored to resource emergencies and put in place as needed to protect overfished species. We were amazed that a good-faith industry offer to work cooperatively towards conservation was so strongly rejected by one federal agency. At a time when the fishing industry and the fishery management system are being vilified as working against sound conservation and management, we think the idea should at least be explored.

In regard to research catches, we again suggest the Council establish a policy of deducting research catch of non-overfished species from the ABC, rather than the OY and that the Council consider modifying the Pacific Groundfish Fishery Management Plan to do the same with overfished species. We appreciate the Council's action under agenda item B.4.c to complement this recommendation by supporting changes in federal law governing control of research catches.

Regarding *OTHER CALIFORNIA MANAGEMENT ISSUES*, the GAP cannot provide comment on the issues of retention of other flatfish with sanddab gear and the ridgeback prawn trawl exemption. Neither of these issues were brought forward to the GAP, so we were unable to discuss them. In the future, the GAP would appreciate having the opportunity to review management issues of this nature.

Regarding *COMMERCIAL MANAGEMENT MEASURES*, the GAP supports the changes to limited entry trawl and limited entry fixed gear recommended by the GMT.

Finally, in regard to *CALIFORNIA RECREATIONAL*, the GAP supports Revised Option 5 as presented by the State of California, with a 24" minimum size for lingcod. This option provides the necessary savings for sensitive species while allowing fishing opportunities for both private recreational and recreational charter sectors. The path taken to arriving at this option was a rough one for all concerned. Sacrifices have been made - sometimes reluctantly - by all of those affected. We are sensitive to the concerns of the Enforcement Consultants and realize it will impose a burden on enforcement agencies. It will also impose a burden on fishermen and small fishing companies. Nevertheless, we believe it is the best that can be developed at this time.

The GAP wants to be clear that - if savings of overfished species are greater than anticipated - we expect strong consideration be given to appropriate inseason adjustments. Inseason management of recreational fisheries is difficult to accomplish, given the amount and timing of data with which we can work. Notwithstanding this problem, the GAP believes that inseason adjustments should be made if warranted.

With this in mind, we will be anticipating possible inseason adjustments in September 2004, which reflect the use of data from the California Recreational Fisheries Survey.

PFMC
06/18/04

Exhibit C.10.d
Supplemental Tribal Comments
June 2004

Mr. Chairman,
I move to adopt the final tribal groundfish management measures for 2005 and 2006 as set forth in Exhibit C.6.c Proposed Treaty Indian Management Measures which was distributed Wednesday.