Bocaccio Rebuilding Analysis for 2005

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Introduction

In 1998, the PFMC adopted Amendment 11 of the Groundfish Management Plan, which established a minimum stock size threshold of 25% of unfished biomass. Based on the stock assessment by Ralston et al. (1996), bocaccio was declared formally to be overfished, thereby requiring development of a rebuilding plan for consideration by the Council in the fall of 1999. Rebuilding was initiated by catch restrictions beginning in 2000.

A number of bocaccio stock assessments (MacCall et al. 1999, MacCall 2002, MacCall 2003a, MacCall 2005) and rebuilding analyses (MacCall 1999, MacCall and He 2002, MacCall 2003b) have now been conducted since the stock was declared overfished. In 2004, a formal rebuilding plan for bocaccio was enacted by the Pacific Fishery Management Council (PFMC) as part of Amendment 16-3 to the Pacific Coast Groundfish Fishery Management Plan (PFMC 2004).

The 2003 stock assessment examined three models of bocaccio. One of those, the STATc model, was used as the basis for subsequent fishery management and as the basis of FMP Amendment 16-3. The 2005 bocaccio stock assessment updated the 2003 STATc model, and is the basis of this rebuilding analysis. Also, the 2005 assessment is the first new assessment since the formal Rebuilding Plan (FMP Amendment 16-3) was established.

IMPORTANT NOTE: In preparing this rebuilding analysis, an error was discovered in the Rebuilding Plan, Amendment 16-3. Although the PFMC clearly selected a bocaccio rebuilding plan with $\mathbf{P_0}$ (probability of reaching rebuilding target by $\mathbf{T_{max}}$) of 70%, the corresponding value of $\mathbf{T_{targ}}$ (year with a 50% probability of reaching the target) was incorrectly specified as 2023. The 2003 rebuilding analysis indicated that a 50% probability rebuilding would require 23 years, but this assumed a beginning date of 2004 (the first simulated year). Accordingly, the correct value of $\mathbf{T_{targ}}$ was 2027. Both values of $\mathbf{T_{targ}}$ are examined in the present analysis.

Management Performance

Details of management performance are provided in Table 1. The rebuilding OY was set at 100 MT for 2000-2002 as a transition to a constant fishing mortality rate policy beginning in 2003. This was a learning period for fishery management, which required unprecedented restrictions on both commercial and recrerationa fishing opportunities. Actual harvest exceeded management targets in the first three years, but with a smaller excess by the third year. In response to the 2002 bocaccio assessment, which indicated very low productivity, the 2003 OY was set at 20MT, and the retained catch was about 12MT. Including mortality of estimated discards, estimated 2003 total kill was 22MT. Based on the 2003 assessment, which showed a much more productive stock, the 2004 OY was set at 250MT, but management used an operational target of 199MT; the final catch was 78MT. Discards brought the estimated 2004 kill to 83MT. Thus, recent management has shown substantial improvement in performance, and has been achieving total removals at (2003) or well below (2004) maximum target levels. The anticipated bocaccio mortality in 2005 also is expected to fall well below the maximum level set by the OY.

Table 1. Recent history of bocaccio management performance.

	Commercial			Recreational			Total			ABC	OY
Year	Catch	Discard	Total	Catch	Discard	Total	Catch	Discard	Total		
1995	730	*	730	31	2	33	761	2	763	1700	1700
1996	480	*	480	89	4	93	569	4	573	1700	1700
1997	324	*	324	146	11	157	470	11	481	265	265
1998	157	*	157	51	0	51	208	0	208	230	230
1999	73	*	73	120	4	124	193	4	197	230	230
2000	25	49	74	103	9	112	128	58	186	164	100
2001	22	76	98	103	6	109	125	82	207	122	100
2002	21	30	51	82	2	84	103	32	135	122	100
2003	1	10	11	9	2	11	10	12	22	244	<20
2004	12	10	22	54	8	62	66	18	84	400	199
2005									150**	566	307

* Discarded commercial catch was not estimated and is assumed to be negligible.
** Anticipated 2005 bocaccio mortality given in June 2005 GMT document dated “6/16/06 17:45" [actual year 2005]

Simulation Model

This analysis uses the SSC Default Rebuilding Analysis (version 2.8a). All data and parameters use as input to this analysis were taken from the STATc model in the 2005 assessment. An example input file is given in Appendix A. Future recruitments were simulated by re-sampling estimated historical recruits/spawning output (**R/B**) ratios from years 1970 to 2005. Re-sampling **R/B** values is justified by the estimated Mace-Doonan steepness value of $\boldsymbol{h}$ = 0.211 in the 2005 stock assessment. This value of steepness indicates negligible curvature in the estimated stock-recruitment relationship. Probability distributions are based on 2000 simulations.

As a comparability check, the input data from the 2003 rebuilding analysis were run in this most recent version of the SSC simulation model, and results were identical to those in the original 2003 analysis. Note that due to differences in model structure, the projections made by the SSC model may differ from projections made by the Stock Synthesis model used in the 2005 stock assessment (MacCall 2005).

Rebuilding Parameters/Management Reference Points

$B_{unfished}$: Unfished biomass (measures as spawning output) is estimated by multiplying average recruitment (**R**) by the spawning output per recruit achieved when the fishing mortality rate is zero (**$SPR_{F=0}$** = 2.499, spawning output in billion eggs, recruitment in thousand fish at age 1). Based on the 2005 bocaccio assessment, the estimated unfished spawning output (**$B_{unfished}$**) is 13325 billion eggs (compared with 13387 billion eggs estimated in the 2003 rebuilding analysis), based on the average recruitment from spawning years between 1950 and 1985. This time period was chosen as representing a presumably "natural" range of stock abundance. Because recruitment is highly variable, this calculation of unfished abundance is imprecise (CV $ 10%; variability is underestimated because estimated recruitment in the first ten years is held constant).

B_{msy}: The rebuilding target is the spawning abundance level that produces MSY. This value cannot be determined directly for bocaccio, so this analysis uses the PFMC proxy value of 40% of estimated unfished spawning output. Estimated **B_{msy}** is 5330 billion eggs (compared with 5355 billion eggs in the 2003 rebuilding analysis).

Current status: According to the 2005 stock assessment as modified for input to the SSC Rebuilding Analysis model, current (2005) spawning output is 1419 billion eggs, which is 27% of the estimated **B_{msy}**. This is a substantial increase over the 2003 values. Historical abundance relative to the rebuilding target is shown in Figure 1.

Mean generation time: Mean generation time of bocaccio is estimated from the net maternity function, and is 14 years.

The following table summarizes results of the 2003 and 2005 rebuilding analyses. Reference years are unchanged by the 2005 update.

Table 2. Parameters and reference points for rebuilding

Date of Analysis	2003	2005
Assessment model used as basis	STATc	STATc update
First year of rebuilding	2000	2000
Present year (Final year of assessment)	2003	2005
First simulated year	2004	2006
Tmin	2018	2018
Mean Generation Time	14	14
Tmax	2032	2032
Prob rebuild by Tmax	0.7	
Rebuild SPR	0.693	
Exploitation Rate	0.0498	
Ttarg from 2003 Rebuilding Analysis	2027	
Ttarg from Amendment 16-3 (wrong)	2023	

Results of Simulations

Table 3 is a suite of projections requested by the GMT. Because of the alternative interpretations of $\mathbf{T_{targ}}$ for bocaccio, two versions of run #2 are presented: Version "a" uses $\mathbf{T_{targ}}$ = 2027 and version "b" uses $\mathbf{T_{targ}}$ = 2023. Both values of $\mathbf{T_{targ}}$ are also considered in run #1.

Table 3. Rebuilding projections requested by the GMT.

Run #	Prob (recovery)	By	Based on
#1 (default)	Estimated	Current T_{TARGET}	Current SPR
#2 (T_{TARGET} with 50% prob)	0.5	Current T_{TARGET}	Estimated SPR
#3 (#1 based on T_{MAX})	Estimated	Current T_{MAX}	Current SPR
#4 (#2 based on T_{MAX})	P_0	Current T_{MAX}	Estimated SPR
#5 (#3 with re-estimated T_{MAX})	Estimated	T_{MAX} (re-estimated)	Current SPR
#6 (#4 with re-estimated T_{MAX})	P_0	T_{MAX} (re-estimated)	Estimated SPR

Projection results, including time series of median catch and median spawning output relative to the rebuilding target are shown in Table 4. Because the value of $\mathbf{T_{max}}$ did not change from the 2003 value, some of the GMT-requested runs are identical (3 and 5, 4 and 6), and Table 4 is condensed accordingly. Results for four additional runs are also shown: cases of **F**=0, catches under ABC ($\mathbf{F_{50\%}}$) and the 40-10 rules, an 80% probability of achieving the rebuilding target by $\mathbf{T_{max}}$, and a "scorecard F projection" requested by the GMT (John Field, Pers. Comm.). The latter projection is based on a constant harvest rate equivalent to a 2005 catch of 148.9 mtons. Catches and biomasses projected under an ABC (i.e., $\mathbf{F_{msy}}$ proxy = $\mathbf{F_{50\%}}$) harvest policy do not correspond to the ABC for individual years under other policies, but rather represent projections under the maximum allowable harvest rate. Also note that the **F**=0 projection now has a median rebuilding date of 2022 because of actual catches taken during 2000-2006 (i.e., this scenario represents no harvest beginning in 2007) as opposed to the original $\mathbf{T_{min}}$ of 2018 which assumed no harvest beginning in 2000.

Simulated individual rebuilding trajectories are erratic due to rare large recruitments (Figure 1). The time series of percentiles and medians of simulated catch and abundance trajectories (Figures 2, 3, 4) provide a more informative overview of likely rebuilding performance and uncertainty.

Table 4. Results of rebuilding projections. Bold numbers are specifications for runs (see Table 3). Shaded cells indicate median abundance exceeds rebuilding target. Where applicable, rebuilding policy reverts to 40-10 policy upon achieving target abundance.

Run	re-do 2003	1a, 1b, 3, 5	2a	2b	4, 6	F=0	F50%(ABC)	40-10 Policy	P=0.8 by Tmax	Scorecard F
SPR	0.693	0.692	0.717	0.883	0.705	1.000	**0.5**	**variable**	0.777	0.844
F	0.0498	**0.0498**	0.0450	0.0166	0.0475	**0**	0.0971	**variable**	0.034	**0.023**
P(by 2023)	0.316	0.240	0.270	**0.5**	0.254	0.638	0.0445	0.284	0.37	0.448
P(by 2027)	0.517	0.458	**0.5**	0.726	0.48	0.8365	0.1145	0.5	0.726	0.688
P(by 2032)	**0.7**	0.678	0.720	0.9	**0.7**	0.958	0.228	0.706	**0.8**	0.868
T(P=0.5)	2027	2028	2027	2023	**2028**	2022	2044	2027	2026	2024
Median Catch										
2004	306									
2005	308	*150*	*150*	*150*	*150*	*150*	*150*	*150*	*150*	*148.9*
2006	309	*150*	*150*	*150*	*150*	*150*	*150*	*150*	*150*	147
2007	316	314	284	106	300	0	602	38	216	147
2008	337	316	287	109	302	0	585	53	219	150
2009	368	334	304	118	319	0	601	73	234	161
2010	400	359	328	129	344	0	627	101	254	176
2011	429	388	356	142	373	0	664	137	277	194
2012	457	425	390	158	408	0	707	187	306	215
2013	483	462	426	175	444	0	753	252	336	237
2014	520	498	460	192	479	0	785	327	365	259
2015	555	535	495	211	516	0	825	424	395	283
2016	594	567	526	228	547	0	848	532	423	305
Median Spawning Output Relative to Target										
2005	0.25	0.27	0.27	0.27	0.27	0.27	0.27	0.27	0.27	0.27
2006	0.26	0.28	0.28	0.28	0.28	0.28	0.28	0.28	0.28	0.28
2007	0.28	0.30	0.30	0.30	0.30	0.30	0.30	0.30	0.30	0.30
2008	0.29	0.31	0.31	0.31	0.31	0.31	0.30	0.31	0.31	0.31
2009	0.31	0.31	0.32	0.33	0.31	0.33	0.30	0.33	0.32	0.32
2010	0.33	0.32	0.33	0.34	0.33	0.35	0.30	0.35	0.33	0.34
2011	0.36	0.34	0.35	0.37	0.34	0.38	0.31	0.38	0.35	0.36
2012	0.38	0.36	0.37	0.40	0.36	0.42	0.31	0.40	0.38	0.39
2013	0.41	0.38	0.39	0.43	0.39	0.46	0.33	0.44	0.41	0.42
2014	0.44	0.41	0.42	0.47	0.42	0.51	0.34	0.48	0.44	0.46
2015	0.47	0.44	0.45	0.52	0.45	0.56	0.35	0.52	0.48	0.50
2016	0.50	0.48	0.49	0.57	0.48	0.62	0.37	0.56	0.52	0.55
2017	0.53	0.51	0.53	0.62	0.52	0.69	0.39	0.61	0.56	0.60
2018	0.57	0.55	0.56	0.68	0.55	0.76	0.40	0.64	0.61	0.65
2019	0.61	0.58	0.60	0.73	0.59	0.82	0.42	0.68	0.65	0.70
2020	0.65	0.61	0.64	0.79	0.63	0.90	0.43	0.72	0.69	0.75
2021	0.69	0.65	0.68	0.85	0.66	0.98	0.45	0.76	0.74	0.81
2022	0.73	0.69	0.72	0.92	0.71	1.07	0.46	0.79	0.79	0.87
2023	0.78	0.73	0.77	0.97	0.75	1.16	0.48	0.83	0.85	0.94
2024	0.84	0.78	0.82	1.01	0.80	1.28	0.50	0.87	0.91	1.02
2025	0.90	0.84	0.88	1.05	0.86	1.40	0.51	0.90	0.95	1.11
2026	0.95	0.89	0.93	1.08	0.91	1.53	0.53	0.94	1.00	1.19
2027	0.98	0.94	0.97	1.12	0.95	1.67	0.55	0.97	1.03	1.28
2028	1.02	1.00	1.00	1.16	0.99	1.82	0.56	1.01	1.07	1.38
2029	1.06	1.06	1.04	1.21	1.02	2.00	0.58	1.05	1.10	1.49
2030	1.10	1.13	1.07	1.25	1.06	2.18	0.60	1.08	1.14	1.61
2031	1.14	1.20	1.11	1.31	1.10	2.38	0.63	1.13	1.19	1.73
2032	1.19	1.28	1.16	1.37	1.14	2.61	0.65	1.18	1.24	1.87
2033	1.24	1.37	1.22	1.43	1.19	2.88	0.68	1.24	1.30	2.04

Analysis of Sustainability

Under the fishing rates given by this rebuilding analysis, the probability of further long-term decline in bocaccio abundance is negligibly small (less than one percent over the next 100 years).

Acceptable Biological Catch (ABC) in 2007 and 2008

The value of ABC for 2007 is 602mtons, as given by the median catch for the ABC scenario in Table 4, which is conditional on actual catches of 150 mtons in 2005 and 2006. Table 5 shows that ABC for 2008 depends weakly on the actual catch in 2007, which in turn is influenced by the choice of rebuilding policies.

Table 5. Median estimated values of ABC in 2008.

Assumed catch in 2005	150	150	150	150
Assumed catch in 2006	150	150	150	150
Assumed catch in 2007	100	150	200	300
2008 ABC (median)	621	618	614	607

References

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Ralston, S., J. Ianelli, R. Miller, D. Pearson, D. Thomas, and M. Wilkins. 1996. Status of bocaccio in the Conception/Monterey/Eureka INPFC areas in 1996 and recommendations for management in 1997. Pacific Fishery Management Council.

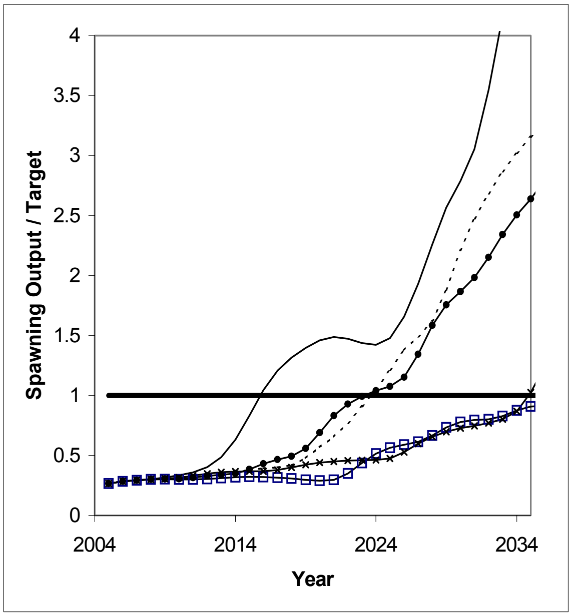

Figure 1. Example individual rebuilding trajectories for bocaccio.

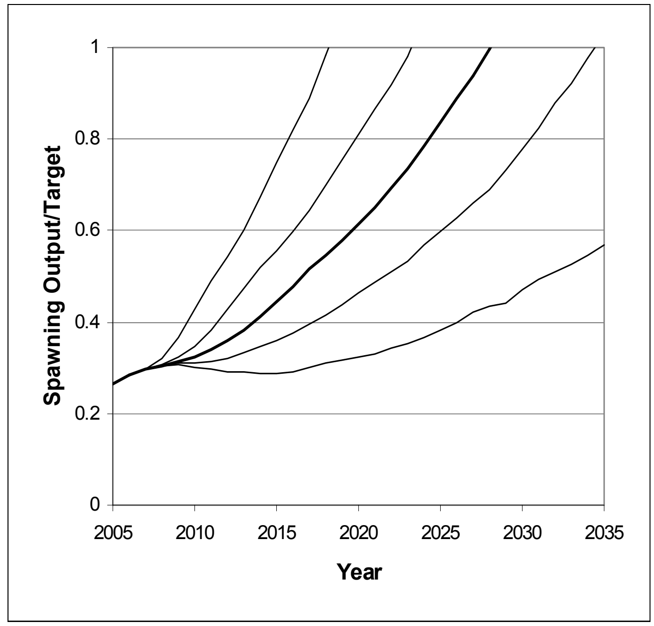

Figure 2. Envelope of rebuilding trajectories for GMT run 1 (current F = 0.0498). Lines are 5, 25, 50, 75 and 95 percentiles of 2000 simulations.

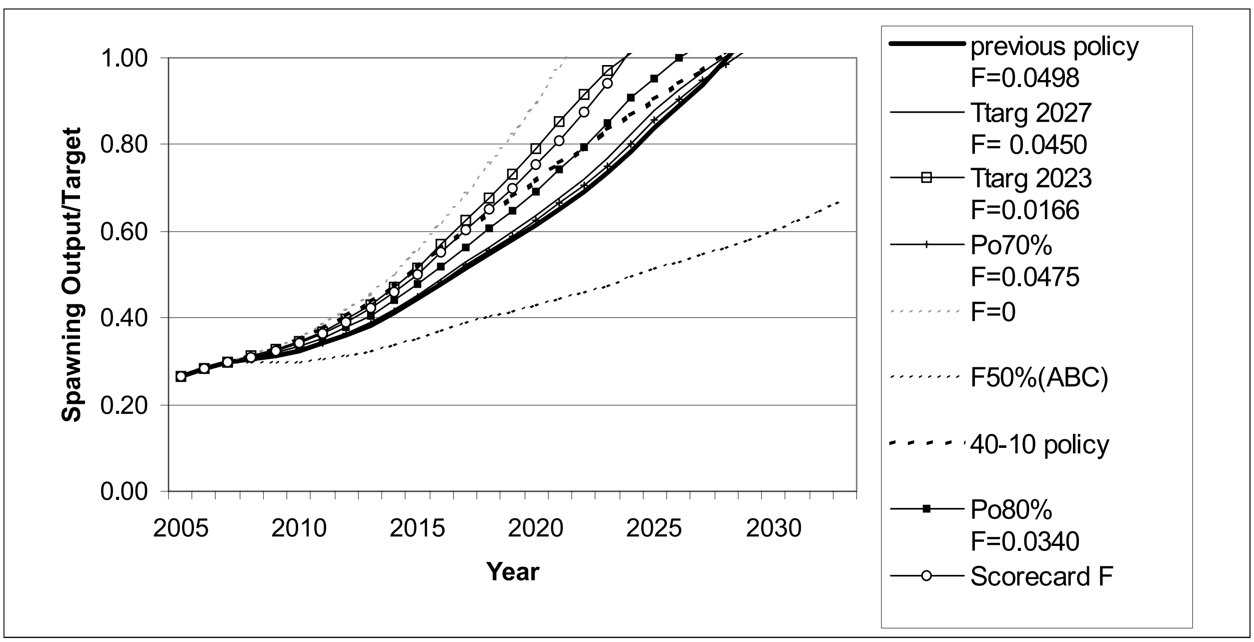

Figure 3. Median trajectories of abundance (relative to rebuilding target) for various cases in Table 4.

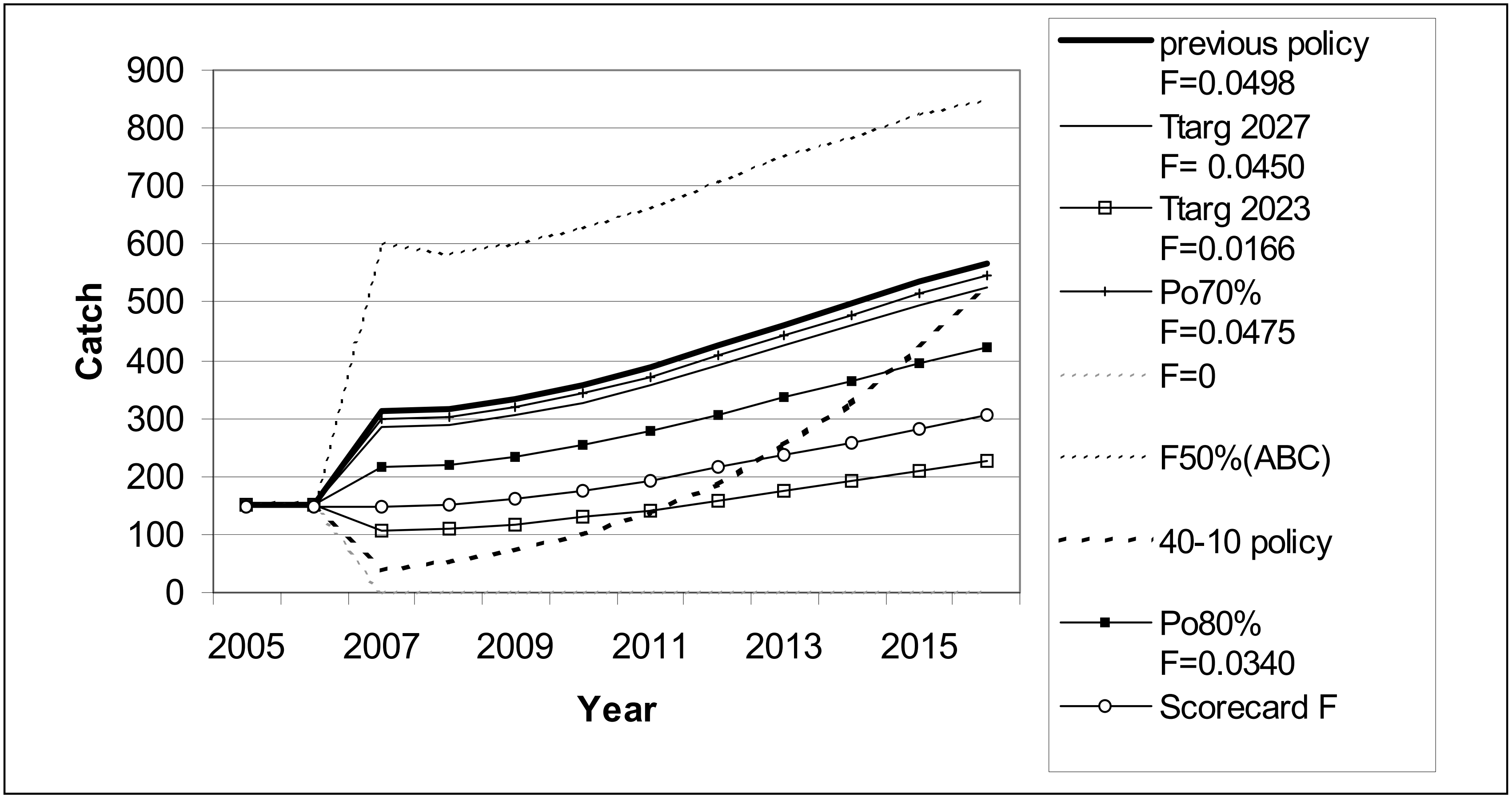

Figure 4. Median trajectories of catch for various cases in Table 4.

Appendix A. Projection data file for Run 1a.

```
# Title
bocaccio 2005 model STATC2005 resample to 2005 use current SPR=0.693 F=0.0498
# Number of sexes
2
# Age range to consider (minimum age; maximum age)
1 21
# Number of fleets to consider
1
# First year of the projection
2005
# Year declared overfished
2000
# Is the maximum age a plus-group (1=Yes;2=No)
1
# Generate future recruitments using historical recruitments (1), historical recruits/spawner (2), or a stock-recruitment
(3)
2
# Constant fishing mortality (1) or constant Catch (2) projections
1
# Fishing mortality based on SPR (1) or actual rate (2)
2
# Pre-specify the year of recovery (or -1) to ignore
21
# Fecundity-at-age
#  1  2  3  4  5  6  7  8  9 ...  21+
 0.000   0.002   0.026   0.131   0.325   0.547   0.762   0.965   1.160   1.345   1.513   1.659   1.781
         1.882   1.965   2.032   2.086   2.129   2.163   2.191   2.265
# Age specific information (Females then males) weight and selectivit
# Females
 0.223   0.499   0.878   1.313   1.771   2.227   2.663   3.071   3.446   3.783   4.074   4.319   4.522
         4.690   4.828   4.939   5.028   5.100   5.157   5.203   5.328
 0.166   0.501   0.792   0.965   0.987   0.903   0.775   0.647   0.545   0.477   0.436   0.411   0.396
         0.386   0.379   0.373   0.369   0.366   0.364   0.362   0.357
# Males
 0.223   0.463   0.770   1.101   1.430   1.742   2.025   2.276   2.495   2.681   2.839   2.972   3.082
         3.174   3.250   3.313   3.365   3.408   3.442   3.471   3.560
 0.167   0.466   0.725   0.906   0.995   1.000   0.958   0.898   0.833   0.772   0.717   0.671   0.633
         0.602   0.578   0.559   0.545   0.533   0.524   0.517   0.501
# Age specific information (Females then males), natural mortality and numbers at age
# Females
 0.15    0.15    0.15    0.15    0.15    0.15    0.15    0.15    0.15    0.15    0.15    0.15    0.15
         0.15    0.15    0.15    0.15    0.15    0.15    0.15    0.15
 442     575     151     91      13      1147    65      34      115     40      57      47      15
         40      32      2       40      7       4       3       24
# Males
 0.15    0.15    0.15    0.15    0.15    0.15    0.15    0.15    0.15    0.15    0.15    0.15    0.15
         0.15    0.15    0.15    0.15    0.15    0.15    0.15    0.15
 442     575     151     91      13      1150    65      35      115     40      57      47      15
         41      32      2       36      6       3       2       11
# Initial age-structure (for Tmin)
 2618    154     83      279     96      134     109     34      92      73      4       89      16
         9       6       29      1       0       1       1       21
 2618    154     83      280     98      138     113     36      96      76      4       83      13
         7       4       18      1       0       0       0       6
# Year for Tmin Age-structure
 2000
# Number of simulations
```

2000
Recruitment and Spanwer biomasses
Number of historical assessment years
55
Historical data: Year, Recruitment, Spawner biomass, Used to compute B0, Used to project based
on R, Used to project based on R/S

1951	3523	3659	1	0	0
1952	3523	3640	1	0	0
1953	3523	3626	1	0	0
1954	3523	3564	1	0	0
1955	3523	3474	1	0	0
1956	3523	3362	1	0	0
1957	3523	3164	1	0	0
1958	3523	2933	1	0	0
1959	3523	2638	1	0	0
1960	2278	2432	1	0	0
1961	1268	2292	1	0	0
1962	1698	2247	1	0	0
1963	53828	2225	1	0	0
1964	767	2073	1	0	0
1965	602	2509	1	0	0
1966	802	4092	1	0	0
1967	1247	6054	1	0	0
1968	1860	7092	1	0	0
1969	2041	7610	1	0	0
1970	3091	7785	1	0	1
1971	15118	7626	1	0	1
1972	1732	7319	1	0	1
1973	2039	6841	1	0	1
1974	15668	5910	1	0	1
1975	5451	4821	1	0	1
1976	1258	4139	1	0	1
1977	511	3783	1	0	1
1978	23029	3860	1	0	1
1979	2367	3714	1	0	1
1980	8090	3499	1	0	1
1981	1395	3470	1	0	1
1982	1520	3488	1	0	1
1983	151	3144	1	0	1
1984	586	2610	1	0	1
1985	10474	2087	1	0	1
1986	1413	1723	1	0	1
1987	1332	1337	0	0	1
1988	1550	1212	0	0	1
1989	5564	1214	0	0	1
1990	167	1035	0	0	1
1991	1822	863	0	0	1
1992	1485	873	0	0	1
1993	374	844	0	0	1
1994	830	789	0	0	1
1995	755	751	0	0	1
1996	413	737	0	0	1
1997	953	731	0	0	1
1998	234	728	0	0	1
1999	362	760	0	0	1
2000	5235	795	0	0	1
2001	50	825	0	0	1
2002	291	878	0	0	1
2003	413	1038	0	0	1

2004	1342	1261	0	0	1
2005	885	1430	0	0	1

```
# Number of years with pre-specified catches
2
# Catches for years with pre-specified catches
2005 150
2006 150
# Number of future recruitments to override
0
# Process for overiding (-1 for average otherwise index in data list)
# Which probability to product detailed results for (1=0.5,2=0.6,etc.)
2
# Steepness and sigma-R  and auto-correlations
  0.211  1.000000 0.0
# Target SPR rate (FMSY Proxy)
0.5
# Target SPR information: Use (1=Yes) and power
0 20
# Discount rate (for cumulative catch)
0.100000
# Truncate the series when 0.4B0 is reached (1=Yes)
0
# Set F to FMSY once 0.4B0 is reached (1=Yes; 2=Apply 40:10 rule after recovery)
2
# Percentage of FMSY which defines Ftarget
0.900000
# Maximum possible F for projection (-1 to set to FMSY)
2
# Conduct MacCall transition policy (1=Yes)
0
# Defintion of recovery (1=now only;2=now or before)
2
# Results for rec probs by Tmax (1) or 0.5 prob for various Ttargets
1
# Definition of the "40-10" rule
10 40
# Produce the risk-reward plots (1=Yes)
0
# Calculate coefficients of variation (1=Yes)
0
# Number of replicates to use
20
# First Random number seed
-89102
# Conduct projections for multiple starting values (0=No;else yes)
0
# File with multiple parameter vectors
MCMC.PRJ
# Number of parameter vectors
100
# User-specific projection (1=Yes); Output replaced (1->6)
1 2 0 0.5
# Catches and Fs (Year; 1/2 (F or C); value); Final row is -1
2007 1 0.0498
-1 -1 -1
# Split of Fs
2005 1
2006 1
-1 1
```

Time varying weight-at-age (1=Yes;0=No)
0
File with time series of weight-at-age data
HakWght.Csv

Cowcod Rebuilding Analysis 2005
Analysis of the Progress towards rebuilding in the Southern California Bight

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Introduction

Cowcod (*Sebastes levis*) population status was initially assessed by Butler et al (1999) and declared overfished in 2000. The original stock assessment was conducted using a Delay-Difference model that estimated recruitments as a random walk function. The model estimated that the spawning stock abundance was 7% of an unfished stock in 1999 and that resilience of the stock was low. The original cowcod rebuilding analysis was completed using a surplus production model because of the density dependent population growth inherent in the logistic equation. The surplus production rebuilding analysis was modeled using a log-normal distribution fitted to recruitment (1951-1998) estimated in the original delay difference model (Butler et al. 1999). A subsequent rebuilding analysis (Butler and Barnes 2000) estimated the following rebuilding parameters and quantities that were adopted by the PFMC in 2004 (PFMC 2004):

Current Adopted Rebuilding Parameters

Year declared overfished	2000
Year rebuilding plan adopted	2004
B_0	3367 t
B_{msy}	1350 t
$B_{current}$	7% (of B0)
T_{min}	2062
T_{max}	2099
P_{max}	60%
T_{target}	2090
Harvest control rule	F=0.0093 (78% SPR)

A new assessment was conducted in 2005 (Piner et al. 2005). The new assessment differed from the previous assessment in that the recruitment process was described by a Stock/Recruit (S/R) relationship. This was a departure from the previous assessment and represents much of the difference in results between the two assessments. Only the level of unexploited recruitment (*R*0) was estimated, and the level of steepness (*h*) in the S/R relationship was fixed. This fixing of *h* greatly reduced the uncertainty in the model because it was the parameter that the STAR panel believed expressed the most uncertainty in the stock assessment (STAR Panel Report 2005). The review of the assessment considered a value of *h*=0.5 to be the most appropriate choice, but that actual steepness may be somewhat higher or lower. The assessment estimated that 2005 spawning biomass was 18% of unfished (h=0.5), but reached as low as 9% of unfished spawning biomass in 1990.

Methods

To evaluate the progress of rebuilding, the Science and Statistical Committee of the Pacific Fishery Management Council suggested that the analytical team use a Synthetic posterior approach. The Synthetic posterior was created from the output of individual model runs bounding a credible range of stock steepness (h=0.25-0.75, increment 0.025). The posterior was symmetrical around a mean h = 0.5 with a S.D. of 0.1, with the frequency of the output from each run reflecting the probability of that steepness (Figure 1). We acknowledge that the Synthetic posterior approach is subjective, but the advantage of this approach is that it incorporates some uncertainty surrounding a fixed but unknown estimate of h. The rebuilding trajectories were calculated using the 'Puntalizer' software (version 2.8 April, 2005) developed by Andre Punt. A total of 1000 iteration were used in each rebuilding run. We chose to use 1000 because the results of a 10,000 iterations run (run#1) were nearly identical to same run using only 1000 iterations. The probability of rebuilding in this analysis is the probability of being at or above $B_{40\%}$ by T_{target}. Biological and fishery parameters-at-age are given in Table 1. Appendix I is the rebuild.data file used for run 1. Rebuilding projections are based upon the following calculations and assumptions:

A) the old F in the adopted rebuilding plan = SPR of 0.78. The calculation of the SPR rate that corresponded to F=0.009 was done in a spreadsheet using the weight at age, maturity at age, selectivity at age and natural mortality used in the assessment. Identical (or nearly so) assumptions about these parameters were made in the current and preceding assessment.
B) Unfished spawning biomass (SB0) is calculated the same as the assessment.
C) Recruitment is generated from the S/R curve taken from the assessment and uncertainty generated using the synthetic posterior and Sigma-R=0.5.
D) A single selectivity pattern is used to describe the removals.

Six rebuilding projections were done following guidelines developed by the NW Region, NW Center, Council Staff and the SSC. The results of the six runs are given in Table 1 and are defined as the following (the same as in the Hastie memo):

Run #1- probability of recovery estimated, T_{target} is the adopted target, harvest rate is adopted SPR.
Run #2- probability of recovery 0.5, T_{target} is the adopted target, harvest rate is estimated SPR.
Run #3- probability of recovery estimated, T_{target} is the adopted T_{max}, harvest rate is adopted SPR.
Run #4- probability of recovery adopted P_0, T_{target} is the adopted T_{max}, harvest rate is estimated SPR.
Run #5- probability of recovery estimated, T_{target} is the estimated T_{max}, harvest rate is adopted SPR.
Run #6- probability of recovery adopted P_0, T_{target} is the estimated T_{max}, harvest rate is estimated SPR.

Results

The results of the analysis of the progress towards rebuilding indicate that cowcod are more likely to rebuild by the old T_{target} than indicated in the first rebuilding analysis (Table 2). A new estimated T_{max} of 2074 was estimated, which is 25 years earlier than the

2099 estimated previously (Butler and Barnes 2000). The estimated catches of cowcod across all 6 SSC scenarios were 6-12 t, and this is projected to increase slowly over time (Table 3). Although this is higher than the 2-3 t in the current rebuilding plan, it is likely that it will be difficult to measure the difference using the historical data sources. At the request of the GMT, Table 4 gives the projected catch for run#6 over all probabilities (0.5-0.9).

A sensitivity analysis was done to the shape of the normal distribution used to construct the Synthetic posterior. Rebuilding parameterization corresponding to run 1 was used in the exploration of the affects of the shape of the Synthetic posterior on the rebuilding results. Results of using a more narrowly defined posterior defined as *h* mean=0.5, sd=0.059, range 0.35-0.65 and more diffuse distribution defined as *h* mean=0.5, sd=0.12, range 0.25-0.75 are given in Table 2. These results suggest that the more narrowly defined the posterior distribution (and smaller range of *h*) the more likely the stock is to rebuild by the current T_{target} and the more diffuse the distribution the less likely the stock is to rebuild.

Conclusions:

The results of this analysis indicate that if the stock of cowcod in the SCB has a population resilience as described in the current stock assessment (Piner et al. 2005) and this synthetic posterior rebuilding analysis, it is 20% more likely to rebuild by the old T_{target} (2090) than previously thought. However, the probability of recovery using the old harvest rate and a new T_{max} is not greater than 80%.

This rebuilding plan is based upon many assumptions. We have no information if the assumption of the Stock/Recruitment relationship and corresponding Synthetic posterior is appropriate. The results of this rebuilding analysis suggest that the previous analysis was not incorrect to suggest that rebuilding of cowcod may take several decades. The true state of nature of the cowcod resilience is quite uncertain and unlikely to become significantly clearer in the near future.

Literature Cited

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Table 1. The biological and fishery parameters used in the 2005 rebuilding analysis of Cowcod.

					Fleet 1								
Age	Fec	M	Init N	Init N Tmin	Wt	Sel	Age	Fec	M	Init N	Init N Tmin	Wt	Sel
0	0.000	0.055	27.658	23.489	0.017	0.000	41	8.518	0.055	0.075	0.014	8.600	1.000
1	0.000	0.055	25.462	21.419	0.017	0.000	42	8.680	0.055	0.051	0.009	8.758	1.000
2	0.000	0.055	23.379	19.287	0.022	0.000	43	8.834	0.055	0.034	0.006	8.909	1.000
3	0.000	0.055	21.402	17.376	0.057	0.000	44	8.982	0.055	0.023	0.004	9.054	1.000
4	0.000	0.055	19.519	16.208	0.114	0.000	45	9.124	0.055	0.015	0.003	9.192	1.000
5	0.000	0.055	17.841	14.885	0.196	0.000	46	9.259	0.055	0.010	0.002	9.324	1.000
6	0.000	0.055	16.269	14.031	0.302	0.000	47	9.388	0.055	0.007	0.001	9.450	1.000
7	0.000	0.055	14.650	12.754	0.433	0.000	48	9.511	0.055	0.004	0.001	9.570	1.000
8	0.002	0.055	13.198	11.937	0.589	0.010	49	9.628	0.055	0.003	0.000	9.685	1.000
9	0.021	0.055	12.311	10.879	0.767	0.090	50	9.740	0.055	0.002	0.000	9.794	1.000
10	0.136	0.055	11.306	9.988	0.965	0.310	51	9.846	0.055	0.001	0.000	9.898	1.000
11	0.464	0.055	10.657	9.297	1.183	0.650	52	9.948	0.055	0.001	0.000	9.997	1.000
12	0.939	0.055	9.686	10.042	1.418	0.900	53	10.044	0.055	0.001	0.000	10.091	1.000
13	1.380	0.055	9.062	10.603	1.666	1.000	54	10.136	0.055	0.000	0.000	10.181	1.000
14	1.735	0.055	8.255	12.225	1.927	1.000	55	10.224	0.055	0.000	0.000	10.266	1.000
15	2.041	0.055	7.571	13.006	2.198	1.000	56	10.307	0.055	0.000	0.000	10.347	1.000
16	2.330	0.055	7.035	13.041	2.477	1.000	57	10.386	0.055	0.000	0.000	10.423	1.000
17	2.616	0.055	7.585	11.996	2.762	1.000	58	10.460	0.055	0.000	0.000	10.496	1.000
18	2.905	0.055	7.997	11.306	3.051	1.000	59	10.532	0.055	0.000	0.000	10.566	1.000
19	3.196	0.055	9.208	10.166	3.342	1.000	60	10.599	0.055	0.000	0.000	10.632	1.000
20	3.488	0.055	9.785	9.277	3.634	1.000	61	10.663	0.055	0.000	0.000	10.694	1.000
21	3.780	0.055	9.800	8.288	3.926	1.000	62	10.724	0.055	0.000	0.000	10.753	1.000
22	4.072	0.055	9.005	7.103	4.216	1.000	63	10.782	0.055	0.000	0.000	10.810	1.000
23	4.361	0.055	8.477	5.922	4.504	1.000	64	10.837	0.055	0.000	0.000	10.863	1.000
24	4.646	0.055	7.613	4.812	4.788	1.000	65	10.889	0.055	0.000	0.000	10.913	1.000
25	4.928	0.055	6.939	3.739	5.067	1.000	66	10.938	0.055	0.000	0.000	10.961	1.000
26	5.204	0.055	6.192	2.851	5.341	1.000	67	10.984	0.055	0.000	0.000	11.007	1.000
27	5.475	0.055	5.301	2.138	5.609	1.000	68	11.029	0.055	0.000	0.000	11.050	1.000
28	5.740	0.055	4.414	1.591	5.870	1.000	69	11.070	0.055	0.000	0.000	11.091	1.000
29	5.999	0.055	3.583	1.168	6.125	1.000	70	11.110	0.055	0.000	0.000	11.129	1.000
30	6.250	0.055	2.780	0.853	6.373	1.000	71	11.148	0.055	0.000	0.000	11.166	1.000
31	6.494	0.055	2.118	0.613	6.614	1.000	72	11.183	0.055	0.000	0.000	11.200	1.000
32	6.731	0.055	1.587	0.438	6.847	1.000	73	11.217	0.055	0.000	0.000	11.233	1.000
33	6.960	0.055	1.179	0.311	7.072	1.000	74	11.249	0.055	0.000	0.000	11.264	1.000
34	7.182	0.055	0.865	0.217	7.290	1.000	75	11.279	0.055	0.000	0.000	11.294	1.000
35	7.395	0.055	0.631	0.150	7.499	1.000	76	11.308	0.055	0.000	0.000	11.321	1.000
36	7.601	0.055	0.453	0.102	7.702	1.000	77	11.335	0.055	0.000	0.000	11.348	1.000
37	7.800	0.055	0.323	0.069	7.896	1.000	78	11.360	0.055	0.000	0.000	11.373	1.000
38	7.991	0.055	0.229	0.046	8.083	1.000	79	11.385	0.055	0.000	0.000	11.396	1.000
39	8.174	0.055	0.160	0.031	8.263	1.000	80	11.408	0.055	0.000	0.000	11.419	1.000
40	8.350	0.055	0.110	0.021	8.435	1.000							

Table 2. Results of the six model runs requested by the SSC for whan evaluating a currently existing rebuilding plan and two sensitivity runs to the shape of the pseudo-posterior.

Run description	F (SPR) Rate	T_{max} year	T_{target} year	P_{0-} (prob of rec by T_{target})	T_{min}	Generation time (yrs)	Virgin spawn (target spawn) (t)
			Requested Runs				
Run 1	0.009 (0.78)	2099	2090	81%	2036	39	3045 (1218)
Run 2	0.021 (0.601)	2099	2090	50%	2035	39	3045 (1218)
Run 3	0.009 (0.78)	2099	2099	83%	2035	39	3045 (1218)
Run 4	0.019 (0.63)	2099	2099	60%	2035	39	3045 (1218)
Run 5	0.009 (0.78)	2074	2074	75%	2035	39	3045 (1218)
Run 6	0.015 (0.69)	2074	2074	60%	2035	39	3045 (1218)
			Sensitivity Runs				
Reduced	0.009 (0.78)		2090	90%			
Diffuse	0.009 (0.78)		2090	78%			

n/a indicates this rebuilding parameter does not apply to the run

Table 3. Ten year projected catches and ABC levels under the six rebuilding scenarios requested by the SSC. Projected catches for Runs #1, 3 and 5 are the same because the runs used the same exploitation rate.

	Run #1 (t)		Run #2		Run #3		Run #4		Run #5		Run #6	
year	OY	ABC	OY	ABC	OY	ABC	OY	ABC	OY	ABC	OY	ABC
2007	6	17	12	17	6	17	11	17	6	17	9	17
2008	6	17	13	17	6	17	11	17	6	17	9	17
2009	6	18	13	17	6	18	11	17	6	18	9	18
2010	6	18	13	18	6	18	12	18	6	18	9	18
2011	6	19	13	18	6	19	12	18	6	19	9	18
2012	6	19	13	18	6	19	12	18	6	19	10	19
2013	6	19	13	18	6	19	12	18	6	19	10	19
2014	7	20	13	18	7	20	12	19	7	20	10	19
2015	7	20	14	19	7	20	12	19	7	20	10	20
2016	7	21	14	19	7	21	13	19	7	21	10	20

Table 4. Projected catches in metric tons under rebuilding run #6 request by the GMT. The probability of recovery by Tmax is given across the top of column and predicted catch across rows.

Prob. year	50% (t)	60%	70%	80%	90%
2007	11	9	7	3	0
2008	11	9	7	4	0
2009	11	9	7	4	0
2010	11	9	7	4	0
2011	11	9	7	4	0
2012	11	10	7	4	0
2013	12	10	8	4	0
2014	12	10	8	4	0
2015	12	10	8	4	0
2016	12	10	8	4	0

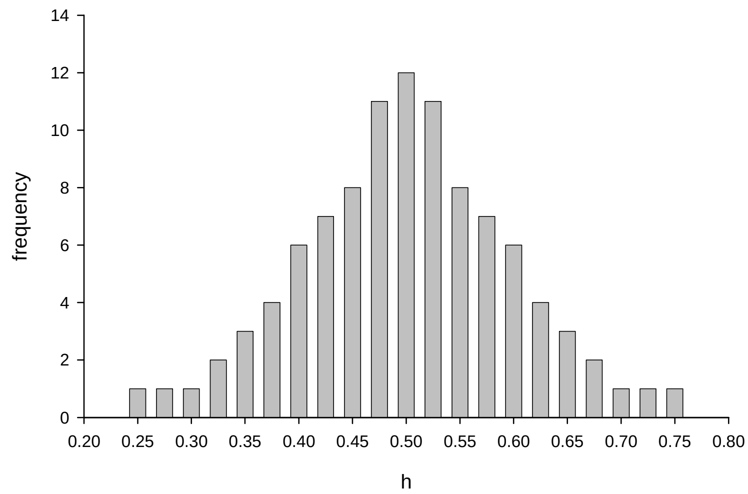

Figure1. Distribution of *h* from the model runs used to create the synthetic posterior used in the rebuilding analysis (*h* mean=0.5, sd=0.1).

Appendix I.
Rebuild.dat file corresponding to run1 in table 2.

```
#Title
COW - STAR panel model
# Number of sexes
1
# Age range to consider (minimum age; maximum age)
0 80
# Number of fleets
1
# First year of projection
2005
# Year declared overfished
2000
# Is the maximum age a plus-group (1=Yes;2=No)
1
# Generate future recruitments using historical recruitments (1)  historical recruits/spawner (2)  or a stock-recruitment (3)
3
# Constant fishing mortality (1) or constant Catch (2) projections
1
# Fishing mortality based on SPR (1) or actual rate (2)
1
# Pre-specify the year of recovery (or -1) to ignore
83
# Fecundity-at-age need to change to weight*maturity
# 0 to 80
2.14288E-11	2.14288E-11	2.14335E-11	5.04419E-10	1.78424E-08	4.62721E-07	9.30794E-06	0.000151707	0.00203723	0.0211324	0.13572	0.464185
	0.93892	1.37984	1.73516	2.04064	2.32951	2.61622	2.9049	3.19583	3.48808	3.78042	4.07164
	4.3606	4.64629	4.92782	5.20442	5.47546	5.74037	5.99871	6.2501	6.49428	6.73102	6.96018
	7.18165	7.39541	7.60145	7.79981	7.99056	8.1738	8.34966	8.51828	8.67982	8.83445	8.98237
	9.12376	9.25883	9.38777	9.5108	9.62812	9.73993	9.84645	9.94787	10.0444	10.1362	10.2236
	10.3066	10.3855	10.4604	10.5316	10.5992	10.6633	10.7241	10.7819	10.8366	10.8885	10.9377
	10.9843	11.0285	11.0704	11.1101	11.1477	11.1833	11.217	11.2489	11.2791	11.3077	11.3347
	11.3604	11.3846	11.4076
# Age specific information (Females then males) weight  selectivity
#
0.0168015	0.0168015	0.0222434	0.0574434	0.114456	0.195677	0.30197	0.43322	0.588562	0.766579	0.96547	1.18319
	1.41754	1.6663	1.92722	2.19814	2.47697	2.76176	3.0507	3.34209	3.63441	3.92629	4.21649
	4.50392	4.78763	5.06678	5.34068	5.60871	5.87038	6.12529	6.37311	6.61359	6.84655	7.07188
	7.2895	7.4994	7.70159	7.89613	8.08311	8.26264	8.43486	8.59992	8.75799	8.90924	9.05387
	9.19207	9.32405	9.45001	9.57016	9.6847	9.79384	9.89778	9.99673	10.0909	10.1805	10.2656
	10.3465	10.4234	10.4965	10.5658	10.6316	10.6941	10.7534	10.8096	10.8629	10.9134	10.9613
	11.0067	11.0498	11.0905	11.1291	11.1657	11.2003	11.2331	11.2642	11.2936	11.3214	11.3477
	11.3727	11.3962	11.4186
0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.01	0.09	0.31	0.65
	0.90	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00
	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00
	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00
	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00
	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00
	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00
	1.00	1.00	1.00
# M and initial age-structure
#
0.055	0.055	0.055	0.055	0.055	0.055	0.055	0.055	0.055	0.055	0.055	0.055
	0.055	0.055	0.055	0.055	0.055	0.055	0.055	0.055	0.055	0.055	0.055
	0.055	0.055	0.055	0.055	0.055	0.055	0.055	0.055	0.055	0.055	0.055
	0.055	0.055	0.055	0.055	0.055	0.055	0.055	0.055	0.055	0.055	0.055
	0.055	0.055	0.055	0.055	0.055	0.055	0.055	0.055	0.055	0.055	0.055
	0.055	0.055	0.055	0.055	0.055	0.055	0.055	0.055	0.055	0.055	0.055
	0.055	0.055	0.055	0.055	0.055	0.055	0.055	0.055	0.055	0.055	0.055
	0.055	0.055	0.055
27.6581	25.4615	23.3788	21.4015	19.5187	17.8413	16.2692	14.6499	13.1979	12.3113	11.3061	10.6566
	9.68567	9.06191	8.25489	7.57081	7.03514	7.58531	7.99687	9.20847	9.78546	9.80023	9.00456
	8.47665	7.61305	6.93917	6.19182	5.30059	4.41363	3.58279	2.7803	2.11816	1.58659	1.17905
	0.865047	0.631135	0.453183	0.323102	0.229102	0.160158	0.11014	0.0749628	0.0506906	0.034094	0.0228424
	0.015273	0.0101753	0.00676334	0.00448062	0.00296042	0.0019501	0.00128113	0.000840131	0.000550735	0.000360606	0.000235928
	0.000154213	0.000100741	6.58E-05	4.29E-05	2.80E-05	1.83E-05	1.19E-05	7.72E-06	5.01E-06	3.25E-06	2.10E-06
	1.35E-06	8.62E-07	5.47E-07	3.44E-07	2.13E-07	1.30E-07	7.75E-08	4.48E-08	2.48E-08	1.29E-08	6.09E-09
	2.42E-09	6.68E-10	4.00E-11
# Initial age-structure
23.4886	21.4188	19.287	17.3755	16.2083	14.885	14.0307	12.7544	11.9365	10.8791	9.98805	9.29686
	10.0417	10.6025	12.2245	13.0059	13.0408	11.996	11.306	10.1662	9.27731	8.28793	7.10331
	5.92156	4.81237	3.73868	2.85143	2.13815	1.59061	1.16819	0.85316	0.6132	0.437596	0.310568
	0.217299	0.149561	0.101876	0.0689435	0.0464055	0.0311133	0.0208176	0.0138784	0.00923061	0.00611886	0.00404518
	0.00266614	0.00175247	0.0011498	0.000754099	0.00049399	0.000323337	0.000211436	0.000138177	9.03E-05	5.89E-05	3.85E-05
	2.51E-05	1.63E-05	1.06E-05	6.89E-06	4.46E-06	2.88E-06	1.85E-06	1.19E-06	7.53E-07	4.73E-07	2.93E-07
	1.79E-07	1.07E-07	6.17E-08	3.42E-08	1.78E-08	8.39E-09	3.34E-09	9.21E-10	5.44E-11	1.13E-13	9.01E-14
	7.57E-14	6.43E-14	5.12E-13
# Year for Tmin Age-structure
2000
# Number of simulations
10000
#  recruitment and biomass
# Number of historical assessment years
91
# Historical data
# year recruitment spawner in B0 in R project in R/S project
1915	59.5551	2998.44	1	0	0
```

1916	59.3267	2998.44	0	0	0
1917	59.294	2991.91	0	0	0
1918	59.2367	2980.52	0	0	0
1919	59.1766	2968.65	0	0	0
1920	59.1434	2962.13	0	0	0
1921	59.1089	2955.36	0	0	0
1922	59.0832	2950.34	0	0	0
1923	59.0624	2946.29	0	0	0
1924	59.0354	2941.04	0	0	0
1925	59.0124	2936.58	0	0	0
1926	58.9836	2931.01	0	0	0
1927	58.937	2922.02	0	0	0
1928	58.9018	2915.27	0	0	0
1929	58.8672	2908.66	0	0	0
1930	58.837	2902.88	0	0	0
1931	58.7966	2895.21	0	0	0
1932	58.7568	2887.66	0	0	0
1933	58.7331	2883.19	0	0	0
1934	58.7179	2880.33	0	0	0
1935	58.7049	2877.89	0	0	0
1936	58.6902	2875.13	0	0	0
1937	58.6781	2872.85	0	0	0
1938	58.6691	2871.17	0	0	0
1939	58.6664	2870.67	0	0	0
1940	58.6666	2870.7	0	0	0
1941	58.6645	2870.3	0	0	0
1942	58.6638	2870.17	0	0	0
1943	58.6814	2873.47	0	0	0
1944	58.6859	2874.32	0	0	0
1945	58.6562	2868.75	0	0	0
1946	58.563	2851.38	0	0	0
1947	58.4914	2838.16	0	0	0
1948	58.4396	2828.64	0	0	0
1949	58.3965	2820.76	0	0	0
1950	58.3483	2811.97	0	0	0
1951	58.2766	2798.99	0	0	0
1952	58.1889	2783.21	0	0	0
1953	58.0594	2760.18	0	0	0
1954	57.9264	2736.8	0	0	0
1955	57.7025	2698.11	0	0	0
1956	57.3729	2642.57	0	0	0
1957	56.9993	2581.59	0	0	0
1958	56.6673	2529.08	0	0	0
1959	56.3446	2479.48	0	0	0
1960	56.0677	2438.03	0	0	0
1961	55.7611	2393.25	0	0	0
1962	55.5216	2359.08	0	0	0
1963	55.2895	2326.62	0	0	0
1964	55.0614	2295.3	0	0	0
1965	54.8674	2269.13	0	0	0
1966	54.5938	2232.92	0	0	0
1967	53.9872	2155.42	0	0	0
1968	53.1728	2057	0	0	0
1969	52.6124	1992.75	0	0	0
1970	52.2639	1954.14	0	0	0
1971	51.6485	1888.32	0	0	0
1972	51.1752	1839.64	0	0	0
1973	50.2998	1753.79	0	0	0
1974	49.1778	1651.03	0	0	0
1975	47.628	1521.02	0	0	0
1976	46.1513	1408.41	0	0	0
1977	44.0725	1265.85	0	0	0
1978	42.5715	1172.91	0	0	0
1979	41.4415	1107.79	0	0	0
1980	39.6995	1014.67	0	0	0
1981	37.8253	923.191	0	0	0
1982	37.027	886.685	0	0	0
1983	34.9855	799.296	0	0	0
1984	34.2606	770.164	0	0	0
1985	31.166	655.655	0	0	0
1986	27.0606	524.64	0	0	0
1987	21.9187	386.943	0	0	0
1988	19.52	330.794	0	0	0
1989	17.0506	277.504	0	0	0
1990	17.3169	283.048	0	0	0
1991	17.8478	294.24	0	0	0
1992	18.5339	308.996	0	0	0
1993	18.7441	313.583	0	0	0
1994	19.5163	330.711	0	0	0
1995	19.5965	332.517	0	0	0
1996	20.1968	346.175	0	0	0
1997	20.4925	353.009	0	0	0
1998	21.5297	377.52	0	0	0
1999	22.6299	404.501	0	0	0
2000	23.4886	426.298	0	0	0
2001	24.3218	448.097	0	0	0
2002	25.2408	472.919	0	0	0
2003	26.0972	496.82	0	0	0
2004	26.9011	519.964	0	0	0
2005	27.6581	542.417	0	0	0

Number of years with pre-specified catches
2
catches for years with pre-specified catches

2005 0.5
2006 2
Number of future recruitments to override
0
Process for overiding (-1 for average otherwise index in data list)
Which probability to product detailed results for (1=0.5; 2=0.6; etc.)
3
Steepness sigma-R Auto-correlation
0.5 0.5 0.5
Target SPR rate (FMSY Proxy)
0.78
Target SPR information: Use (1=Yes) and power
0 20
Discount rate (for cumulative catch)
0.1
Truncate the series when 0.4B0 is reached (1=Yes)
0
Set F to FMSY once 0.4B0 is reached (1=Yes)
0
Percentage of FMSY which defines Ftarget
0.9
Maximum possible F for projection (-1 to set to FMSY)
-1
Conduct MacCall transition policy (1=Yes)
0
Defintion of recovery (1=now only;2=now or before)
2
Results for rec probs by Tmax (1) or 0.5 prob for various Ttargets (2)
1
Definition of the "40-10" rule
10 40
Produce the risk-reward plots (1=Yes)
0
Calculate coefficients of variation (1=Yes)
0
Number of replicates to use
20
Random number seed
-89102
Conduct projections for multiple starting values (0=No;else yes)
3
File with multiple parameter vectors
MCMC.PRJ
Number of parameter vectors
100
User-specific projection (1=Yes); Output replaced (1->6)
0 6 0 0.5
Catches and Fs (Year; 1/2 (F or C); value); Final row is -1
2007 1 0.01025
-1 -1 -1
Split of Fs
2005 1
-1 1
Time varying weight-at-age (1=Yes;0=No)
0
File with time series of weight-at-age data
Elvis_lives.CSV

Update of Darkbotched Rockfish (*Sebastes crameri*) Rebuilding Analyses

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Introduction

Darkblotched rockfish was declared overfished in January 2001 (John DeVore, PFMC, pers.comm.). The declaration was based on the 2000 stock assessment (Rogers et al. 2000).

Rebuilding analyses were first conducted in mid-year 2001 (Methot and Rogers 2001). Those analyses included a partial update of the 2000 stock assessment, which added data through 2002 and re-estimated recruitments (Methot and Rogers 2001). The authors presented a range of rebuilding models with varying assumptions regarding recruitment (Table 1). The Pacific fisheries management council (PFMC) selected a model (A1) which assumed that recruitment was based primarily on environmental conditions. Spawning output in the absence of fishing was calculated by assuming recruitment was the average of the entire time series of recruitments, but future recruitments were randomly selected only from recruitments in more recent years (after 1982).

The PFMC used the 2001 rebuilding model A1 to set the 2002 and 2003 Optimum Yields (OYs) and to create a rebuilding plan, which was adopted in June 2003 (PFMC 2004). The model estimated that darkblotched rockfish could not be rebuilt within 10 years, so the maximum year to rebuild the spawning stock (T_{MAX}) was the minimum year to rebuild the stock in the absence of fishing (T_{MIN}) (11.5 years beginning in 2002) plus one mean generation time (33 years) or 2047 (Table 2). The 2002 OY was based on a 70% probability of rebuilding by T_{MAX} (P_{MAX}), while the 2003 OY was based on an 80% P_{MAX}. This 80% probability was the value chosen as policy (Po) in the rebuilding plan (PFMC 2004). The target year to rebuild (T_{TARGET}) was set at 2030, which was the median year to rebuild the stock given Po (T_{MED}). (A glossary of rebuilding terms and abbreviations is provided at the end of this document).

In mid-year 2003, the 2000 assessment and 2001 rebuilding analyses were fully updated (Rogers 2003). In the assessment update, data were added through 2002 and all fitted parameters (selectivities and recruitments) were re-estimated. The 2000 and 2001 age-one recruitments (1999 and 2000 year classes) were estimated to be very high in the assessment update (Figure 1). The rebuilding analyses updated only the model selected by the PFMC (Model A1). Virgin recruitment was set equal to the mean of the entire recruitment time series, but the projected recruitments were randomly selected only from recruitments after 1982. The SSC requested progressively including the high 2000 and 2001 age-one recruitment estimates into the rebuilding analyses (Rogers 2003). Risk of error progressively increased from including those recruitments because they were based on increasingly limited data. The PFMC chose the rebuilding model which included age-one recruitment estimates only through 2000 (Table 2). Recruitments after 2000 were randomly selected from the 1982-2000 estimates.

The PFMC used the 2003 rebuilding model to set the 2004-2006 OYs and produce a 2004 amendment to the rebuilding plan (PFMC 2004). The rebuilding plan addendum reduced T_{MAX} from 2047 to 2044. T_{MAX} was modified because T_{MIN} was reduced from 2014 to 2011 (Table 2). T_{MIN} was reduced for two reasons. The time to rebuild in the absence of fishing was lowered from 11.5 to 10 years, and a 2002 change in the rebuilding software (Punt 2005) caused that 10 years to begin with the year overfishing was declared (2001) rather than the first year of projection (2002). The addendum also increased Po. The Allowable Biological Catch (ABC) was lower than the 2004 OY given the Po of 0.8. Since the OY cannot be greater than the ABC, the ABC was adopted as the OY. Po in the amendment was therefore the probability of rebuilding by 2044 given the ABC catch. That probability was slightly more than 90%.

The 2004 ABC was lower than the 2004 OY given a Po of 0.8 because of a difference in time frames. The ABC was based only on the 2004 biomass available to the fishermen. In 2004, the strong 2000 age-one recruitment was only age 5, so each fish had a relatively small biomass and that age was not yet fully selected by the fishery gear. The rebuilding analyses considered the biomass available during 2004-2044. During that time period, the strong 2000 recruitment would not only affect the biomass available to the fishermen, but could be randomly selected in the prediction of other recruitments.

Although the 2004 addendum reduced T_{MAX} and increased Po, the target year to rebuild (T_{TARGET}) was unchanged from 2030 (PFMC 2004). T_{TARGET} is essentially inviolate according to the FMP, only to be changed if absolutely needed (i.e., its falls outside the range of Tmin to Tmax) (John DeVore, PFMC, pers.comm.). T_{TARGET} was therefore no longer the median year to rebuild given the selected probability of rebuilding by T_{MAX}. T_{MED} given the ABC catches and the new T_{MAX} was 2019 (Table 2).

A full stock assessment for darkblotched rockfish was conducted in 2005, with substantial changes to the 2000-2003 model structure and data (Rogers 2005). The model was extended back to 1928 and data were added through 2004. Data included a new survey index of relative abundance. Growth and discard were estimated within the 2005 model rather than externally, as was done previously. Growth and the fishery selectivity and retention curves in the new model were allowed to change over time in order to better fit the data and reflect known changes. Changes were also made to the fixed life history parameters. Natural morality in the selected model was increased from 0.05 to 0.07 and the fecundity-at-weight and weight-at-length relationships were changed slightly.

This document revises the 2003 rebuilding analyses using the new information from the 2005 assessment. It also provides an assessment of rebuilding progress given the parameters in the current rebuilding plan.

Update of Rebuilding Plan and Addendum

Rebuilding Program and Files

The 2005 rebuilding analyses were primarily conducted in June 2005 using version 2.8a (April 2005) of the SSC default rebuilding analysis software (Punt 2005).

The input file for Model A1 is at the end of this document. That model is a full update of the initial rebuilding analyses using the standard environmental hypothesis (A1), which is the basis of the rebuilding plan (PFMC 2004).

Inputs to the Rebuilding Model

Recruitments

Recruitments estimates input to the 2005 rebuilding model were the number of age 0 fish in 1968-2003 (Table 2). Although the 2005 assessment model was extended back to 1928, recruitments were fit stochastically only after 1967. Fitting recruitments earlier than that led to wide fluctuations due to lack of data, so recruitments in 1928-1967 were taken from the Beverton-Holt stock-recruitment curve. In the new stock recruitment model (SS2) recruitments are always specified as age 0.

The strength of recruitments before and after 1982 was similar in the 2005 stock assessment estimates (Figure 1, Table 3). The 1982 change in recruitments was most evident in the 2001 update (Methot and Rogers 2001). That update indicated that age-one recruitment in 1983-1996 was only 67% of the level in 1963-1982. In the 2000 assessment and the 2003 full update of that assessment, recruitments before and after 1982 were more similar.

Life History

Life history-at-age inputs to the rebuilding program included spawning output (fecundity times proportion mature), body weight in the fishery, and natural mortality (Table 4). This update increased natural mortality from 0.05 to 0.07. It also slightly changed the spawning output and weight at age from the values input in the 2001 and 2003 rebuilding analyses. There were slight changes to the fecundity and weight-at-length relationships fixed in the 2005 assessment model.

Since the 2005 assessment model fit growth within the model, there was slightly slower growth in 1998 than in other years. Given that slower growth, estimates for ages greater than age 6 in 2004 were based on a smaller weight-at-age than estimated for the population before 1998. Although the rebuilding program allows for the life history inputs to change with each year, only the 2004 relationships for spawning output and weight were used in the rebuilding models. Yearly outputs were not available from the stock synthesis assessment model, and the author of the rebuilding model stated that his yearly-change option was not appropriate in this circumstance (Andre Punt, U. of W., pers.comm.).

Age Compositions

Both the 2001 and 2004 age composition data from the assessment model were supplied to the rebuilding model (Table 5). The age composition in 2001, the year the stock was declared overfished, was needed to determine $T_{MIN,}$ which assumed no fishing mortality after that year. Using the 2004 age composition from the assessment model required including the 2004 age-0 recruitment, which was based on the stock-recruitment curve rather than estimated using available data (Table 2). The 2004 age composition was chosen because it was compatible with the available fecundity-at-age and weight-at-age in the fishery, which were output by the stock synthesis model only for the ending year of the assessment model. The 2004 age composition included the high recruitment estimates for both 1999 and 2000 (Figure 1). The STAR panel for the 2005 assessment specified that those recruitments should not be down-weighted in the projections (Rogers 2005).

In the past rebuilding analyses, the age composition input was for a year prior to 2001, so only one age composition was necessary. The 2001 analyses used the 1998 age 1+ population age composition, and the 2003 analyses (as selected by the PFMC) used the 2000 age composition (Table 2). Although the stock assessment ending year age compositions were not used in the previous rebuilding analyses (1999 was not used in the 2001 analyses and 2001 was not used in the 2003 analyses), this was not a problem because growth was constant over time in those models.

Fishery Selectivity

The 2004 fishery selectivity-at-age for males and females was input to the rebuilding model. Those selectivities were higher for the younger ages and had more difference between sexes than the selectivities used in the previous rebuilding analyses (Table 6). Selectivity in the assessment models was based on length and then converted to selectivity-at-age, and the age-length relationship was different in 2004. As mentioned under the above life history section, slower growth in 1998 affected the growth in 2004. The 2004 selectivities were also fit to the fishery data after 2002, when the fishery was shifted out of the depth range of the medium-sized darkblotched rockfish.

Catch

Catch was supplied to the model for 2004-2006. The 2004 catch was based on the known landings and an assumed discard rate of 15%. The 2005-2006 catches were assumed equal to their previously-set OYs, which were the ABCs forecast using the 2003 rebuilding model. Catches were forecast beginning with 2007, the first year these rebuilding analyses could affect the OY (Table 2).

In the previous analyses, catch was also supplied for the last three years. For the 2001 analyses, catch in 1999-2001 was assumed equal to the known landings in 1999-2000 and the OY in 2001. Catches were forecast beginning with 2002 (Table 2). For the 2003 analyses, catch in 2000-2003 were supplied to the rebuilding model. In 2000, the catch was equal to the known landings. In 2001-2002, discard was added to the known landings using limited entry rates assumed by the PFMC (16% in 2001 and 20% in 2002). Catch in 2003 was assumed equal to that estimated for 2002. Catches were forecast beginning in 2004 (Table 2).

Rebuilding Outputs

The new life history inputs to the rebuilding model (primarily the increase in natural mortality) changed the rebuilding program estimates for mean generation time, unfished level of spawning output per recruit, and F50% (Table 2). The mean generation time was reduced from 33 to 24 years and the unfished level of spawning output per recruit was reduced from 18.42 to 10.16. F50%, which was approximately 0.03 in the prior analyses, was increased to 0.046.

Model A1

Model A1 was a standard environmental scenario, similar to the models selected in the initial rebuilding plan (2001 model) and addendum (2003 model). Virgin recruitment was set equal to the 1968-2003 mean recruitment and projected recruitments were randomly sampled from1982-2003 recruitments (Tables 2).

As in the 2003 model, T_{MAX} was re-calculated. Based on the revised generation time (24 years) plus a modified T_{MIN} (8 years), it was now 32 years. The maximum allowable year to rebuild the stock was therefore 2033: 2001 (the year overfishing was declared) plus 32 years. Since T_{MIN} is less than 10 years, given the new information T_{MAX} could be equal to the year the stock was declared overfished plus 10 years, which would occur in 2011. The rebuilding software, however, determined that T_{MAX} was 2033 and the 10 year rule is presently being revised.

Given the T_{MAX} of 2033, the catch based on the ABC at F50% was once again less than the catch given P_{MAX} = 0.80, the Po in the initial rebuilding plan (Tables 7,8 and Figure 2). The P_{MAX} associated with the ABC catches and the new T_{MAX} was 0.97 (Tables 2,7,8). The median year to rebuild given the ABC catches and the new T_{MAX} was 2012. The new T_{MAX} (2033) is close to the previous T_{TARGET} (2030). The probability of rebuilding by that T_{TARGET} is very high (0.96) given the ABC catches (Table 8). Even given the lower 95% confidence interval, the probability of rebuilding by T_{TARGET} is greater than 80% (Figure 3).

The ABC catch was based on a proxy of F50%, which was increased from 0.032 in 2003 to 0.046 in 2005 (Tables 2,6). The 2007 ABC catch projected in 2005 was also greater than that catch projected in 2003. As would be expected, if F was set at the old value for F50% (the current harvest control rule) in the 2005 model projections, the catches were smaller than the ABC based on the new value for F50% (Tables 7,8, Figure 2).

If the 10 year rule is used and T_{MAX} is set equal to 2011, the OY at Po of 0.80 would be intermediate between the current F OY and the F50% OY (Table 9). The probability of rebuilding the stock by 2011 is 100% for the current F OY and 0% given the F50% OY. Use of the 40-10 rule would result in around 40% change of rebuilding by T_{MAX}.

Model A1-b

Because changing the values for T_{MAX} and P_{MAX}, and the harvest control rule (F) might require another amendment to the rebuilding plan, a second model was developed to assess rebuilding progress using the T_{MAX} and Po currently in effect (Table 2). Rebuilding was therefore required by 2044. The current Po is not an exact value, only slightly greater than 0.9, so 0.9 was used as a proxy. This was also compared to the results given the Po of 0.8, from the original rebuilding plan. There was 67% chance of rebuilding by T_{TARGET} given the catches at P0.8, and 79% chance given the catches at P0.9 (Table 10).

Progress Towards Rebuilding

In July 2005, the SSC requested six comparisons which would help determine progress towards rebuilding (Table 11). The fifth comparison was Model A1 and the fourth comparison was Model A1-b. The first comparison (default) is consistent with the results shown in Table 8: that given the ABC catches, the stock has a 96% chance of rebuilding by the current T_{TARGET} of 2030.

Sensitivity Analyses

Model 2

Model 2 used the stock assessment option in the rebuilding model to forecast recruitments. The SSC was requested this comparison for darkblotched rockfish. As in the 2005 assessment model, a Beverton-Holt relationship with a steepness parameter of 0.95 was assumed. The standard deviation of the log-recruitment was set at 0.8, the value that was iteratively fit in the 2005 assessment model. Auto-correlation was set at zero. Although there was some correlation in recruitments with a one-year lag, this could be attributed to slightly miss-specified aging error or coefficient of variation in length-at-age in the assessment model, rather than actual recruitment correlation. Virgin recruitment from the 2005 assessment model was used to estimate B_0 in the rebuilding model. This model could be considered comparable to scenario B2 (optimistic stock-recruitment) in the 2001 analyses (Table 1). ABC catches for Model 2 were also lower than catch given PMAX of 0.9, so the OY was assumed equal to the ABC. The Model 2 OYcatches were slightly higher than the Model A1 catches in the later years of ten year projection (Table 12).

Conclusions

Given the parameters in the current rebuilding plan, rebuilding is ahead of schedule. There is a 96% chance of rebuilding by the 2030 target year. If the OY catch continues to be based on the current F, the stock has 100% chance of rebuilding by 2011, which is ten years after the stock was declared overfished.

References

Methot, R. and J.B. Rogers. 2001. Rebuilding analysis for darkblotched rockfish. Pacific Fishery Management Council, 7700 NE Ambassador Place, Suite 200, Portland, OR 97201.

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Rogers, J.B., R.D. Methot, T.L. Builder, K. Piner, and M. Wilkins. 2000. Status of the Darkblotched Rockfish (*Sebastes crameri*) Resource in 2000, appendix to Status of the Pacific coast groundfish fishery through 2000 and recommended acceptable biological catches for 2001. Pacific Fishery Management Council, 7700 NE Ambassador Place, Suite 200, Portland, OR 97201.

Table 1. Rebuilding models compared in 2001 analyses.

Hypothesis			Recruitment		2002 OY (mt)
Label	**Recruitment**	**Type**	**Virgin**	**Forecast**	$P_{MAX} = 0.7$
A1	Environmental	Standard	1963-1996 average	1983-1996	168
A2	Environmental	Optimistic	1963-1996 average	1963-1996	260
B1	Stock-Recruitment	Pessimistic	initial conditions	1983-1996	115
B2	Stock-Recruitment	Standard	initial conditions	1963-1996	196

Table 2. Comparison of scenario A1 models from the 2001 analyses, which were the basis of the rebuilding plan, the 2003 analyses, which were the basis of the plan amendment, and the 2005 analyses presented in this document. Outputs from the assessment models were used as inputs to the rebuilding models.

		Year of Analysis		
Model		**2001**	**2003**	**2005**
Assessment				
	Type	partial update	full update	full
	Ending Year of Model	2001	2002	2004
	Age of Recruits	1	1	0
	Last Year Recruits were Estimated	1999	2001	2003
Rebuilding				
	Utilization	Plan	Amendment	Amendment?
	First Year with Zero Catch (to calculate T_{MIN})	2002	2001	2001
	First Year Catch was Forecast	2002	2004	2007
	Year Declared Overfished - Age Comp	na	na	2001
	Year of Current Age Comp, Life History, Selectivity	1998	2000	2004
	Generation Time	33	33	24
	F_{MSY} proxy (F50%)	0.0321	0.0319	0.0463
	SPR unfiished population	18.42	18.42	10.16
	Age 0 Recruitments used to estimate B_0 (mean)	1962-1995	1962-1999	1968-2003
	Resample for Future Age 0 Recruits (from within range)	1982-1995	1982-1999	1982-2003
	B_0	29,044 mt	30,775 mt	25,361 mt
	B_{MSY}	11,618 mt	12,310 mt	10,144 mt
	T_{MIN} (years)	11.5	10	8
	T_{MIN}	2014	2011	2009
	T_{MAX}	2047	2044	2033
	T_{MED}	2030	2019	2012
	T_{TARGET}	2030	2030	2030
	P_{MAX}	80%	>90% (ABC)	97% (ABC)
	Harvest Control Rule (F)	0.027	0.032	0.046
	2007 OY		314 mt	456 mt

Table 3. Comparison of the mean age-0 recruitments (numbers of fish x 1000) in various time periods, as estimated in the last four stock assessments for darkblotched rockfish. Age-0 recruitments in the 2000-2003 assessments were calculated using age-1 recruitments with natural mortality of 0.05.

		Mean Age 0 Recruitment x 1000			
Time Period	**Years**	**Assessment Year**			
		2000	**2001**	**2003**	**2005**
Last Year Estimated in Model		**1997**	**1998**	**2000**	**2003**
Last Year Used in Rebuilding			**1995**	**1999**	**2003**
virgin	Initial		1961	1757	2623
entire	1962-1995	2001	1658	1663	2402
	1962-1999			1902	2439
	1968-2003				2475
early	up to 1981	2073	1916	1919	2685
late	1982-1995	1898	1288	1297	2023
	1982-1999			1883	2184
	1982-2003				2338

Table 4. Comparison of life history inputs into earlier rebuilding analyses versus those input into the 2005 rebuilding model. The 2005 model had inputs up to age 75, but the values were similar to those at age 40.

	Year of Analysis							
	2001 and 2003				2005			
Age	M	Fecundity	Weight (kg)		M	Fecundity	Weight (kg)	
		10^7 eggs	Females	Males		10^7 eggs	Females	Males
0					0.07	0.00	0.01	0.01
1	0.05	0.00	0.05	0.04	0.07	0.00	0.06	0.06
2	0.05	0.00	0.14	0.12	0.07	0.00	0.16	0.16
3	0.05	0.00	0.26	0.23	0.07	0.00	0.31	0.30
4	0.05	0.00	0.38	0.33	0.07	0.00	0.45	0.44
5	0.05	0.01	0.47	0.42	0.07	0.04	0.59	0.55
6	0.05	0.04	0.56	0.50	0.07	0.07	0.63	0.59
7	0.05	0.14	0.65	0.57	0.07	0.44	0.81	0.71
8	0.05	0.32	0.73	0.64	0.07	0.78	0.91	0.77
9	0.05	0.57	0.81	0.70	0.07	1.13	1.00	0.82
10	0.05	0.86	0.89	0.75	0.07	1.44	1.08	0.86
11	0.05	1.15	0.96	0.80	0.07	1.71	1.14	0.89
12	0.05	1.43	1.02	0.84	0.07	1.94	1.20	0.91
13	0.05	1.69	1.08	0.87	0.07	2.14	1.24	0.93
14	0.05	1.92	1.13	0.89	0.07	2.30	1.28	0.94
15	0.05	2.13	1.17	0.92	0.07	2.44	1.31	0.95
16	0.05	2.32	1.21	0.93	0.07	2.55	1.34	0.96
17	0.05	2.49	1.24	0.95	0.07	2.64	1.36	0.96
18	0.05	2.63	1.27	0.96	0.07	2.72	1.37	0.97
19	0.05	2.76	1.29	0.97	0.07	2.78	1.39	0.97
20	0.05	2.86	1.32	0.98	0.07	2.83	1.40	0.97
21	0.05	2.96	1.33	0.99	0.07	2.87	1.41	0.97
22	0.05	3.04	1.35	0.99	0.07	2.90	1.41	0.98
23	0.05	3.11	1.36	1.00	0.07	2.93	1.42	0.98
24	0.05	3.17	1.37	1.00	0.07	2.95	1.42	0.98
25	0.05	3.22	1.38	1.00	0.07	2.97	1.43	0.98
26	0.05	3.27	1.39	1.00	0.07	2.98	1.43	0.98
27	0.05	3.30	1.40	1.01	0.07	2.99	1.43	0.98
28	0.05	3.34	1.41	1.01	0.07	3.00	1.44	0.98
29	0.05	3.36	1.41	1.01	0.07	3.01	1.44	0.98
30	0.05	3.39	1.41	1.01	0.07	3.01	1.44	0.98
31	0.05	3.41	1.42	1.01	0.07	3.02	1.44	0.98
32	0.05	3.42	1.42	1.01	0.07	3.02	1.44	0.98
33	0.05	3.44	1.42	1.01	0.07	3.02	1.44	0.98
34	0.05	3.45	1.43	1.01	0.07	3.03	1.44	0.98
35	0.05	3.46	1.43	1.01	0.07	3.03	1.44	0.98
36	0.05	3.47	1.43	1.01	0.07	3.03	1.44	0.98
37	0.05	3.48	1.43	1.01	0.07	3.03	1.44	0.98
38	0.05	3.48	1.43	1.01	0.07	3.03	1.44	0.98
39	0.05	3.49	1.43	1.01	0.07	3.03	1.44	0.98
40	0.05	3.51	1.44	1.01	0.07	3.03	1.44	0.98

Table 5. Comparison of age composition inputs into earlier rebuilding analyses versus those input into the 2005 rebuilding model. The 2005 model had inputs up to age 75+, but those values were summed to age 40+ for purposes of comparison.

	Year of Analysis							
	2001		2003		2005			
	1998 Age Comp		2000 Age Comp		2004 Age Comp		2001 Age Comp	
Age	**females**	**males**	**females**	**males**	**females**	**males**	**females**	**males**
0					1215	1215	836	836
1	1338	1338	3449	3449	1723	1723	2795	2795
2	176	176	272	272	334	334	3133	3133
3	791	791	837	837	677	677	299	299
4	1643	1644	175	175	2256	2255	865	865
5	260	262	781	785	2481	2483	202	202
6	417	424	1672	1692	235	234	1538	1549
7	380	389	185	189	644	647	457	465
8	201	208	309	318	148	149	61	62
9	83	86	248	257	1120	1133	171	175
10	271	282	88	91	332	339	53	55
11	214	223	53	55	44	45	71	73
12	228	238	161	169	124	127	23	24
13	93	97	133	139	39	40	197	204
14	60	63	160	168	51	53	81	83
15	34	35	65	68	17	17	25	26
16	30	32	42	44	143	148	29	30
17	77	81	22	24	58	60	13	13
18	111	117	20	22	18	19	15	16
19	115	120	54	57	21	22	22	23
20	56	59	76	80	9	9	39	41
21	29	30	81	84	11	11	48	50
22	19	20	39	41	16	16	9	10
23	16	16	21	22	28	30	3	4
24	18	18	13	14	35	36	4	4
25	55	56	12	12	7	7	5	5
26	4	4	11	11	2	3	3	3
27	40	41	44	45	3	3	13	13
28	0	0	6	6	3	3	4	4
29	1	1	25	26	2	2	4	5
30	71	73	0	0	9	9	4	5
31	3	3	2	2	3	3	3	3
32	36	37	48	49	3	3	2	2
33	0	0	3	3	3	3	2	2
34	0	0	25	26	2	2	3	3
35	0	0	0	0	1	2	3	3
36	25	26	0	0	1	1	2	2
37	10	10	0	0	2	2	2	2
38	8	9	17	18	2	2	1	2
39	8	8	7	7	2	2	1	1
40+	119	121	97	99	10	10	11	11

Table 6. Comparison of fishery selectivity inputs into earlier rebuilding analyses versus those input into the 2005 rebuilding model. The 2005 model had inputs up to age 75, but the values were similar to those at age 40.

	Year of Analysis					
	2001		2003		2005	
Age	**Females**	**Males**	**Females**	**Males**	**Females**	**Males**
0					0.00	0.00
1	0.00	0.00	0.00	0.00	0.00	0.00
2	0.00	0.00	0.00	0.00	0.01	0.01
3	0.02	0.01	0.03	0.02	0.05	0.05
4	0.11	0.08	0.14	0.11	0.24	0.21
5	0.32	0.26	0.36	0.30	0.51	0.43
6	0.57	0.51	0.59	0.54	0.60	0.50
7	0.76	0.72	0.77	0.73	0.85	0.73
8	0.87	0.84	0.87	0.84	0.92	0.81
9	0.93	0.91	0.92	0.90	0.96	0.86
10	0.96	0.94	0.96	0.94	0.98	0.89
11	0.98	0.96	0.97	0.96	0.99	0.91
12	0.98	0.97	0.98	0.97	0.99	0.92
13	0.99	0.98	0.99	0.98	0.99	0.93
14	0.99	0.98	0.99	0.98	1.00	0.94
15	1.00	0.99	0.99	0.98	1.00	0.94
16	1.00	0.99	1.00	0.99	1.00	0.94
17	1.00	0.99	1.00	0.99	1.00	0.95
18	1.00	0.99	1.00	0.99	1.00	0.95
19	1.00	0.99	1.00	0.99	1.00	0.95
20	1.00	0.99	1.00	0.99	1.00	0.95
21	1.00	0.99	1.00	0.99	1.00	0.95
22	1.00	0.99	1.00	0.99	1.00	0.95
23	1.00	0.99	1.00	0.99	1.00	0.95
24	1.00	1.00	1.00	0.99	1.00	0.95
25	1.00	1.00	1.00	0.99	1.00	0.95
26	1.00	1.00	1.00	0.99	1.00	0.95
27	1.00	1.00	1.00	0.99	1.00	0.95
28	1.00	1.00	1.00	0.99	1.00	0.95
29	1.00	1.00	1.00	0.99	1.00	0.95
30	1.00	1.00	1.00	0.99	1.00	0.95
31	1.00	1.00	1.00	0.99	1.00	0.95
32	1.00	1.00	1.00	0.99	1.00	0.95
33	1.00	1.00	1.00	0.99	1.00	0.95
34	1.00	1.00	1.00	0.99	1.00	0.95
35	1.00	1.00	1.00	0.99	1.00	0.95
36	1.00	1.00	1.00	0.99	1.00	0.95
37	1.00	1.00	1.00	0.99	1.00	0.95
38	1.00	1.00	1.00	0.99	1.00	0.95
39	1.00	1.00	1.00	0.99	1.00	0.95
40	1.00	1.00	1.00	0.99	1.00	0.95

Table 7. Model A1 output (2005 update of the rebuilding plan and addendum).

Quantity	**P_{MAX} =0.5**	**P_{MAX} =0.6**	**P_{MAX} =0.7**	**P_{MAX} =0.8**	**P_{MAX} =0.9**	**F= 0.032***	**F=0**	**40-10 Rule**	**ABC Rule**
F	0.0715	0.0682	0.0645	0.0594	0.0531	0.032	0		0.046
SPR RATE	0.376	0.389	0.405	0.429	0.461	1.000	1.000		0.500
OY_{2007}(mt)	696.1	665	629.5	581.2	521.4	316.9	0	255.1	456
P_{MAX}	50.0	60.0	70.0	80.1	90.0	100.0	100.0	100.0	97.2
T_{MED}	2033.0	2024.7	2019.6	2016.0	2013.6	2010.5	2009.5	2011.2	2012.2
						*** The current rebuild fishing mortality**			

Table 8. Comparison of 2005 Model A1 results for a variety of assumptions. P=.8 and P=0.9 are based on T_{MAX} of 2033. The 2004-2006 catches were externally-derived estimates supplied to the model. Values are medians from 1000 runs.

	Probability Rebuilt					OY Catch (mt)			
Year	P= .8	P= .9	F=0	F50%	F=0.032	P= .8	P= .9	F50%	F=0.032
2004	0.00	0.00	0.00	0.00	0.00	227	227	227	227
2005	0.00	0.00	0.00	0.00	0.00	269	269	269	269
2006	0.00	0.00	0.00	0.00	0.00	294	294	294	294
2007	0.00	0.00	0.00	0.00	0.00	581	521	456	317
2008	0.00	0.00	0.00	0.00	0.00	615	554	487	343
2009	0.00	0.00	0.00	0.00	0.00	624	565	500	355
2010	0.00	0.00	1.00	0.00	0.00	641	584	519	373
2011	0.00	0.00	1.00	0.00	1.00	650	594	530	385
2012	0.06	0.19	1.00	0.43	1.00	654	600	538	395
2013	0.25	0.42	1.00	0.74	1.00	659	607	546	403
2014	0.38	0.55	1.00	0.80	1.00	662	612	553	412
2015	0.46	0.61	1.00	0.83	1.00	664	615	558	418
2016	0.50	0.65	1.00	0.86	1.00	662	615	560	422
2017	0.54	0.68	1.00	0.87	1.00	663	618	563	427
2018	0.57	0.71	1.00	0.88	1.00	662	617	563	430
2019	0.60	0.74	1.00	0.89	1.00	664	621	567	435
2020	0.62	0.75	1.00	0.90	1.00	661	619	568	438
2021	0.64	0.77	1.00	0.91	1.00	661	620	568	439
2022	0.66	0.79	1.00	0.92	1.00	659	618	569	440
2023	0.68	0.80	1.00	0.93	1.00	661	622	573	445
2024	0.69	0.82	1.00	0.93	1.00	657	617	570	445
2025	0.71	0.82	1.00	0.94	1.00	656	619	571	447
2026	0.72	0.84	1.00	0.94	1.00	659	622	572	449
2027	0.73	0.85	1.00	0.95	1.00	655	619	571	450
2028	0.75	0.86	1.00	0.96	1.00	657	620	575	451
2029	0.76	0.87	1.00	0.96	1.00	656	620	574	451
2030	0.77	0.88	1.00	0.96	1.00	656	618	573	453
2031	0.78	0.89	1.00	0.97	1.00	652	616	571	452
2032	0.79	0.89	1.00	0.97	1.00	650	614	570	452
2033	0.80	0.90	1.00	0.97	1.00	651	615	571	453

Table 9. Comparison of Model A1 results assuming T_{MAX} is 2011, 10 years after the stock was declared overfished. Values are medians from 1000 runs.

Year	Probability Rebuilt						OY Catch (mt)				
	P=0.8	P= 0.9	40-10	F=0	F=0.032	F50%	P=0.8	P=0 .9	40-10	F=0.032	F50%
2007	0.00	0.00	0.00	0.00	0.00	0.00	333	521	255	317	456
2008	0.00	0.00	0.00	0.00	0.00	0.00	360	554	353	343	487
2009	0.00	0.00	0.00	0.00	0.00	0.00	373	565	421	355	500
2010	0.00	0.00	0.00	1.00	0.00	0.00	390	584	494	373	519
2011	0.80	0.90	0.37	1.00	1.00	0.00	403	594	546	385	530

Table 10. Comparison of 2005 Model A1 results with T_{MAX} fixed at the year in the amendment (2044) (Model A1-b) and P_{MAX} either from the rebuilding plan (0.8) or from the amendment (0.9). Values are medians from 1000 runs.

	Probability Rebuilt		OY Catch (mt)	
Year	**P= .8**	**P= .9**	**P= .8**	**P= .9**
2007	0.00	0.00	628	571
2008	0.00	0.00	662	604
2009	0.00	0.00	669	614
2010	0.00	0.00	685	631
2011	0.00	0.00	692	640
2012	0.00	0.08	694	645
2013	0.14	0.28	698	651
2014	0.27	0.41	699	653
2015	0.34	0.48	699	655
2016	0.39	0.53	697	654
2017	0.43	0.56	696	656
2018	0.46	0.59	694	654
2019	0.49	0.62	695	657
2020	0.51	0.64	691	654
2021	0.53	0.67	689	654
2022	0.55	0.68	688	652
2023	0.57	0.70	689	654
2024	0.59	0.71	683	650
2025	0.61	0.73	684	650
2026	0.62	0.74	686	653
2027	0.64	0.75	681	649
2028	0.64	0.77	684	651
2029	0.65	0.79	683	650
2030	0.67	0.79	681	650
2031	0.68	0.81	678	646
2032	0.69	0.82	675	644
2033	0.70	0.83	677	645
2034	0.72	0.84	675	643
2035	0.73	0.85	677	647
2036	0.74	0.86	680	649
2037	0.75	0.86	677	647
2038	0.75	0.87	678	648
2039	0.76	0.87	679	648
2040	0.78	0.88	675	644
2041	0.78	0.88	676	645
2042	0.79	0.89	678	647
2043	0.79	0.90	680	650
2044	0.80	0.90	682	650

Table 11. Comparisons requested by the SSC to evaluate progress towards rebuilding.

	1 (Default)	2	3	4	5	6
P_{MAX}	**estimated**	**0.5**	**estimated**	**P_0**	**estimated**	**P_0**
T_{MAX}	**current T_{TARGET}**	**current T_{TARGET}**	**current T_{MAX}**	**current T_{MAX}**	**new T_{MAX}**	**new T_{MAX}**
BASED ON	**current SPR**	**est SPR**	**current SPR**	**est SPR**	**current SPR**	**est SPR**
Model				**A1-b**	**A1**	
T_{MIN}	2009	2009	2009	2009	2009	2009
T_{MAX}	2030	2030	2044	2044	2033	2033
T_{MED}	2012	2012	2012	2016	2012	2014
P_{MAX}	0.962	0.5	0.986	0.9	0.972	0.9
F	0.0463	0.0701	0.0463	0.0583	0.046	0.0531
SPR rate	0.5	0.381	0.5	0.434	0.5	0.461

Table 12. Comparison of model results with recruitment predicted from stock-recruitment relationship (Model 2) to the model with re-sampled recruitments (Model A1).

	Model A1	Model 2
Age-0 Recruitments		
Estimate B_0 (mean from range)	1968-2003	intial
Resample for Future Recruits (from within range)	1982-2003	S-R
Outputs		
B_0 (10^7 eggs)	25361	26662
B_{MSY} (10^7 eggs)	10144	10665
T_{MIN}	2009	2009
T_{MAX}	2033	2033
P_{MAX}	0.97	0.96
Median year to rebuild given P_{MAX} by T_{MAX}	2012	2014
2007 OY (mt)	456	456
2008 OY (mt)	487	488
2009 OY (mt)	500	500
2010 OY (mt)	519	519
2011 OY (mt)	530	532
2012 OY (mt)	538	540
2013 OY (mt)	546	548
2014 OY (mt)	553	556
2015 OY (mt)	558	563
2016 OY (mt)	560	570
2017 OY (mt)	563	577

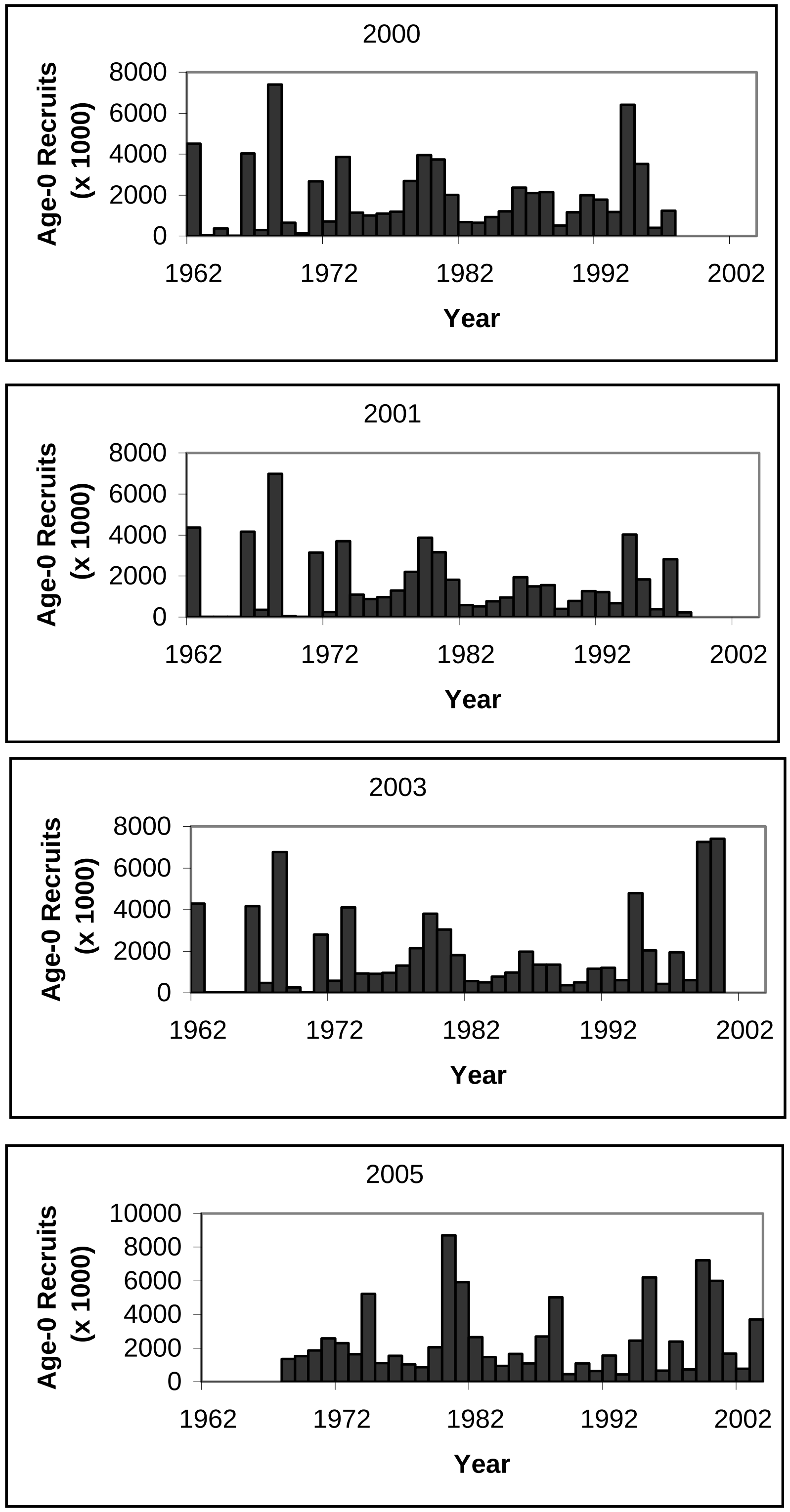

Figure 1. Comparison of recruitments estimated in the three stock assessments for darkblotched rockfish.

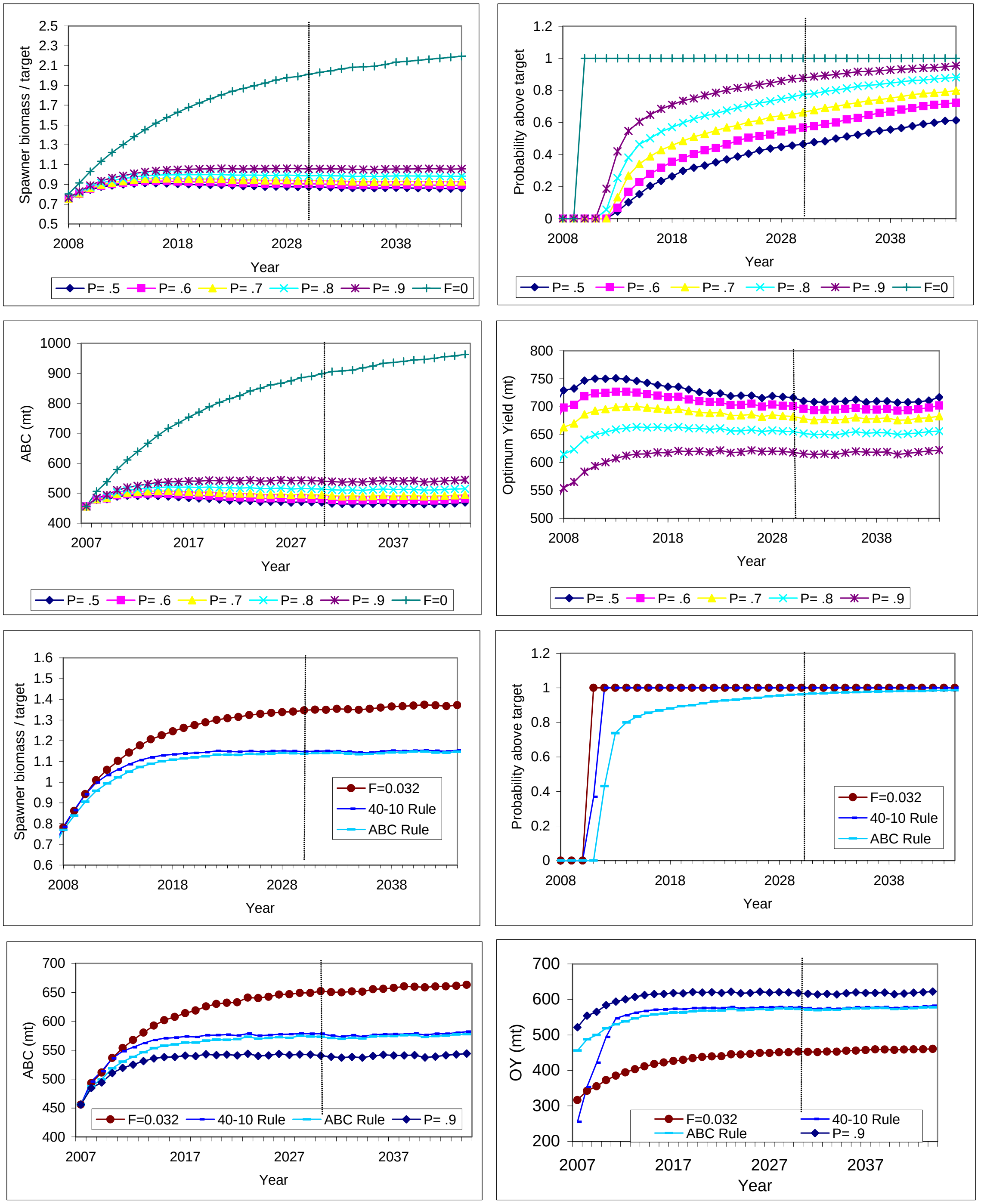

Figure 2. Median time-trajectories for spawning output relative to target level, the probability of being above the target level, the ABC and OY for a set of rebuilding strategies. The vertical dashed line is the year 2030, the target year to rebuild.

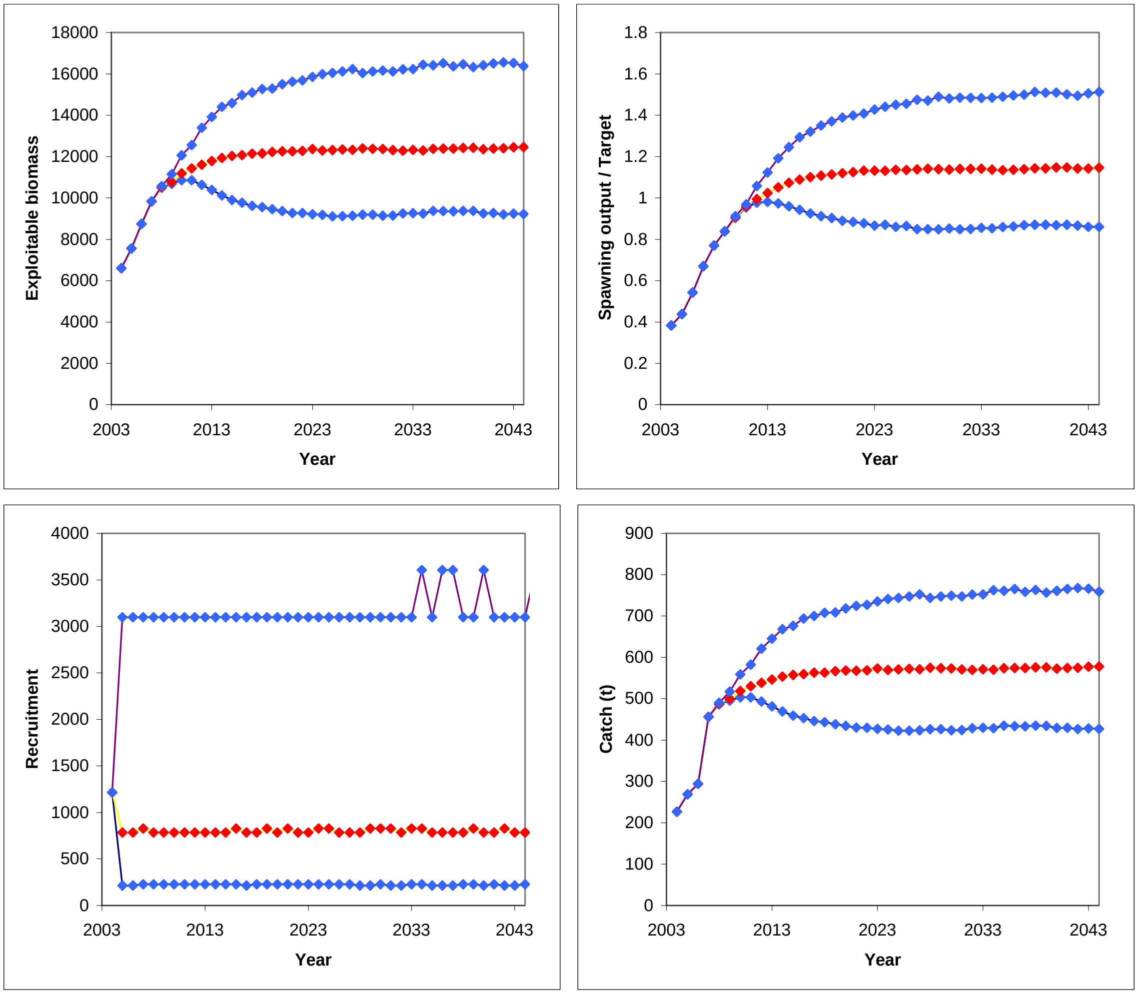

Figure 3. Median and 95% confidence intervals for the ABC harvest strategy, as output by Model A1.

MODEL A1 INPUT FILES

```
#Title
Darkblotched 2005
# Number of sexes
2
# Age range to consider (minimum age; maximum age)
0 75
# Number of fleets
1
# First year of projection
2004
# Year declared overfished
2001
# Is the maximum age a plus-group (1=Yes;2=No)
1
# Generate future recruitments using historical recruitments (1)
historical recruits/spawner (2)  or a stock-recruitment (3)
1
# Constant fishing mortality (1) or constant Catch (2) projections
1
# Fishing mortality based on SPR (1) or actual rate (2)
2
# Pre-specify the year of recovery (or -1) to ignore
-1
# Fecundity-at-age
# 2004 eggs ages 0-75
0.00  0.00  0.00  0.00  0.00  0.04  0.07  0.44  0.78  1.13  1.44  1.71
      1.94  2.14  2.30  2.44  2.55  2.64  2.72  2.78  2.83  2.87  2.90
      2.93  2.95  2.97  2.98  2.99  3.00  3.01  3.01  3.02  3.02  3.02
      3.03  3.03  3.03  3.03  3.03  3.03  3.03  3.03  3.03  3.04  3.04
      3.04  3.04  3.04  3.04  3.04  3.04  3.04  3.04  3.04  3.04  3.04
      3.04  3.04  3.04  3.04  3.04  3.04  3.04  3.04  3.04  3.04  3.04
      3.04  3.04  3.04  3.04  3.04  3.04  3.04  3.04  3.04

# Age specific information (Females then males) weight then selectivity
in 2004
# Females
0.01  0.06  0.16  0.31  0.45  0.59  0.63  0.81  0.91  1.00  1.08  1.14
      1.20  1.24  1.28  1.31  1.34  1.36  1.37  1.39  1.40  1.41  1.41
      1.42  1.42  1.43  1.43  1.43  1.44  1.44  1.44  1.44  1.44  1.44
      1.44  1.44  1.44  1.44  1.44  1.44  1.44  1.44  1.44  1.44  1.44
      1.44  1.44  1.44  1.44  1.44  1.44  1.44  1.44  1.44  1.44  1.44
      1.44  1.44  1.44  1.44  1.44  1.44  1.44  1.44  1.44  1.44  1.44
      1.44  1.44  1.44  1.44  1.44  1.44  1.44  1.44  1.44
0.00  0.00  0.01  0.05  0.24  0.51  0.60  0.85  0.92  0.96  0.98  0.99
      0.99  0.99  1.00  1.00  1.00  1.00  1.00  1.00  1.00  1.00  1.00
      1.00  1.00  1.00  1.00  1.00  1.00  1.00  1.00  1.00  1.00  1.00
      1.00  1.00  1.00  1.00  1.00  1.00  1.00  1.00  1.00  1.00  1.00
      1.00  1.00  1.00  1.00  1.00  1.00  1.00  1.00  1.00  1.00  1.00
      1.00  1.00  1.00  1.00  1.00  1.00  1.00  1.00  1.00  1.00  1.00
      1.00  1.00  1.00  1.00  1.00  1.00  1.00  1.00  1.00
# Males
0.01  0.06  0.16  0.30  0.44  0.55  0.59  0.71  0.77  0.82  0.86  0.89
      0.91  0.93  0.94  0.95  0.96  0.96  0.97  0.97  0.97  0.97  0.98
      0.98  0.98  0.98  0.98  0.98  0.98  0.98  0.98  0.98  0.98  0.98
      0.98  0.98  0.98  0.98  0.98  0.98  0.98  0.98  0.98  0.98  0.98
      0.98  0.98  0.98  0.98  0.98  0.98  0.98  0.98  0.98  0.98  0.98
```

```
     0.98  0.98  0.98  0.98  0.98  0.98  0.98  0.98  0.98  0.98  0.98
     0.98  0.98  0.98  0.98  0.98  0.98  0.98  0.98  0.98
0.00 0.00  0.01  0.05  0.21  0.43  0.50  0.73  0.81  0.86  0.89  0.91
     0.92  0.93  0.94  0.94  0.94  0.95  0.95  0.95  0.95  0.95  0.95
     0.95  0.95  0.95  0.95  0.95  0.95  0.95  0.95  0.95  0.95  0.95
     0.95  0.95  0.95  0.95  0.95  0.95  0.95  0.95  0.95  0.95  0.95
     0.95  0.95  0.95  0.95  0.95  0.95  0.95  0.95  0.95  0.95  0.95
     0.95  0.95  0.95  0.95  0.95  0.95  0.95  0.95  0.95  0.95  0.95
     0.95  0.95  0.95  0.95  0.95  0.95  0.95  0.95  0.95

# M and 2004 age-structure
# Females
0.07 0.07  0.07  0.07  0.07  0.07  0.07  0.07  0.07  0.07  0.07  0.07
     0.07  0.07  0.07  0.07  0.07  0.07  0.07  0.07  0.07  0.07  0.07
     0.07  0.07  0.07  0.07  0.07  0.07  0.07  0.07  0.07  0.07  0.07
     0.07  0.07  0.07  0.07  0.07  0.07  0.07  0.07  0.07  0.07  0.07
     0.07  0.07  0.07  0.07  0.07  0.07  0.07  0.07  0.07  0.07  0.07
     0.07  0.07  0.07  0.07  0.07  0.07  0.07  0.07  0.07  0.07  0.07
     0.07  0.07  0.07  0.07  0.07  0.07  0.07  0.07  0.07
1215 1723  334   677   2256  2481  235   644   148   1120  332   44
     124   39    51    17    143   58    18    21    9     11    16
     28    35    7     2     3     3     2     9     3     3     3
     2     1     1     2     2     2     1     1     1     1     1
     1     1     1     1     0     0     0     0     0     0     0
     0     0     0     0     0     0     0     0     0     0     0
     0     0     0     0     0     0     0     0     1
# Males
0.07 0.07  0.07  0.07  0.07  0.07  0.07  0.07  0.07  0.07  0.07  0.07
     0.07  0.07  0.07  0.07  0.07  0.07  0.07  0.07  0.07  0.07  0.07
     0.07  0.07  0.07  0.07  0.07  0.07  0.07  0.07  0.07  0.07  0.07
     0.07  0.07  0.07  0.07  0.07  0.07  0.07  0.07  0.07  0.07  0.07
     0.07  0.07  0.07  0.07  0.07  0.07  0.07  0.07  0.07  0.07  0.07
     0.07  0.07  0.07  0.07  0.07  0.07  0.07  0.07  0.07  0.07  0.07
     0.07  0.07  0.07  0.07  0.07  0.07  0.07  0.07  0.07
1215 1723  334   677   2255  2483  234   647   149   1133  339   45
     127   40    53    17    148   60    19    22    9     11    16
     30    36    7     3     3     3     2     9     3     3     3
     2     2     1     2     2     2     1     1     1     1     1
     1     1     1     1     0     0     0     0     0     0     0
     0     0     0     0     0     0     0     0     0     0     0
     0     0     0     0     0     0     0     0     1
# 2001 age-structure
836  2795  3133  299   865   202   1538  457   61    171   53    71
     23    197   81    25    29    13    15    22    39    48    9
     3     4     5     3     13    4     4     4     3     2     2
     3     3     2     2     1     1     1     1     1     1     1
     1     1     1     1     1     0     0     0     0     0     0
     0     0     0     0     0     0     0     0     0     0     0
     0     0     0     0     0     0     0     0     1
836  2795  3133  299   865   202   1549  465   62    175   55    73
     24    204   83    26    30    13    16    23    41    50    10
     4     4     5     3     13    4     5     5     3     2     2
     3     3     2     2     2     1     1     1     1     1     1
     1     1     1     1     1     0     0     0     0     0     0
     0     0     0     0     0     0     0     0     0     0     0
     0     0     0     0     0     0     0     0     1
# Year for Tmin Age-structure
```

```
2001
# Number of simulations
1000
#  recruitment and biomass
# Number of historical assessment years
78
# Historical data
# year recruitment spawner in B0 in R project in R/S project
1927  2495  25930 1     0     0
1928  2623  26977 0     0     0
1929  2623  26976 0     0     0
1930  2623  26973 0     0     0
1931  2623  26970 0     0     0
1932  2623  26969 0     0     0
1933  2623  26968 0     0     0
1934  2623  26967 0     0     0
1935  2623  26966 0     0     0
1936  2623  26964 0     0     0
1937  2623  26962 0     0     0
1938  2623  26960 0     0     0
1939  2623  26956 0     0     0
1940  2623  26949 0     0     0
1941  2622  26942 0     0     0
1942  2622  26933 0     0     0
1943  2622  26924 0     0     0
1944  2622  26885 0     0     0
1945  2622  26794 0     0     0
1946  2622  26555 0     0     0
1947  2622  26395 0     0     0
1948  2622  26299 0     0     0
1949  2621  26146 0     0     0
1950  2621  25986 0     0     0
1951  2621  25801 0     0     0
1952  2621  25560 0     0     0
1953  2620  25394 0     0     0
1954  2620  25236 0     0     0
1955  2620  25079 0     0     0
1956  2620  24934 0     0     0
1957  2619  24749 0     0     0
1958  2619  24547 0     0     0
1959  2619  24376 0     0     0
1960  2619  24216 0     0     0
1961  2618  24049 0     0     0
1962  2618  23946 0     0     0
1963  2618  23777 0     0     0
1964  2618  23568 0     0     0
1965  2617  23483 0     0     0
1966  2617  23196 0     0     0
1967  2609  19175 0     0     0
1968  1361  16304 0     0     0
1969  1516  14110 0     0     0
1970  1854  14036 0     0     0
1971  2569  14021 0     0     0
1972  2296  13911 0     0     0
1973  1626  13706 0     0     0
1974  5219  13257 0     0     0
1975  1115  12849 0     0     0
```

```
1976  1547  12567 0     0     0
1977  1037  12294 0     0     0
1978  861   12358 0     0     0
1979  2045  12343 0     0     0
1980  8698  11903 0     0     0
1981  5918  11908 0     0     0
1982  2653  11522 0     1     1
1983  1464  10810 0     1     1
1984  943   10164 0     1     1
1985  1653  9303  0     1     1
1986  1090  8386  0     1     1
1987  2692  8227  0     1     1
1988  5019  7247  0     1     1
1989  455   6627  0     1     1
1990  1087  6090  0     1     1
1991  633   5052  0     1     1
1992  1569  4366  0     1     1
1993  428   4166  0     1     1
1994  2439  3696  0     1     1
1995  6198  3485  0     1     1
1996  650   3280  0     1     1
1997  2385  2985  0     1     1
1998  740   2598  0     1     1
1999  7212  2136  0     1     1
2000  5995  2103  0     1     1
2001  1672  2304  0     1     1
2002  769   2739  0     1     1
2003  3695  3282  0     1     1
2004  2430  3848  0     0     0
# Number of years with pre-specified catches
3
# catches for years with pre-specified catches
2004 227
2005 269
2006 294
# Number of future recruitments to override
0
# Process for overiding (-1 for average otherwise index in data list)
# Which probability to product detailed results for (1=0.5; 2=0.6;
etc.)
9
# Steepness sigma-R Auto-correlation
0.95 0.8 0.00
# Target SPR rate (FMSY Proxy)
0.5
# Target SPR information: Use (1=Yes) and power
0 20
# Discount rate (for cumulative catch)
0.1
# Truncate the series when 0.4B0 is reached (1=Yes)
0
# Set F to FMSY once 0.4B0 is reached (1=Yes)
0
# Percentage of FMSY which defines Ftarget
0.9
# Maximum possible F for projection (-1 to set to FMSY)
2
```

```
# Conduct MacCall transition policy (1=Yes)
0
# Defintion of recovery (1=now only;2=now or before)
2
# Results for rec probs by Tmax (1) or 0.5 prob for various Ttargets
(2)
1
# Definition of the "40-10" rule
10 40
# Produce the risk-reward plots (1=Yes)
0
# Calculate coefficients of variation (1=Yes)
0
# Number of replicates to use
20
# Random number seed
-89102
# Conduct projections for multiple starting values (0=No;else yes)
0
# File with multiple parameter vectors
MCMC.PRJ
# Number of parameter vectors
100
# User-specific projection (1=Yes); Output replaced (1->6)
1 6 0 0.5
# Catches and Fs (Year; 1/2 (F or C); value); Final row is -1
2007 1 0.032
2008 1 0.032
2009 1 0.032
2010 1 0.032
2011 1 0.032
2012 1 0.032
2013 1 0.032
2014 1 0.032
2015 1 0.032
2016 1 0.032
2017 1 0.032
-1 -1 -1
# Split of Fs
2004 1
-1 1
# Time varying weight-at-age (1=Yes;0=No)
0
# File with time series of weight-at-age data
Fecwt.csv
```

Glossary for Terms Used in this Document

ABC	Allowable Biological Catch
B_0	Population spawning output in the unfished state
B_{MSY}	Population spawning output that can support MSY
B40%	Proxy for $B_{MSY} = 0.40*B_0$
F_{MSY}	Fishing mortality rate which will achieve MSY
F50%	Proxy for F_{MSY}
Harvest Control Rule	Fishing mortality rate applied to the exploitable biomass to determine the OY
Mean Generation Time	Time required for a female to reproduce a reproductive female offspring Sum (age x spawn x survival - for each age)/ sum(spawn x survival - for each age)
MSY	Maximum sustained yield
OY	Optimum Yield -the desired fishery catch in a given year
P_0	The probability of rebuilding by TMAX that was selected as policy by the council
$P_{CURRENT}$	The forecast probability of rebuilding within T_{MAX} given the existing harvest rate.
P_{MAX}	Probability that stock will rebuild by T_{MAX}
Spawning Output	Fecundity output by the females in the population (#age*%mature*fecundity)
T_{MAX}	Maximum allowable rebuilding time (T_{MIN} if T_{MIN} is <= 10, otherwise, T_{MIN} + generation time)
T_{MED}	Median year to rebuild given the selected probability of rebuilding by $T_{MAX)}$
T_{MIN}	Time needed to rebuild in the absence of fishing (beginning with the year the stock was declared overfished)
T_{TARGET}	Time needed to have at least 50% probability of rebuilding within T_{MAX} (often median year to rebuild given the selected probability of rebuilding by $T_{MAX)}$

Request for Proposals

Analytical Package for an Individual Quota Program for the West Coast Limited Entry Groundfish Trawl Fishery

Actual Issue Date: August 15, 2006

Schedule/Instructions/Provisions/Clauses

Deadlines for Submissions: 4 p.m., September 14, 2005

Pacific Fishery Management Council
www.pcouncil.org

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## Section 1:	Proposed Schedule

Date:August 15, 2005	RFP issued and distributed
Date : September 14, 2005	Deadline for submission of proposals
	All paper media proposals should be submitted to Pacific Fishery Management Council ATTN: JIM SEGER 7700 NE Ambassador Place Portland OR, 97220 503-820-2280 Proposals can also be e-mailed to to: jim.seger@pcouncil.org. All e-mail correspondence related to this RFP should have a subject line line of "RFP for Analysis of Trawl Individual Quotas"
Date: September 30 or earlier	Selection of finalists or contract award

All deadlines are 4 PM Pacific Daylight Time on the date indicated.

Section 2: Description of Specifications/Work Statement

Section 2.1 Scope of Work

The Pacific Fishery Management Council (Council) announces its formal Request for Proposals (RFP) for work on the first of a two phase project to assess the potential biological, economic and social effects of a groundfish trawl individual fishing quota program in a draft Supplemental Environmental Impact Statement, Regulatory Impact Review, Initial Regulatory Flexibility Analysis and Social Impact Analysis (EIS/RIR/IRFA/SIA). A principle focus of the assessment produced by the end of the second phase will be the estimation of direct, indirect and cumulative impacts on the human environment of proposed management alternatives in contrast with a no action alternative.

While this analytical project is being carried out in a two stage process, the current RFP covers only the first stage. The first stage entails the development of the introductory chapters, outline, and analytical framework/approach for the EIS/RIR/IRFA/SIA. It will entail the gathering of information and sufficient analysis to fully develop a detailed, specific and documented analytical framework/approach to address each feature of the alternatives and their likely impacts along with an assessment of the overall differences in impacts among the alternatives. The second stage will be the completion of the baseline and impact analysis on the basis of the product from the first stage.

The Council has identified seven management regime alternatives for consideration. One of the alternatives is a no action alternative, five would implement a trawl IFQ management regime, and one would implement a permit stacking management regime. The five IFQ management regime alternatives vary primarily in terms of the species covered and the complementary regulations used to manage nonIFQ species or species with very low OYs. An IFQ program can entail a variety of design features with respect to elements such as initial allocation; IFQ transfer; and program administration, monitoring and enforcement. The Council has developed three different IFQ program designs for consideration. The organization of the management regime and IFQ alternatives are described in the information sheet provided in the appendix to this RFP. Contract bidders should also be aware that additional detail on the provisions of the IFQ programs and some initial analysis have already been developed and may be requested from the Council office.

In conjunction and complementary to the development of IFQ alternatives, the Council is also working on the intersector allocations necessary to determine the amounts of each OY that will be available for the trawl fishery. This effort will not likely be completed until after the trawl IFQ program final decision. Adoption of a trawl IFQ program would not guarantee the trawl sector any particular share or amount of the available harvest.

Trawl harvest may increase or decrease in the future as a result of fluctuations in the OYs or changes in the intersetor allocations over time. The analytical framework/approach should provide information useful in assessing the robustness of the alternatives and net impacts over a reasonable range of possible future trawl harvest levels.

The document to be provided at the end of the first stage is to include the following elements. These elements should appear in the format that will be used for the completed analytical package.

1. A glossary of terminology and list of acronyms.
2. The first two chapters of an EIS (introduction and alternatives) with the exception of sections summarizing impacts - Elements to be included in the first two chapters are provided in the example outline provided in the appendix to this RFP and will largely be drawn from the scoping summary and information documents provided by the Council. The main augmentation to be provided by the contractor is the summary of "Criteria Used to Evaluate the Impacts of the Proposed Action."
3. An outline of sections for the baseline description of the affected environment and description of information to be included in each section - The information identified for inclusion should not be encyclopedic but rather relevant to and in support of issues to be covered in the impact analysis. Tables and figures should be specifically identified and described with respect to their content and the sources for the data to be used in each table. The production of blank tables with titles, labels and footnotes might be an efficient way to ensure that the descriptions provided are sufficiently complete with respect to the intent of this contract.
4. An outline of the impact analysis section(s) plus text explaining the analytical approach that will be used - The analytical text for each impact section should be the same as that which would be expected to appear in the completed analytical package but should stop short of assessing the impacts of the various alternatives and providing a comparison of results. Appendices should be specified, outlined and annotated with analytical approaches, as appropriate. Direct indirect and cumulative impacts should be explicitly addressed. Each impact section should
    a. identify potential impacts,
    b. identify criteria to be used in assessing each type of impact,
    c. explain mechanisms of action that relate the proposed regulatory action to the impact and criteria,
    d. specify the quantitative approach and metrics or qualitative approach for evaluating effect of the proposed action on the impact criteria,
    e. identify impact thresholds (if already specified in policy documents),
    f. detail the methods, models and data sets to be used in the analysis, and
    g. provide background information and documentation explaining and substantiating the recommended analytical approach, including references.

    In particular, the impacts considered should take into account concerns referenced during the scoping process. The impact analysis will not only need to address the tradeoffs between the major alternatives but also evaluate specific design features of the IFQ program. For example, the differences between using a 1998-2003 or a 1994-2003 qualifying period for the initial allocation of IFQ. Design options considered during scoping but not included as part of the IFQ program alternatives will also need to be covered in the analysis. This coverage should be such that one of the non-included features could be incorporated as part of the final Council action and the likely effects of such incorporation readily understood by the Council. A complete list of these design features can be found in Appendix B to the scoping document, available from the Council office.

5. An annotated outline for a section covering consistency with the groundfish FMP, goals and objectives for the current action, Magnuson Stevens Fishery Conservation and Management Act (MSA) national standards, and other applicable MSA provisions (such as Section 303(b)(6)). The annotated outline should indicate the information that will be used to assess performance with respect to these standards and criteria and its location in the impact analysis section.
6. An annotated outline for a section covering cross cutting mandates (see example outline in the appendix to this RFP for a listing of mandates). The annotated outline should indicate the information that will be used to assess performance of the alternatives with respect to criteria in cross cutting mandates and its location in the impact analysis section.
7. A list of preparers.
8. A list of references.

The description of data sets should include a description of the fields to be included in the data sets, the level of aggregation, the scope of the data, and the source. An example description is as follows: a set of landings data including vessel identifier, species landed, weight and revenue; aggregated at the daily level; for nontribal trawl vessel groundfish landings taken with groundfish trawl gear under jurisdiction of the Council; and acquired from the PacFIN data system. The first phase, and this contract, do not cover the acquisition of data, except to the extent that the contractor may need to acquire some data to assess its utility for the proposed purposes.

The document transmitted to the Council is to be in Microsoft Word format with Microsoft Excel spreadsheets, as needed.

The work product resulting from the first phase should be sufficient to

1. ensure that when the analytical package is completed, if the outline and analytical framework/approach have been followed, all relevant impacts will have been addressed in a manner that meets Federal requirements pertaining to the analysis of regulatory proposals;
2. efficiently convey important results and allow reviewers to easily locate information central to the requirements of all relevant legislation, executive orders and guidelines.
3. provide analysts with substantial specific guidance on the approaches to be used and work to be done to complete each section of the impact analysis;

4. ensure that analysts working on different sections of the final document use consistent assumptions;
5. ensure that analysts working on different sections consider impacts across a consistent scope (e.g. time, entities, areas);
6. ensure that analysts do not duplicate efforts and that individual work products meet multiple needs; and
7. ensure that analysts are using consistent terminology (e.g., minimize the number of terms used for IFQs/ITQs/TIQs/IQs/Quota-Shares/Shares and standardize their usage.)

Proposals submitted should cover only those tasks covered under the first phase of this project as indicated in Section 2.1. After the first phase is complete, a separate process will be initiated to complete drafting of the analytical package.

Those submitting proposals should review and take into account initial analysis already conducted as part of the scoping process. This analysis is available on request from the Council office.

Section 2.2 Tasks to Be Completed

Dates provided are initial targets and subject to negotiation. The contractor proposal should specify a realistic set of dates given the contractors capabilities and other time commitments. To ensure the work product is efficiently developed and achieves its intended purpose, the contractor must work closely with Council staff.

1. Develop a draft document that includes introductory chapters, a detailed outline, and an analytical framework/approach (as described in Section 2.1) for a document meeting all analytical requirements from NEPA (including the contents and format requirements specified in 40 CFR 1502), the MSA, and other applicable laws and executive orders (analytical package). Provide the initial outline and early drafts of example annotated impact sections to Council staff for review and comment.

2. Present the draft document to a workshop attended by approximately 30 to 50 scientists/analysts, managers, industry representatives, and members of the public (travel expenses of selected participants, except those employed by contractor to be paid by Council). The draft document should be distributed to participants at least two weeks in advance of the meeting. Establish dates for the workshop in coordination with workshop attendees and announce the date no later than two months in advance of the workshop. Provide facilitators and rapporteurs for the workshop and organize the workshop as needed to cover the tasks within the time planned for the workshop (approximately 3 days but adjusted as necessary based on contractors proposal).

3. Provide complete documentation of all comments received pertaining to issues to be covered in the analysis and methods to be used. Within the document, include

methods proposed during the workshop or in other forums but not recommended for use in the analysis and provide the rationale for the recommendations.

4. Provide progress reports and updates to the Council office on at least a monthly basis.

5. Present a revised draft document at the March 2006 Council meeting for review by the Council and its advisory bodies (draft document due at the Council office by February 15, 2006 for the March Council meeting).

6. Modify the document in response to comments received at the Council meeting and provide a finished document to the Council by April 10, 2006.

Section 3: Instructions, Conditions, and Notices to Contract Bidders

3.1 Basis of Contract Award

The contract will be awarded based on the following criteria.

1. Costs
2. Experience and training of those who will work on the project.
3. Past performance, previous experience and expertise in development of analytical packages for regulatory actions, including environmental impact statements, regulatory impact reviews, regulatory flexibility analyses and MSA required analyses.
4. Previous experience and knowledge of West Coast fisheries and the West Coast Federal regulatory environment.
5. Proposed processes, soundness of the approach for development of the work product, likelihood of providing a document of the quality and thoroughness requested, and likelihood of meeting the deadlines presented in the proposal.

Bidders should carefully follow the instructions below in the section "Information Requested from Contract Bidders"

3.2 Information Requested from Contract Bidders

Each contract bidder is asked to include at least the following in their proposal:

1. A list of qualifications of each person who will manage or work on the project.
2. A brief statement of previous experience the firm has had in developing analytical packages for proposed regulatory actions; experience in the West Coast groundfish regulatory environment; and experience with developing analyses for fisheries managed under the MSA.
3. A list of all other fisheries related projects the bidder has worked on during the past ten years.
4. The proposed approach, organization and timeline for developing the specified work product.
5. The duration, approximate timing, design and staffing proposed for the workshop specified in Task 2 of Section 2.2.
6. Total costs and a detailed breakdown

To assist in evaluation, proposals should be submitted in a document with the following organization.

A. **Proposal Narrative**

1. Table of Contents
2. List of Tables and Figures, if applicable
3. Short Introduction and Summary
4. Discussion of Processes and Approaches to be Used in Developing the Work Product
5. Program Organization, Including Project Management And Organization Of Personnel Working On The Project
6. Proposed Schedule
7. Contractor Experience and Personnel Qualifications, Including Subcontractors
8. Supporting Data or Other Information

B. **Budget**

1. General Cost Proposal
2. Cost Breakdown Including Projected Hours and Personnel Costs for Each Employee and Subcontractor to be Involved on the Project, Travel, And Other Costs Such as Indirect Costs and Overhead

3.3 Level of Funding

Not to exceed $200,000 for this contract. Additional funding is expected for the second phase of developing the analytical package (not covered under this contract).

3.4 Submission Instructions

Submissions will be considered confidential. All information must be submitted via paper media or email. Email submissions are preferred. Proposals may not be submitted by FAX. The bidder is responsible for confirming that the Council has received the proposal by the deadline.

All paper media proposals should be submitted to

Pacific Fishery Management Council
ATTN: JIM SEGER
7700 Ambassador Place NE
Portland OR, 97220
503-820-2280

Proposals as well as written questions can also be sent via e-mail to pfmc.comments@pcouncil.org. All e-mail correspondence related to this RFP should have a subject line line of “RFP for Analysis of Trawl Individual Quotas”

Appendix

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July 2005 Information Sheet

INSERT WHEN COMPLETED (18 PAGES)

Chapters 1 and 2 from Scoping Results Summary

The following scoping results summary provides background information on the proposals the Council will be considering. Additional analysis already developed by the Ad Hoc Trawl Individual Quota Analytical Team is available from the Council website.

INSERT WHEN COMPLETED

Example Outline from the 2005-2006 Annual Specifications Analytical Package

The following is an example outline provided for contract bidders. The document developed by the contractor need not follow this outline but should, at a minimum, include the main elements listed. Greater detail is expected in the outline to be provided by contractors. For example, breakouts may be needed for separate treatment of impacts to vessels owners, crew, permit owners, suppliers, families etc.

Organization of the final outline should be driven by efficiency considerations both in terms of the development of the material and the conveyance of information to the reader. The document outline and text developed should allow reviewers to easily locate information central to the requirements of all relevant legislation, executive orders and guidelines.

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Example Text for Impact Sections

The following example text is drawn from the 2005-2006 annual specifications EIS. It is intended to provide a general indication of the type of material that is expected under the contract, with respect to impact evaluation. **However, it is not as detailed as is requested in the RFP.** Each impact section should

a. identify potential impacts,
b. identify criteria to be used in assessing each type of impact,
c. explain mechanisms of action that relate the proposed regulatory action to the impact and criteria,
d. specify the quantitative approach and metrics or qualitative approach for evaluating effect of the proposed action on the impact criteria,
e. identify impact thresholds (if already specified in policy documents),
f. detail the methods, models and data sets to be used in the analysis, and
g. provide background information and documentation explaining and substantiating the recommended analytical approach, including references.

See Section 2.1 of the RFP for additional information on what is expected in the requested document.

4.5 Socioeconomic Impacts

A screening for potentially significant socioeconomic impacts was conducted. Section 1.4.4.5 provides a summary of the main issues that are the subject of the socioeconomic impact analysis.

4.5.1 West Coast Groundfish Fishery - All Sectors

This section includes analysis of management measures affecting all sectors. The sectors benefitting from the resource can be placed into three groups: consumptive users (e.g. recreational fishers, commercial harvesters and processors), nonconsumptive users (e.g. divers interested in viewing wildlife), 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). Subsequent sections of the analysis address in more depth the impacts of the management alternatives on each sector.

4.5.1.1 Criteria Used to Evaluate Impacts

This section addresses two issues that cut across all sectors. The first is the overall level of harvest mortality planned for the 2004 fishery (total OY levels). The second is how the resource benefits will be divided up among sectors (allocations).

Total OY Levels

In this analysis the short- and long-term economic effects of harvest policy decisions are assessed. These harvest policy decisions determine the level at which ABCs and OYs are set. The harvest policy issues before the Council for the 2004 fishery primarily involve stocks with new assessments. The issues include questions of whether to adopt the new assessment in place of the previous assessment, the assumptions to use in the assessment, and for some overfished stocks, the level at which the rebuilding probability should be set. For most species for which a

change in the OY is being considered, there are a range of options being considered. For the following species the range of OY options is not related directly to trade-offs between long- and short- term biomass and harvest opportunities: canary rockfish, Pacific whiting, lingcod, shortspine thornyheads, and yelloweye rockfish. For canary rockfish the range of OYs in the EIS is based on a recreational commercial allocation issue, greater proportions of harvest allocated to the commercial fishery require lower OYs to maintain the same long-term effects on biomass. For Pacific whiting the range of OYs is intended to include the range of possible OYs that may come from a stock assessment that has yet to be produced. For lingcod, shortspine thornyheads and yelloweye, the changes in OY from status quo reflect expected growth of the stock between years and continuation of the status quo harvest policies used for the 2003 fishery.
With respect to the harvest policy issues for the 2004 fishery, the trade-off between production in the current year and probable levels of harvest in future years will be examined. While, one year's harvest will not usually have a significant impact over the long-term, the current year's harvest is generally set in the context of a harvest policy decision that is likely to be implemented over a longer term. The choice of an OY option affects current year harvests and is a strong indicator of the harvest policy that will guide the selection of OYs over the long-term. The long-term effects are generally considered "cumulative effects" and would be considered in Section 4.5.1.3, however, because of their close tie to the immediate direct and indirect impacts, they will be considered in detail in Section 4.5.1.2 on direct and indirect effects.

In economic terms from a societal point of view, the choice between alternative harvest policies generally entails a fundamental tradeoff between current versus future costs and benefits. The individuals point of view may vary from the societal view. For some of the individuals benefitting from harvest, the time horizon of concern may extend only to the point at which they expect to stop relying on fishery harvest. If these individuals expect to participate in the fishery for only a relatively short time, they may not experience the future harvest reductions that would be the consequence of excessive harvest in the near term. On the other hand, many if not most of those who benefit from current harvest also value the resource as something to bequeath to future participants in the fishery and to the benefit of the general public. There are also those who derive benefit from not harvesting the resource. The view of these individuals also varies from the societal view as for them there is no trade-off: lower harvest levels bring higher present biomass levels and result in larger future biomass levels as well. All of these different types of views, in aggregate, comprise the societal point of view with respect to economic effects.

For the discussion of short-term effects of the OY options, net social benefits are the primary type of impact evaluated using rough indicators that summarize relative differences between OY levels of the management alternatives. Other relevant types of socioeconomic impacts listed in Table 1.4.4-1 will be covered in the sections on each sector. The following is a summary of the indicators of net benefits that will be used in the analysis of total OY levels. The indicators are divided into those which will be used to look at the cumulative effects of the individual species OY decisions when taken together and those used to assess the effect of the decision on they OY for each species separately.

Indicators of Net-benefit	Management Alternatives (All Low OYs together, All *Med OY*s together, etc.)	Individual Species
	Short-term	
Commercial &Tribal	Total Revenue	OY for the sector. Indicator of whether the species is a constraint on harvest of the complex.
Recreational	Number of Groundfish Trips (Quality indicators: Change in Harvest, Change in Restrictions)	OY for the sector (quality indicator)

Non-consumptive Use	Total Biomass Removed Under OYs	Total Biomass Removed Under OY
	Long-term	
Harvesters and Non-consumptive Use	Qualitative discussion of effects on biomass and harvest for groundfish fishery in aggregate (reference to biological impacts)	Where available from stock assessments, quantitative information on the effects of erroneous assumptions on future biomass and harvest.

The analysis provides only an approximate indicator of the effects of the OY decisions on net benefits for two reasons. First, the indicators do not capture all of the factors necessary to calculate net benefits. For example, a complete calculation of net benefits needs to include an assessment of costs. The reasons for the shortcomings in the indicators used for analysis will be discussed in sections on each sector. Second, the analysis of the alternatives does not isolate the effects of the OY decisions from the effects of other management decisions. Due to the large number of management measures that vary between alternatives, it is not practicable to compare every permutation. For example, there are 1,296 potential combinations of OY and allocation options (more if combinations are considered that would use the high OY for one species and the medium or *Low OY* for another species). Consideration was given to omitting the summary indicators for management alternatives from this portion of the analysis and providing only a qualitative analysis of the OY options, however, we believe the summary values of the management alternatives provide useful information regarding the general direction and magnitude of differences between the OY options (the management "alternatives" include both the OYs and the management measures to achieve them, as distinct from the OY "options," which refers only to the OY levels and not the management measures used to achieve the OY levels).

Short-term Impacts

Short-term socioeconomic impacts arising from the choice of harvest mortality level (OY) for the current year are evaluated for the fishery in aggregate and for each sector. The evaluation of fishery wide effects is provided in this section and the sector specific effects are covered in the sections on each sector (Sections 4.5.2 through 4.5.7).

For consumptive-use sectors, the best available proxies for net social benefits of harvest are estimates of total expected revenue for the commercial fishery and number of recreational trips for the recreational fishery. Explanation of factors limiting our ability to provide a quantitative assessment of net social benefits is provided in sections on each sector. Also provided in those sections are further discussions that qualitatively, and in some cases quantitatively, elucidate changes in net benefits related to each sector under the alternatives.

For the commercial fishery, an estimate of total revenue is provided for each management alternative. Additional indicators are provided on the choice of individual species OYs including: change in the OY for the commercial sector, whether or not the species is expected to be a major constraint on harvest of the groundfish complexes, 2002 exvessel value for the species, 2002 exvessel value for the complexes in main depth strata in which the species is taken, exvessel value for the 2004 OY based on 2002 prices and assuming the total commercial OY is landed. The indicators of whether or not the species is a constraint on harvest and the ratio of the value of the OY species to the aggregate value of the complexes in the depth strata in which the species is taken provide a sense of how marginal changes in the OY for that species might affect the aggregate result for the management alternative. One precaution in interpreting the ratio of the OY species to the harvest for the depth strata is that the depth strata may have complexes that can be targeted and managed separately that include the species of interest to greater and lesser degrees. This ability to regulate the complexes might allow reductions to be achieved with less effect on the harvest for the depth strata than would be implied by the aggregate ratio. Additionally, applying a ratio to evaluate a marginal effect presumes that the species is a constraint on harvest and that there is not a means of reducing impacts without reducing harvest of the complex. Reducing the OY for a species may have no effect on harvest of the complex if the species in question is not a binding constraint, i.e. total harvest of the complex is constrained by the need to conserve some other species in the complex. While the initial indication in this analysis may be that a species is not a binding constraint on harvest at a particular OY level, it may become a constraint as the OY is incrementally reduced; or a species that is constraining may become nonconstraining as the OY is increased. Further, a nonconstraining species may become a constraint as the OYs for other species are increased, and a constraining species may become nonconstraining as the OYs for other species are reduced. If there is a means of reducing impacts on a species other than reducing harvest of a complex (such as an area closure), operating costs would likely increase, while revenue from the complex remains stable with the exception of a decline in revenue from the species being conserved.

For the recreational fishery, estimates of changes in the number of trips are provided for each management alternative. However, the more significant effect may be changes in the quality and value of the individual trip as management measures, such as bag limits, become more or less restrictive. For the analysis of the effect of individual species OYs on recreational fishing, 2002 trips taking groundfish in the depth strata in which the species of interest occurs will be used as an indicator of the breadth of effect of any change in quality of the trips resulting from a change in trip restrictions. Change in the OY allocated to the recreational fishery will be used to indicate the amount of change in recreational harvest required. This change will have to be achieved either through a change in the number or quality of trips. A third indicator shows how regulations will achieve the desired change in catch. A change achieved primarily through a closure reduces effort in an area while changes in harvest that are achieved through trip catch limits affect the quality of trips. In the former case, trips are not necessarily eliminated, but rather the timing or location of the trips may change, changing their quality. In the latter case, the change in trip quality may also affect effort, however, the degree of effort changes in response to changes in restrictions of this nature are uncertain and generally not part of the preseason management modeling used to assess the effect of the regulation on total harvest. Additional information on the effect of regulations on effort and trip quality is provided in Section 4.5.4.

Non-consumptive use sectors and nonuse sectors both derive greater benefit when harvest is forgone in favor of increasing biomass. Absent the data necessary to produce dollar estimates for non-consumptive values, change in total biomass provides proxy information on the relative differences in nonuse values between the alternatives. With respect to the short term, the differences in OY between the options reflect the differences in the amounts of biomass that would be left, with lower OYs leaving greater total biomass in the ocean (in the very short term). Based on the concept that marginal utility diminishes with each additional unit of a good acquired, for most nonconsumptive users the importance of the additional biomass left in the oceans diminishes as total biomass increases. Thus, ideally it would be useful to put the proposed removal in the context of the amount of biomass presently in the ocean. However, each option is based on a different set of modeling assumptions and each set of modeling assumptions implies a different current biomass. If it were known that the *High OY* alternative assumptions were correct, nonconsumptive users might be as happy with the *High OY* alternative as they would be if the *Low OY* alternative were proposed and it was known that the *Low OY* alternative assumptions were correct. Some clarity can be gained from this complex situation by evaluating the outcomes from the point of view that there is one real biomass and one real level of stock productivity, both of which are unknown. Thus for any of the OYs we are not absolutely certain of the proportion of the total stock removed or, after taking into account growth, whether total biomass over the short term will increase or decrease as a result of the removal. The more significant effect on biomass is long-term in nature, related to the application of a harvest policy over a number of fishing years. The effect is related to the probability and size of negative outcomes that may result from managing under a false set of harvest assumptions. This risk to biomass is discussed under the section on long-term impacts. Additional information on nonconsumptive use values is provided in Section 4.5.7.

Long-term Impacts

In general, those assumptions that result in higher OYs in the present entail a higher risk that future biomass, and hence harvests, will be at lower than optimum levels. Lower OYs entail a risk that current harvests will be at lower than optimum levels. If frequency distributions of possible future harvest outcomes were available, the proper calculation of the costs of increased risk to future production resulting from higher harvests in the present would be to multiply the change in the potential net value of harvest for the future period by the probability of that outcome occurring. While the probability of the adverse outcomes are generally not available, for some stocks information is provided that indicates the degree of adverse effect from making the wrong assumption. That adverse effect is expressed as a change in biomass. The adverse effect would extend over a number of years as future harvests would have to be reduced to rebuild the stock. The differences between the options in the biomass resulting from erroneous assumptions will be used as a proxy indicator of the potential adverse economic impact.

Ideally, the differences in biomass would be translated into a difference in OY and a difference in net revenue in the commercial fishery or a difference in number of trips and experience value in the recreational fishery. In the commercial fishery, the change in value for the individual species would be expanded to adjust for changes in opportunities within the complex in which the individual species is taken, under the assumption that if harvest of the species is not allowed, harvest of the complex would likely be diminished or the cost of harvest increased by measures imposed to reduce incidental catch of the species. The ratio of the exvessel value of the complex to the exvessel value of the single species, as provided in the analysis of short term impacts, provides a rough multiplier that translates the single species economic effect into an effect for the complex (assuming proportional changes in costs and revenues and other caveats provided in the description under short-term impacts). If the time at which future changes in harvest might occur could be taken into account, a discount rate would be applied to determine the present value of the change. The present value of a future harvest is generally viewed to be lower than the same harvest taken in the present. For example, losing $100 of net profit 5 years from now would be viewed as the equivalent of losing $78 today (applying a 5% discount rate). In cases where the negative outcome of a wrong assumption is minor, a more risk prone stance may be warranted if there would be sufficient compensation from current production. On the other hand, where the negative outcome of a wrong assumption is substantial, a more risk averse stance may be warranted.

An attempt is made here to use biomass as an indicator of long-term risk and costs associated with harvest policy decisions. Numerous factors make quantification of socioeconomic impacts difficult over the long term, as follows. Estimates of stock biomasses and therefore OYs are not stable from one year to the next and, given ecological principles, there is likely to be some inverse correlation in the natural variation of biomass among the various species that make up the groundfish complex. Thus, the species constraining harvest of a multispecies complex is likely to change over time. Additionally, a changing socioeconomic environment is likely to change allocation decisions across time. Finally, the needed models have not been developed to relate harvest policies in a multispecies fishery to specific estimates of future harvest levels permissible for the complex as a whole.

In assessing the risk of adverse outcomes, the dynamics of the decision system need to be kept in mind. Overtime, bad assumptions in stock assessments that result in overharvest should result in lower than projected estimates of biomass in future stock assessments (barring the intervention of other factors such as trends in ocean productivity). If detected soon enough, corrective actions may be taken such that the adverse effect of the erroneous assumption is reduced in duration by an adjustment based on the actual response of the stock to the harvest policy. Under Amendment 16-1, for stocks under rebuilding plans, there are mandatory assessments of rebuilding progress with each new stock assessment.

Allocations

Decisions on how to allocate harvest among sectors have implications for net social benefits, business profits, distribution of benefits and costs, impacts on adjacent fisheries, fairness and equity, income and employment. There are also indirect affects on public health and safety. The distribution of costs and benefits among sectors will be addressed as reflected by the distribution of OY. Social costs and benefits for each sector, profits, impacts on adjacent fisheries, and impacts on public health and safety of each alternative will be addressed in the analysis for each sector. Effects on income and employment will be addressed in the section on communities.

Exvessel value and recreational trips are used as summary indicators of the net social benefits for each management alternative. These indicators provide an overview of the result from the interaction of allocation, OY and other management measure decisions. For the OY decision, biomass was also relevant to the assessment of net social benefits. However, with the exception of canary rockfish, the total harvest will not generally vary with the allocation decision. Therefore, the long-term impact on biomass resulting from the allocation decision is minimal.[1/]

Historic and proposed distribution of harvest among sectors is provided on the individual species allocation decisions to help assess social costs that are not well captured by the fishery wide exvessel value and total recreational trip proxies: (1) disruption and dislocation costs, (2) fairness and equity, (3) compliance, and (4) conservation behavior.

The following is a summary of the indicators for these social costs. Additional descriptive information on the indicators is provided in the subsequent text. The Council final action created a specific allocation only for black rockfish. Therefore a detailed assessment is provided only for that species.

	Indicators of Social Costs
Disruption and Dislocation Costs	Changes in species related economic activity (trips and exvessel revenue) and OY relative to past OY levels
Fairness and Equity	Decision basis and reasonableness (limited objective standards)
Compliance Behavior	Perceptions of fairness and equity

1/ However, there may be secondary effects of allocational decisions that do have a long-term affect on biomass levels. One example may be the differences among the gear types in their impacts on habitat and consequently on productivity of the ocean environment. Habitat impacts are discussed in Section 4.1.

Conservation Behavior	Imposition of penalties or rewards from previous conservation actions.

Disruption and Dislocation

Costs associated with disruption and dislocation are part of change, a necessary element of maintaining an efficient economy. However, where change is needed, attention should be given to the attendant disruption and dislocation costs. These adjustment costs need to be balanced with the expected costs and benefits of the post change activities. If it is possible to achieve the same end result with less disruption and dislocation (lower adjustment costs), social benefits are likely to be greater. On the other hand, there may be circumstances where greater disruption and dislocation speeds or enhances the achievement of benefits or results in greater benefits, such that there is sufficient compensation to cover the greater adjustment costs.

The groundfish FMP management objective 14 states:

> 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 environment.

The degree of change of harvest, as compared to *No Action*, provides an indicator of the relative magnitude of disruption and dislocation costs for each sector. Over the short-term, very small reductions in harvest can sometimes be absorbed as reductions in income for owners and workers in the fishery and industry related businesses and communities (workers and capital become underemployed and the rate of investment is reduced).[2/] Larger changes in harvest will likely result in some firms laying off employees or going out of business (workers and capital become unemployed). When unemployment occurs there is greater economic and social disruption as costs are incurred in the adjustments necessary to enter other employment.

Disruptive impacts of the management alternatives will be evaluated based on aggregate changes in harvest, changes in exvessel revenue and changes in recreational trips for the affected groups. Each management alternative is based on a unique combination of OY level and allocation schedule. Aggregate results for the groundfish fishery provide information on the combined effects of the management measures.

The relative magnitude of disruptive impacts with respect to individual species allocation decisions will be represented by changes in the magnitude of harvest allocated to the sector. For the OY/allocation options around which each alternative is structured, distribution of harvest among sectors and major management areas is provided in comparison to actual harvests for the species to be allocated (black rockfish, bocaccio, canary rockfish, lingcod, widow rockfish and yelloweye rockfish) for 1998 and 2002 and expected harvests for 2003.

In order to illustrate the full range of possible harvest constraints for individual sectors or geographic areas, each allocation option is applied to each species OY. This range is provided only for the individual species that are the subject of the allocation options. The resources are not available to produce, analyze and summarize quantitative economic information on the multispecies fishery for multiple combinations of OY and allocation schemes within the time

2/ Lack of alternative employment or consideration of adjustment costs keep workers and capital from moving to another productive activity.

frame required for the Council and NMFS decisions on the 2004 groundfish fishery. Therefore, the broader effects on exvessel value and recreational trips supported by the groundfish complex are not provided. A rough indicator of the effect of each OY/allocation combination on exvessel revenue or recreational trips can be inferred by referencing the proportional difference between the allocation level for the OY/allocation scheme in question, as compared to that for the management alternative with the most similar allocation level. If the species in question is a constraint on management (see Section 2.1) then this proportional difference can be applied to the exvessel value or recreational trips modeled for the sector in question to roughly infer a hypothesis on the effect of the OY/allocation scheme on exvessel revenue or recreational trips. If the species is not a constraint on management, then there is not likely to be a substantial effect on the sector being considered with respect to the change in allocation level. If the species is not a constraint on a particular sector under a management alternative but would become a constraint under the OY/allocation scheme in question or *visa versa*, a rough estimate cannot be inferred and additional analysis will be required to develop an estimate of the economic effect.

The value of the individual species to a sector should be put in context of the broader fishery. For the commercial sector, exvessel value is provided for the individual species and the other species in the depth strata in which the species of concern is harvested. The opportunity to harvest an individual species may be of value for the direct amount the fish can be sold as well as for the opportunity it provides to harvest other species in a fishery complex. For the recreational fishery, the number of trips with groundfish catch, by depth strata, is used as an indicator of the number of trips potentially harvesting a recreational species. The stringency of recreational management measures designed to reduce harvest mortality for a particular species also affects the value of the recreational experience. Absent an ability to relate a change in trip value to a change in management measures, the management measures themselves will have to serve as the primary indicator of the relative quality of trips under the different management alternatives (see Section 4.5.4 for additional discussion).

Fairness and Equity

Executive Order 12866 (*Regulatory Impact Review*) includes equity as a factor to be included in cost-benefit analyses. National Standard 4 dictates that allocations be made in a fair and equitable manner. Because of the wide-ranging views in our society about what constitutes equitable allocation, there are not generally accepted standards against which an objective analysis can conclude that one allocation decision is more fair and equitable, or of greater social value, than another. There are no widely accepted measuring sticks for equity similar to those for evaluating such factors as economic efficiency. Therefore, analysis is necessarily limited to pointing out the major decision that would likely affect the perceived fairness and equity of proposed allocations and the rationale for those decisions. It will be up to each individual involved in the process to evaluate for him or herself whether the recommended allocation are, or would be, evaluated by the general public to be, on the whole, fair and equitable.

Compliance

Perception of fairness and equity has implications for the costs of management through its impact on incentives for compliance. In general, systems that are broadly perceived to be unfair or inequitable are more likely to result in noncompliance. As such, enforcement costs will be increased.

Conservation Incentives

Impacts of allocation on incentives for precautionary conservation action was one of the issues raised during scoping. Allocations based on historic catch during a period in which harvest was voluntarily reduced may reduce future incentive for voluntary conservation actions. The disincentive for individual, sector or state agencies to voluntarily reduce harvest mortality will introduce an increased element of risk into the management system. The cost associated with that risk can be measured as the amount one would be willing to pay in the present to avoid the increased possibility of a negative outcome in the future.

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4.5.2 Commercial Fleets (Non-Tribal)

4.5.2.1 Criteria Used to Evaluate Impacts

Changes in exvessel revenue will be used as an indicator of the directions of change expected in net economic benefits derived from harvest by the commercial seafood vessels. Subgroups of the groundfish fleet will be examined to determine if any particular group is experiencing greater effects than others. The primary divisions will be between the limited entry trawl, limited entry fixed gear and open access fishery. The open access fishery will be divided between those vessels deriving more than 5% of their gross income from groundfish (vessels which may be more likely to engage in directed groundfish fishing) and those deriving less than 5% of their gross income from groundfish (vessels more likely to be taking groundfish incidental to other fishing activities.

A more accurate quantitative assessment of changes in exvessel revenue would require the inclusion of an assessment of the changes in fishing costs. Comprehensive information on fishing costs for the West Coast groundfish fishery is not available. There is some cost information available from surveys and studies on some segments of the fleet, however, this information is not comprehensive and has not been turned into a model that can be used to appraise effects of changes in harvest regulations on net fishing revenue. Additionally, estimates of net fishing revenue would need to be adjusted with appropriate shadow prices (the real cost after taking into account all opportunity costs) in order to use the results to generate estimates of social net economic benefits). For example, expenditures on harvest, such as the cost of labor, do not count as an economic opportunity cost if the labor would otherwise be unemployed. Additionally, if the labor would have been employed but at a lower earnings rate, then the difference between the earnings in the fishery and next best alternative employment would not be counted as a cost (i.e., only the next best wage rate would be counted as a cost). The cost of an existing vessel is another cost to the firm that would not be considered a cost from the national viewpoint of a social net benefit analysis. If firms cannot make a profit given the capital costs of an existing vessel, the vessel will tend to be resold at lower prices until the vessel price is low enough to make its operation economically viable. The vessel is likely to stay active so long as revenue is sufficient to cover the operation and maintenance costs of the vessel.) If profits in the fishery are such that a vessel is likely to be replaced if lost, the cost of the vessel would become a consideration in a long-term analysis.

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 cumulative impact section will discuss the effects of the recently implemented VMS system, the possible expansion of that system, and the possible implementation of trawl permit buyback and ITQ programs. These regulatory changes will be discussed in terms of their likely effects on vessel revenue and operational costs.

Changes in revenue will be used as an indicator of the magnitude of likely harvest pressure that may be brought to bear on adjacent fisheries as a result of reduction in opportunity in the groundfish fishery.

United States General Accounting Office

GAO

Report to Congressional Requesters

February 2004

INDIVIDUAL FISHING QUOTAS

Methods for Community Protection and New Entry Require Periodic Evaluation

G A O

Accountability * Integrity * Reliability

GAO-04-277

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Accountability•Integrity•Reliability

Highlights

Highlights of GAO-04-277, a report to congressional requesters

INDIVIDUAL FISHING QUOTAS

`Agenda Item H.11.a
Attachment 4
November 2005

Methods for Community Protection and New Entry Require Periodic Evaluation

Why GAO Did This Study

To assist in deliberations on individual fishing quota (IFQ) programs, GAO determined (1) the methods available for protecting the economic viability of fishing communities and facilitating new entry into IFQ fisheries, (2) the key issues faced by fishery managers in protecting communities and facilitating new entry, and (3) the comparative advantages and disadvantages of the IFQ system and the fishery cooperative approach.

What GAO Recommends

GAO recommends that the Director of the National Marine Fisheries Service (NMFS) ensure that regional fishery management councils that are designing community protection and new entry methods for new or existing IFQ programs

- Develop clearly defined and measurable community protection and new entry objectives.
- Build performance measures into the design of the IFQ program.
- Monitor progress in meeting the community protection and new entry objectives.

www.gao.gov/cgi-bin/getrpt?GAO-04-277.

To view the full product, including the scope and methodology, click on the link above. For more information, contact Anu Mittal at (202) 512-3841 or mittala@gao.gov.

What GAO Found

Several methods are available for protecting the economic viability of fishing communities and facilitating new entry into IFQ fisheries. The easiest and most direct way to help protect communities under an IFQ program is to allow the communities themselves to hold quota. Fishery managers can also help communities by adopting rules aimed at protecting certain groups of fishery participants. Methods for facilitating new entry principally fall into three categories: (1) adopting transfer rules on selling or leasing quota that help make quota more available and affordable to new entrants; (2) setting aside quota for new entrants; and (3) providing economic assistance, such as loans and subsidies, to new entrants.

In considering methods to protect communities and facilitate new entry into IFQ fisheries, fishery managers face issues of efficiency and fairness, as well as design and implementation. Community protection and new entry methods are designed to achieve social objectives, but realizing these objectives may undermine economic efficiency and raise questions of equity. For example, allowing communities to hold quota may result in a loss of economic efficiency because communities may not have the knowledge and skills to manage the quota effectively. Similarly, rules to protect communities or facilitate new entry may appear to favor one group of fishermen over another. Furthermore, community protection and new entry methods raise a number of design and implementation challenges. For example, according to fishery experts, defining a community can be challenging because communities can be defined in geographic and nongeographic ways. Similarly, loans or grants may help provide new entrants with the capital needed to purchase quota, but they may also contribute to further quota price increases. Given the various issues that fishery managers face in developing community protection and new entry methods, it is unlikely that any single method can protect every type of fishing community or facilitate new entry into every IFQ fishery. Deciding which method(s) to use is made more challenging because fishery managers have not conducted comprehensive evaluations of how IFQ programs protect communities or facilitate new entry.

In comparing the key features of IFQ programs and U.S. fishery cooperatives, we found that each approach has advantages and disadvantages in terms of regulatory and management framework, number of participants, quota allocation and transfer, and monitoring and enforcement. Specifically, in terms of regulatory and management framework, IFQ programs have greater stability than cooperatives because they are established by federal regulations, while cooperatives are voluntary contractual arrangements. In terms of quota allocation and transfer, IFQ programs are open in that they allow the transfer of quota to new entrants, whereas cooperatives are exclusive by contractual arrangement among members. In terms of monitoring and enforcement, IFQ programs are viewed as being more difficult to administer, because NMFS must monitor individual participants, while cooperatives are viewed to be simpler for NMFS to administer, because NMFS monitors only one entity—the cooperative. For some fisheries, a combined approach may be beneficial. For example, a cooperative of IFQ quota holders can combine an IFQ program's stability with a cooperative's collaboration to help manage the fishery.

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Abbreviations

IFQ	individual fishing quota
ITQ	individual transferable quota
IVQ	individual vessel quota
NMFS	National Marine Fisheries Service
NOAA	National Oceanic and Atmospheric Administration
TAC	total allowable catch

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Accountability * Integrity * Reliability

United States General Accounting Office
Washington, DC 20548

February 24, 2004

The Honorable Olympia J. Snowe
Chairman
The Honorable John F. Kerry
Ranking Minority Member
Subcommittee on Oceans, Fisheries, and Coast Guard
Committee on Commerce, Science, and Transportation
United States Senate

Commercial fishing and fishing-related businesses contributed about $28 billion to the U.S. gross national product in 2002. However, these businesses are at risk of decline because about one-third of the U.S. fish stocks assessed by the National Marine Fisheries Service (NMFS) are overfished or approaching overfished conditions. The United States is not alone in facing this problem. According to the United Nation's Food and Agriculture Organization, about 28 percent of the world's major fish stocks are reported as overexploited, depleted, or recovering from depletion. Another 47 percent are fully exploited and are producing catches that have reached, or are very close to, their maximum sustainable limits. Greater competition for fewer fish increases the likelihood that stocks will decline further and catches will decrease. If a fishery—composed of one or more fish stocks in a geographic area—cannot be sustained, the marine ecosystem could be transformed, thus threatening the livelihood of fishermen and the way of life in many communities.

Concerns about the condition of the world's fisheries have led to a search for new management tools to maintain fisheries at sustainable levels. One such tool is the individual fishing quota (IFQ), which has been used worldwide since the late 1970s. Today, several nations, including the United States, use IFQ programs to manage fisheries within their 200-mile exclusive economic zone, where foreign vessels are generally prohibited from fishing. Usually, these programs are established by law. The primary goals of an IFQ program are to conserve the resource and reduce fishing capacity (e.g., the number and size of boats). Under an IFQ program, fishery managers set a total allowable catch (TAC) and allocate quota—the right or privilege to fish a certain portion of the TAC—to eligible vessels, fishermen, or other recipients. IFQ programs often allow a quota holder to transfer quota by sale, lease, or other methods.[1] Such transfers are expected to reduce the number of fishermen and vessels and consolidate the quota among the more efficient fishermen. In the United States, the Magnuson-Stevens Fishery Conservation and Management Act (Magnuson-Stevens Act) established eight regional fishery councils to manage the nation's fisheries. These councils develop IFQ programs that are administered by NMFS.

IFQ programs have achieved several desired conservation and management benefits, such as helping to stabilize fisheries and reducing excess investment in fishing capacity. However, these programs have also raised concerns about the fairness of initial quota allocations, the increased costs for fishermen to gain entry, and the loss of employment and revenues in communities that have historically depended on fishing. Responding to these concerns, Congress, through the Sustainable Fisheries Act, placed a moratorium on new IFQ programs in 1996. Congress later extended the moratorium through September 30, 2002, and then allowed it to expire. Fishery councils are now free to propose new IFQ programs. During the moratorium, fishery cooperatives emerged as alternatives to IFQ management in two fisheries—Pacific whiting in 1997 and Bering Sea pollock in 1998. These cooperatives are voluntary contractual agreements among fishermen to apportion shares of the catch among themselves. The Department of Justice, in business review letters concerning its antitrust enforcement intentions with respect to the cooperatives, stated that Justice did not anticipate bringing any antitrust enforcement actions against the cooperatives.

This report is the second in a series of reports you requested on individual fishing quotas. In December 2002, we reported on the extent of consolidation of quota holdings, the extent of foreign holdings of quota, and the economic effect of IFQ programs on seafood processors.[2] For this report you asked us to determine (1) the methods available for protecting the economic viability of fishing communities and facilitating new entry into IFQ fisheries, (2) the key issues faced by fishery managers in protecting communities and facilitating new entry, and (3) the comparative advantages and disadvantages of the IFQ system and the fishery cooperative approach.

[1]These programs are frequently called individual transferable quota (ITQ) programs.

[2]U.S. General Accounting Office, *Individual Fishing Quotas: Better Information Could Improve Program Management*, GAO-03-159 (Washington D.C.: Dec. 11, 2002).

To conduct this review, we visited domestic fishing communities in Alaska and Maine, as well as communities in Iceland, New Zealand, and Scotland. We visited these foreign countries because Iceland and New Zealand have extensive experience with IFQ programs, and Scotland has developed an innovative approach for protecting communities and facilitating new entry. In these locations and elsewhere, we spoke with domestic and foreign fishery managers, fishery participants, and fishery researchers; reviewed literature on domestic and foreign quota-based programs; and reviewed key regulations and studies. We did not evaluate the effectiveness of the programs in the locations we visited. See appendix I for additional details on our scope and methodology and appendix II for descriptions of the programs we reviewed.

Results in Brief

Several methods are available for protecting the economic viability of fishing communities and facilitating new entry into IFQ fisheries. The easiest and most direct way to help protect communities under an IFQ program is to allow the communities themselves to hold quota. Communities allowed to hold quota can decide how to use it to protect their economic viability by, for example, keeping the quota in the community and leasing it to local fishermen. Fishery managers can also help communities by adopting rules aimed at protecting certain groups of fishery participants. Under these rules, fishery managers can decide how quota is traded and fished in order to protect a particular group, such as fishermen with small boats. Methods for facilitating new entry principally fall into three categories: (1) adopting transfer rules on selling or leasing quota that help make quota more available and affordable to new entrants, (2) setting aside quota for new entrants, and (3) providing economic assistance to new entrants. Under quota transfer rules, fishery managers can, for example, place small amounts of quota in blocks and limit the number of blocks that an individual can hold, thereby making smaller amounts of quota available and more affordable to new entrants. Under set-aside methods, fishery managers can set aside a portion of the total quota to make a supply of quota specifically available for new entrants. Under economic assistance methods, government entities can provide low-interest loans, grants, or other subsidies to help new entrants obtain quota that they might not otherwise be able to afford.

In considering methods to protect communities and facilitate new entry into IFQ fisheries, fishery managers face issues of efficiency and fairness, as well as design and implementation. Protecting communities and facilitating new entry are social objectives, but realizing these objectives may undermine economic efficiency and raise questions of equity. For example, allowing communities to hold quota may result in a loss of economic efficiency because communities may not have the knowledge and skills to manage the quota effectively. Similarly, rules to protect communities or facilitate new entry may appear to favor one group of fishermen over another. Community protection and new entry methods also raise a number of design and implementation challenges. For example, according to fishery experts, defining a community can be challenging, because communities can be defined in geographic and nongeographic ways. Similarly, loans or grants may help provide new entrants with the capital needed to purchase quota, but they may also contribute to further quota price increases. Given the various issues that fishery managers face in developing community protection and new entry methods, it is unlikely that any single method can protect every type of fishing community or facilitate new entry into every IFQ fishery. Deciding which method(s) to use is made more challenging because fishery managers have not conducted comprehensive evaluations of how IFQ programs protect communities or facilitate new entry. Consequently, we are making recommendations to the Director of the National Marine Fisheries Service to ensure that fishery councils that are designing community protection and new entry methods include clearly defined and measurable objectives, build performance measures into the design of the IFQ program, and monitor whether the program is achieving its community protection and new entry objectives.

In comparing the key features of IFQ programs and U.S. fishery cooperatives, we found that each approach has advantages and disadvantages in terms of regulatory and management framework, number of participants, quota allocation and transfer, and monitoring and enforcement. Specifically, in terms of regulatory and management framework, IFQ programs have greater stability than cooperatives because they are established by federal regulations, while cooperatives are voluntary contractual arrangements. In terms of quota allocation and transfer, IFQ programs are open in that they allow the transfer of quota to new entrants, whereas cooperatives are exclusive by contractual arrangement among members. In terms of monitoring and enforcement, IFQ programs are viewed as being more difficult to administer, because NMFS must monitor individual participants, while cooperatives are viewed to be simpler for NMFS to administer, because NMFS monitors only one entity—the cooperative. For some fisheries, combining elements of both approaches can be beneficial. For example, a cooperative of IFQ quota holders can combine the stability of an IFQ program with the collaboration of a cooperative to help manage the fishery.

Background

The Magnuson-Stevens Act provides for the conservation and management of fishery resources in the United States.[3] The act established eight regional fishery management councils that are responsible for preparing plans for managing fisheries in federal waters and submitting them to the Secretary of Commerce for approval. NMFS, within the Department of Commerce's National Oceanic and Atmospheric Administration, is responsible for implementing these plans. The eight councils are New England, Mid-Atlantic, South Atlantic, Gulf of Mexico, Caribbean, Pacific, North Pacific, and Western Pacific.

The Magnuson-Stevens Act, as amended by the Sustainable Fisheries Act,[4] also establishes national standards for fishery conservation and management. The fishery councils use these standards to develop appropriate plans for conserving and managing fisheries under their jurisdiction. For example:

- National Standard 1 requires that conservation and management measures prevent overfishing while achieving, on a continuing basis, the optimum yield from each fishery;
- National Standard 4 requires that conservation and management measures not discriminate between residents of different states;
- National Standard 5 requires that conservation and management measures, where practicable, consider efficiency in the use of fishery resources; and
- National Standard 8 requires that fishery conservation and management measures take into account the importance of fishery resources to fishing communities in order to provide for the sustained participation of these communities in the fishery and, to the extent practicable, minimize adverse economic impacts on these communities.

In addition to the national standards, the Magnuson-Stevens Act also requires that new IFQ programs consider providing opportunities for new individuals to enter IFQ fisheries.

[3] Pub. L. No. 94-265 (codified as amended at 16 U.S.C. §§ 1801-1883).

[4] Pub. L. No. 104-297 (1996).

The Magnuson-Stevens Act defines a fishing community as one that is substantially dependent on, or engaged in, harvesting or processing fishery resources to meet social and economic needs. The definition includes fishing vessel owners, operators, and crew, and U.S. fish processors based in such a community. NMFS guidance further defines fishing community to mean a social or economic group whose members reside in a specific location.[5]

At the time of our review, NMFS had implemented three IFQ programs: (1) the Mid-Atlantic surfclam/ocean quahog program in 1990, (2) the South Atlantic wreckfish program in 1992, and (3) the Alaskan halibut and sablefish (black cod) program in 1995. New IFQ programs were being considered in other commercial fisheries, such as the Bering Sea crab; the Gulf of Alaska groundfish (e.g., pollock, cod, and sole); and the Gulf of Mexico red snapper.

Under IFQ programs, fishery managers set a maximum, or total allowable catch, in a particular fishery—typically for a year—based on stock assessments and other indicators of biological productivity, and they allocate quota—generally expressed as a percentage of the TAC—to eligible vessels, fishermen, or other recipients, based on initial qualifying criteria, such as catch history. In the United States, fishery councils can raise or lower the TAC annually to reflect changes in the fishery's health. Fishery managers distribute these changes among the quota holders proportional to their share. For example, a fisherman who received a 5 percent quota share in a fishery with a TAC of 100 metric tons can catch 5 tons of fish. Should the TAC increase from 100 to 200 metric tons in the following year, the quota holder with a 5 percent share would be able to catch 10 tons, or 5 tons more than the previous year. Furthermore, IFQs are generally transferable, meaning that quota holders can buy, sell, lease, or otherwise transfer some or all of their shares, depending on how much or how little they want to participate in the fishery. The nature of the fishing right varies by country. In New Zealand, for example, an IFQ is an exclusive property right that can be held in perpetuity, whereas in the United States, an IFQ represents the privilege to fish a public resource. While this privilege has an indefinite duration, the government may legally revoke it at any time.

[5] 50 C.F.R. § 600.345(b)(3).

IFQ programs arose in response to conditions that resulted in a race for fish and overfishing and that reduced economic efficiency, safety, and product quality. For example, before the IFQ program, the Alaskan halibut fishery had limits on the amount of time allowed for commercial fishing in an attempt to keep the annual halibut catch within the TAC, but it did not have limits on the number of boats that could fish. In response, fishermen increased the number of vessels in their fleets and used larger vessels with more gear to catch as much fish as they could in the time allowed. As a result, the halibut season was reduced to a few days. After the IFQ program was implemented, the fishing season was increased to 8 months. Fishermen could choose when to fish and they could use more economical fishing methods, as long as they kept within their quota limits.

Individual IFQ programs may differ considerably, depending on the circumstances of the fishery and the objectives of the program. For example, an IFQ program for a fishery where there are concerns about overfishing and the consolidation of power among corporate interests may have different objectives than a program for a fishery where there are concerns about developing the fishery and attracting new fishermen. Depending on the fishery, fishery managers may be willing to trade some potential gains in economic efficiency in exchange for the opportunity to protect fishing communities or facilitate new entry.

IFQ programs are largely intended to improve economic efficiency and conserve the resource. According to the theory underlying IFQ programs, unrestricted quota trading promotes economic efficiency, because those willing to pay the highest price for quota would be those expected to use quota the most profitably, by catching fish at a lower cost or transforming the fish into a more valuable product. Over time, unrestricted trading should lead less efficient fishermen to either improve their efficiency or sell their quota. In contrast, restrictions on quota transfers could be expected to reduce the economic benefits that would otherwise be obtained where quota is freely transferable. Another fundamental tenet of this theory is that quota holders will act in ways to promote the stewardship of the resource. Specifically, giving fishermen a long-term interest in the resource is likely to provide incentives to fish in ways that protect the value of their interest.

Methods Exist for Protecting Fishing Communities and Facilitating New Entry

Several methods are available under IFQ programs for protecting the economic viability of fishing communities and facilitating new entry. For protecting communities, the easiest and most direct method is allowing communities to hold quota. Fishery managers may also help protect communities by adopting program rules aimed at protecting certain groups of fishery participants. For facilitating new entry into IFQ fisheries, the methods principally fall into three categories: (1) adopting quota transfer rules that promote new entry, (2) setting aside quota for new entrants, and (3) providing economic assistance to potential new entrants.

Methods for Protecting Communities

Concerns have developed in the United States and in other countries about the potential for IFQ programs to harm the economic viability of fishing communities. Many fishery experts and participants are concerned that individual quota holders will sell their quota outside of the fishing community or sell their quota to large companies. If this were to occur, fishing jobs could leave the community and larger companies could consolidate their quota holdings and dominate the fishery. Fishing communities that lose fishing jobs may have few alternative employment options, particularly if they depend primarily on fishing and no other industry replaces fishing.

Allowing communities to hold quota is the easiest and most direct way under an IFQ program to help protect fishing communities. According to fishery experts and participants, fishery managers can give each community control over how to use the quota in ways that protect the community's economic viability, such as selling or leasing quota to fishermen who reside in the community. Community quota could be held by municipalities, regional organizations, or other groups representing the community—unlike traditional individual fishing quota, which is generally held by individual boat owners, fishermen, or fishing firms. Of the three U.S. IFQ programs, only one allows communities to buy and hold quota—the Alaskan halibut and sablefish program.

Communities allowed to hold quota can obtain it through allocation when the program begins or at any time thereafter. For example:

- The North Pacific Fishery Management Council (North Pacific Council) is considering allocating quota to community not-for-profit entities as it develops a proposal for managing the Gulf of Alaska groundfish fishery.

- New Zealand fishery managers allocated quota to a Chatham Islands community trust several years after the IFQ program was implemented. The trust leases out annual fishing privileges to Chatham Islands-based fishermen to help keep fishing and fishing-related employment in the community.

Similarly, fishery managers can incorporate rules into existing IFQ programs or into the design of new programs to allow communities to make quota purchases. For example, in 2002, the North Pacific Council amended the Alaskan halibut and sablefish IFQ program to allow communities along the Gulf of Alaska to purchase quota. The council is considering including a similar provision in the proposed plan to manage the Gulf of Alaska groundfish fishery.

In addition to allowing communities to hold quota, fishery managers can establish rules governing who is eligible to hold and trade quota as well as other rules to manage quota as a means of protecting certain groups of fishery participants. Specific rules may vary by program and change over time, depending on which members or groups a council wants to protect. In terms of eligibility to hold quota, for example, the North Pacific Council initially restricted allocations of Alaskan halibut and sablefish quota to individual vessel owners in part to protect the fisheries' owner-operator fleet. The council later expanded eligibility to allow crew members to hold quota without owning a vessel.

We also identified several different types of quota transfer restrictions used in foreign IFQ programs that were aimed at protecting communities. For example:

- *Prohibiting quota sales*. While none of the IFQ programs in the United States prohibits the transfer of quota through sales, fishery managers in other countries have done so. For example, Norway's IFQ program prohibited all quota sales to protect fishing communities in certain locations. Alternatively, prohibitions could be used temporarily to help prevent fishermen from hastily selling their quota. For example, according to New Zealand fishermen we spoke with, many small boat fishermen did not initially understand the long-term value of their quota and therefore sold their quota shortly after the initial allocation. To remedy this situation, they suggested that fishery managers could prohibit sales for the first year after a program's initial allocation to give fishermen time to make informed decisions about whether to sell their quota.

- *Placing geographic restrictions on quota transfers.* Iceland and New Zealand fishery managers have also set limits on where quota can be sold or leased to protect certain groups, such as local fishermen and the communities themselves. The Icelandic IFQ program, in which individuals own vessels with associated quota rather than the quota itself, adopted a “community right of first refusal” rule to provide communities the opportunity to buy vessels with their quota before the vessels are sold to anyone outside of the community. IFQ programs can also regulate quota leasing to keep fishing in a certain area by establishing rules that limit leasing or fishing to residents of the community. In terms of leases, New Zealand’s Chatham Islands community trust has, in effect, used residence in the Chatham Islands as a requirement to lease its quota.

- *Limiting quota leasing.* Iceland requires that all quota holders fish at least 50 percent of their quota every other year and prohibits quota holders from leasing more than 50 percent of their quota each year. Fishery managers introduced such restrictions, in part, to minimize the number of “absentee” quota holders—those who hold quota as a financial asset but do not fish.

Finally, according to fishery managers and experts we spoke with, fishery managers can help protect fishing communities by (1) setting limits on quota accumulation, (2) establishing separate quota for different sectors of the fishery, (3) requiring quota holders to be on their vessels when fish are caught and brought into port, and (4) restricting the ports to which quota fish can be landed.

- *Setting limits on quota accumulation.* Fishery managers can place limits on the total amount of quota an individual can accumulate or hold to protect certain fishery participants. In the United States, for example, the North Pacific Council set limits on individual halibut quota holdings that range from 0.5 percent to 1.5 percent, depending on the fishing area, as a means of protecting the fishery’s owner-operator fleet.

- *Establishing separate quota for different sectors of the fishery.* To protect small boat fishermen and local fishing jobs, Iceland developed a separate quota for small vessels and large vessels and prohibited owners of small vessels from selling their quota to owners of large vessels. In the U.S. halibut and sablefish IFQ program, the North Pacific Council established separate quota categories based on vessel type and length and placed certain restrictions on transfers among these categories to ensure that quota would be available to owners of smaller vessels.

- *Requiring quota holders to be on their vessels.* Some programs require the owner of the quota to be on board when fish are caught and brought into port. For example, the North Pacific Council requires fishermen who entered the Alaskan halibut and sablefish IFQ program by purchasing certain categories of quota, rather than receiving it as part of the initial allocation, to abide by this rule. The rule was designed in part to limit speculative quota trading by individuals who are primarily interested in quota as a financial asset and not otherwise invested in the fishery.

- *Restricting landings.* Fishery managers could restrict the ports to which quota holders or those who lease quota can deliver their catch. For example, New Zealand's Chatham Islands trust leases rock lobster quota to local fishermen who must then land their catch in the Chatham Islands.

Methods to Facilitate New Entry

IFQ programs have also raised concerns about opportunities for new entry. As IFQ programs move toward achieving one of their primary goals of reducing overcapitalization, the number of participants decreases and consolidation occurs, generally reducing quota availability and increasing price. As a result, it is harder for new fishermen to enter the fishery, especially fishermen of limited means, such as owners of smaller boats or young fishermen who are just beginning their fishing careers. According to New Zealand officials, quota prices increased dramatically. For example, the average price of abalone quota increased by more than 50 percent in the first 6 months of trading—from about NZ$11,000 to NZ$17,000 per metric ton—and, by 2003, the average price had reached about NZ$300,000 per metric ton, or about 27 times the price at the start of abalone quota trading in 1988.

To reduce the barriers to new entry, fishery managers have established quota transfer rules and set-asides, and/or provided economic assistance, such as loans or grants. In terms of transfer rules, all domestic and most foreign IFQ programs allow quota to be sold or leased. Allowing such transfers provides the opportunity for new entry to those who can find and afford to buy or lease quota. Since the lease price is generally below the sales price, leasing quota may help make entry more affordable to fishermen of limited means, such as small boat fishermen.

Fishery managers can also make quota available and more affordable to new entrants by "blocking" small amounts of quota and limiting the number of "blocks" that any one individual or entity can hold. For example, the North Pacific Council set up two types of halibut quota at the initial allocation—unblocked and blocked. Unblocked quota holds no restrictions. Blocked quota, on the other hand, is an amount of quota that yielded less than 20,000 pounds of halibut in 1994 and can only be bought or transferred in its entirety. An individual or entity can hold unblocked quota and one quota block; an individual who holds no unblocked quota can hold two quota blocks. A state of Alaska study found that estimated prices for blocked quota were less per pound than for unblocked quota over the first 4 years of the Alaskan halibut and sablefish IFQ program and that estimated prices for smaller blocks were less per pound than for larger blocks.[6]

Setting aside a portion of the total quota specifically for new entrants can also make quota available. Quota could be set aside at the time of the initial allocation for future distribution to entities that did not initially qualify for quota. For example, at the start of the Alaskan halibut and sablefish program, the North Pacific Council set aside a portion of the TAC for allocation to communities in western Alaska for community development purposes. According to fishery managers, similar set-asides could be used for new entrants by establishing the set-aside at the start of the IFQ program, or by buying or reclaiming, rolling over, or setting aside quota during the program.

- *Buying or reclaiming quota from existing quota holders*. Fishery managers could buy back quota from existing quota holders. For example, the New Zealand government bought back quota to give to the indigenous Maori tribes in partial settlement of their claims against the government over fishing rights. Fishery managers could also obtain quota forfeited by fishermen who have not complied with program rules; in the New Zealand IFQ system, for example, quota holders risk forfeiting their quota holdings if they catch more fish than they have quota for.

- *Issuing quota for a fixed period of time and then rolling it over for distribution to new entrants*. Depending on the program, the frequency of the rollover could range from every few years to annually and the amount of the rollover could range from some to all of the quota. For example, a rollover system has been proposed for Australia's New South Wales fishery under which fishery managers would issue quota for a finite period of time (e.g., 30 years) under one set of program rules and, periodically (e.g., every 10 years), quota holders would have the opportunity to choose

[6]Dinneford, E., K. Iverson, B. Muse, and K. Schelle, *Changes Under Alaska's Halibut IFQ Program, 1995 to 1998*, Abstract, Alaska Department of Fish and Game, Commercial Fisheries Entry Commission (November 1999).

whether to continue to participate in the old system or move their quota into a new system with different rules for another 30 years.

- *Setting aside TAC increases for distribution to new entrants*. Foreign and domestic IFQ programs generally define an individual fishing quota as a percentage of the overall TAC and distribute any changes in the TAC among existing quota holders proportional to their share. Alternatively, fishery managers could distribute TAC increases to new entrants, leaving existing quota holders fishing the same amount of fish as they did in the previous year.

Once fishery managers have set aside quota, they must devise a method for allowing new entrants to obtain it. According to fishery experts, the options include:

- *Selling quota at auction*. Fishery managers could auction off quota to the highest bidder and keep the proceeds. Alternatively, the managers could serve as an intermediary by auctioning off quota on behalf of existing quota holders, and the seller would incur all losses or gains. In case the auction price becomes prohibitive for new entrants, fishery managers could set aside quota that could be sold at a lower, predetermined price.[7] Economists generally support the idea of auctioning quota because an efficient market provides quota to its most profitable users. However, in the United States, the Magnuson-Stevens Act limits the amount of fees that may be charged under an IFQ program, which may effectively preclude the use of auctions.
- *Distributing quota by lottery*. New entrants could be randomly selected from a pool of potential entrants, giving persons of limited means an equal chance to obtain quota. Lotteries might be especially advantageous when the demand for quota from new entrants is greater than the supply of quota set aside.
- *Distributing quota to individuals who meet certain criteria*. Fishery managers could allocate quota to new entrants using a point system based on criteria such as fishing experience or completion of an apprenticeship program.

[7] For example, the Clean Air Act provides for the Environmental Protection Agency to withhold a proportion (2.8 percent) of utilities' annual sulfur emissions allowances and offer a portion of them for sale in an auction, and to set aside another portion for direct sale at a price specified in the statute.

Finally, to help make quota affordable, fishery managers and experts told us that government entities could provide loans or subsidies to potential entrants who might not otherwise be able to afford the quota. Affordability is particularly an issue as an IFQ program becomes more successful and the value of the quota increases.

- *Loans*. The Magnuson-Stevens Act allows NMFS to offer loans.[8] Under this provision, for example, NMFS has established a low-interest loan program for new entrants and fishermen who fish from small boats in the halibut and sablefish fisheries off Alaska. The fishermen can use these loans to purchase or refinance quota. Since the program's inception in fiscal year 1998, Alaska has approved 207 loans, totaling nearly $25 million. The Magnuson-Stevens Act also provides for the creation of a central registry where owners and lenders can register title to, and security interests (such as liens) in, IFQs.[9] According to the National Research Council, a registry would increase lender confidence and provide opportunities for individuals to obtain financing to enter IFQ fisheries.[10] Although NMFS has not yet established this registry, its Alaska Region maintains a voluntary registry where creditors, such as private banks, the state of Alaska, and private lenders can record liens against quota shares.[11] The Alaska Region reported that most lending institutions take advantage of this service. The registry contained 2,581 reported interests in quota share at the end of 2002.[12]

- *Grants or other subsidies*. Grants or other subsidies could decrease the costs associated with buying or leasing quota. Since grants do not have to be repaid, they could give fishermen of limited means the opportunity to enter the fishery and then build their capital in order to increase their quota holdings. In addition to grants, fishery managers could establish a "lease-to-own" quota program—new entrants would pay for the quota while using it. Also, quota could be made available for purchase or lease at below market prices. Iceland, for example, is considering adopting a

[8]16 U.S.C. § 1853(d)(4).

[9]16 U.S.C. § 1855(h).

[10]National Research Council, *Sharing the Fish: Toward a National Policy on Individual Fishing Quotas* (Washington, D.C.: National Academy Press, 1999), 8.

[11]Lenders file against identifiable groups of quota shares and not against quota holders.

[12]More than one person may have reported an interest against the same group of quota shares.

discount program to make quota more affordable. This discounting scheme would allow crews of small vessels to purchase quota from the government at 80 percent of its market value.

Community Protection and New Entry Methods Raise a Variety of Issues That Require Consideration

In considering methods to protect communities and facilitate new entry into IFQ fisheries, fishery managers face issues about efficiency, fairness, and design and implementation. Community protection and new entry methods are designed to achieve social objectives, but achieving these objectives may undermine economic efficiency, one of the primary benefits of an IFQ program, and raise questions of equity. Moreover, community protection and new entry methods present a number of design and implementation challenges. However, given the particular circumstances of the fishery and the goals of the IFQ program overall, it is unlikely that any single method can protect every type of fishing community or facilitate new entry into every IFQ fishery. It is also unclear how beneficial these protective methods can be.

Community Protection and New Entry Methods Raise Concerns about Economic Efficiency and Equity

Fishery managers face an inherent tension between the economic goal of maximizing efficiency and the social goal of protecting communities or facilitating new entry. According to fishery experts we spoke with, this tension occurs because a community or new entrant often may not be the most efficient user of quota. For example, according to Icelandic fishery experts, some communities did not manage their quota effectively and sold it, reducing the communities' economic base. In addition, setting aside quota for new entrants may not be the most efficient use of quota because experienced fishermen or fishing firms are generally able to fish the quota more economically than a new entrant. Adopting rules that constrain the free trade of quota, such as those designed to protect communities or facilitate new entry, would likely limit the efficiency gains of the IFQ program. Therefore, fishery managers have to decide how much economic efficiency they are willing to sacrifice to protect communities or facilitate new entry.

Methods to protect communities or facilitate new entry may also raise concerns about equity. In the United States, certain community quotas or rules aimed at protecting certain groups may not be approved because they are not allowed under the Magnuson-Stevens Act. For example, National Standard 4 of the Magnuson-Stevens Act prohibits differential treatment of states. A rule that proposes using residence in one state as a criterion for receiving quota may violate the requirements of National Standard 4. Furthermore, methods that propose allocating quota to communities or adopting rules aimed at making quota more available or affordable to a certain group of fishermen can appear unfair to those who did not benefit and could result in legal challenges. Moreover, allowing communities to purchase quota may be considered unfair or inequitable, because relatively wealthy communities would more readily have the funds needed to purchase quota while relatively poor communities would not.

Designing and Implementing Community Protection Methods Presents Multiple Challenges

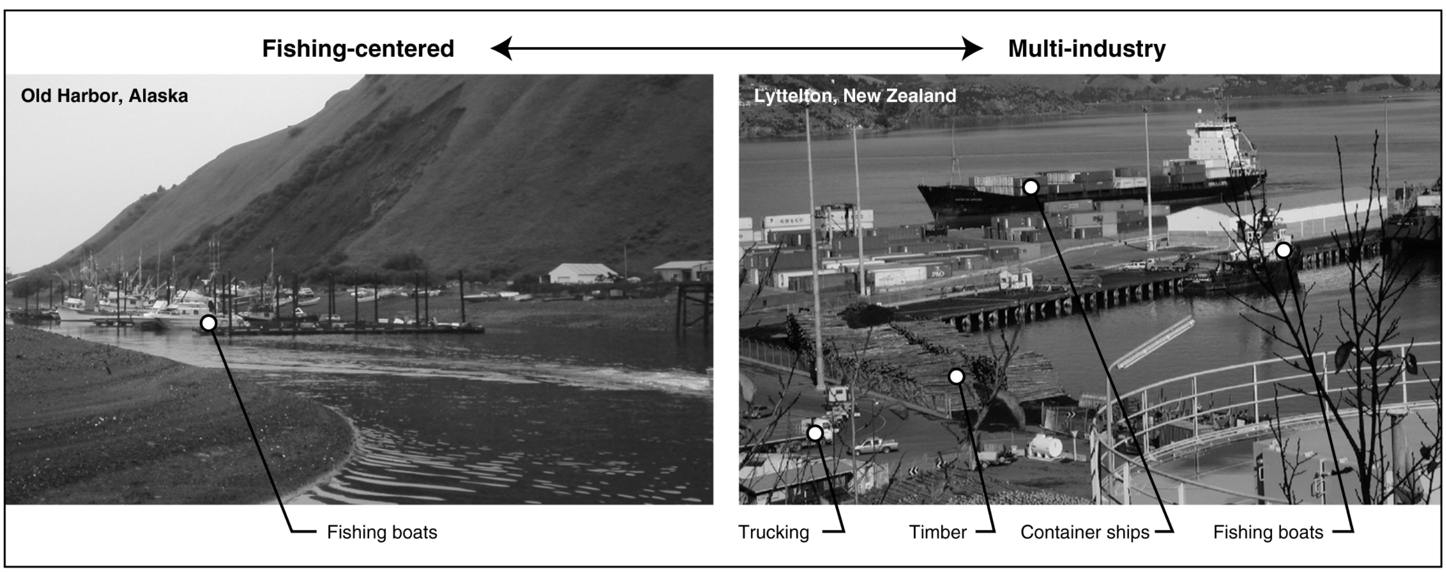
Fishery managers face multiple challenges in designing and implementing community protection and new entry methods, according to fishery managers and experts we spoke with. The resolution of these issues depends on the fishery's circumstances and the program's objectives. It is unlikely that any single method can protect every kind of fishing community or facilitate new entry into every IFQ fishery.

In developing an approach to protect fishing communities, fishery managers have to define community, determine who represents it, and define economic viability, and communities must determine how to use the quota. Defining community can be challenging because communities can be defined in many ways. As discussed earlier, the Magnuson-Stevens Act defines a fishing community as one that substantially depends on, or is engaged in, harvesting or processing fishery resources to meet social and economic needs. NMFS guidance further defines fishing community geographically—that is, a social or economic group whose members reside in a specific location. Fishery managers and experts told us that communities with geographically distinct boundaries are easier to define, such as island communities or remote communities in Alaska. However, some communities are difficult to define when, for example, some of the fishermen live away from the areas they fish, as is the case for many halibut fishermen who reside in other states and fish in the waters off the coast of Alaska. Moreover, communities can also be defined in nongeographic ways, such as fishermen who use the same type of fishing gear (e.g., hook-and-line or nets) for a particular species or people and businesses involved in a fishery regardless of location. These communities can include fishermen and fish processors, as well as support services such as boat repair businesses, cold storage facilities, and fuel providers.

Once fishery managers define the community, they must then determine who represents the community and thus who will decide how the quota is used. More than one organization (e.g., government entity, not-for-profit organization, private business, or cooperative group) may claim to represent the interests of the community as a whole. For example, rural coastal communities in Alaska, which are geographically distinct, could have several overlapping jurisdictions, including a local native corporation, a local municipality, and a local borough. Determining who represents the community is more difficult in communities without geographically distinct boundaries.

Fishery managers also need to define what constitutes economic viability, which is likely to differ by community because the fishery has different economic significance in each community. Some communities primarily rely on fishing and fishing-related businesses, while others may have a more diverse economic base. (See fig. 1.) Consequently, it may be unclear what type of protection a community needs to ensure its economic viability. Fishery experts we spoke with agreed that few communities in the United States primarily depend on fishing as their economic base. Moreover, the balance of industries making up a community's economy may change over time when, for example, the area becomes more modernized or a new industry enters. For example, the economy of the Shetland Islands changed dramatically with the development of the oil industry off the Shetland Islands in the 1970s. This development resulted in jobs and settlement funds that the community used to enhance its economic base through community development projects.

Figure 1: Fishing-centered and Multi-industry Fishing Communities



Source: GAO.

Finally, communities have to decide whether to keep their quota, sell it, or lease it to others. If they keep their quota, they also have to decide how to allocate it. Similarly, if they sell or lease their quota, they have to decide how to allocate the proceeds. Unless communities can decide how to allocate quota or the proceeds, the community quota may go unused and thus prevent the community from receiving its benefit. For example, the quota New Zealand's Maori people received from the government in 1992 has not been fully allocated to the Maori tribes, largely because the commission responsible for distributing the quota and the tribes could not agree on the allocation formula.[13]

Along with these definitional challenges, fishery managers and communities have to address other design and implementation issues, such as whether to establish prohibitions on quota sales or geographic restrictions on quota transfers.

- *Prohibitions on quota sales*. Prohibiting quota sales may not allow fishing communities or businesses to change over time as the fishing industry changes. According to fishery experts we spoke with, rules that prevent change essentially freeze fishing communities at one point in time and may create "museum pieces." For example, prohibitions on quota sales prevent the fishery from restructuring, thus forcing less efficient quota holders and fishing businesses to remain in the fishery. Consequently, prohibitions on quota sales may actually undermine the economic viability of the fishing communities they were designed to protect. In addition, prohibitions on quota sales might run counter to an IFQ program's overall objective of reducing excess investment in the fishery because such prohibitions act to prevent fishermen from selling some of their boats or leaving the fishery.

- *Geographic restrictions on quota transfers*. Protecting communities by imposing geographic restrictions on quota transfers also raises issues that must be considered and addressed. According to fishery experts we spoke with, rules that give communities the right to purchase quota before it is sold outside the community might be legally avoided. For example, Icelandic officials told us that in their IFQ program, where individuals own vessels with associated quota rather than the quota itself, companies holding quota easily avoided the "community right of first refusal" rule by selling their companies as a whole to an outside company, rather than just selling their vessels and associated quota. As a result, communities could

[13]In December 2003, legislation was introduced in the New Zealand Parliament that, among other things, sets out the allocation formula to be used to allocate quota to the Maori tribes.

not use this rule to prevent the sale. Furthermore, communities that could benefit from such a rule may not have the money to purchase the quota, while those communities that can afford to purchase the quota may not need the rule's protection.

Other program rules aimed at protecting the community also raise implementation issues that fishery managers must consider:

- *Accumulation limits*. The challenge in setting accumulation limits—the amount of quota that any one individual or entity can hold—is to set limits that are high enough to promote economic efficiency and low enough to prevent any one individual or entity from holding an excessive share. According to New Zealand fishery managers and experts, for example, accumulation limits were set at between 10 and 35 percent, depending on the species, in order to allow individuals to acquire enough quota to be efficient and competitive while also stemming overcapacity and overfishing in the inshore fisheries. Furthermore, as quota becomes more valuable, managers may face pressure from existing quota holders to raise or eliminate the limits on accumulation. In Iceland, for example, fishery managers recently increased accumulation limits from 8 percent to 12.5 percent of the total quota because of such pressure. In cases where both communities and individuals hold quota, fishery managers may want to set different limits for communities and individuals. Even after managers set accumulation limits, monitoring and enforcing these limits could be more difficult when fishermen create subsidiaries and complicated business relationships that enable them to catch more than the quota limit for an individual quota holder. To mitigate this problem, the Alaskan halibut and sablefish program, for example, requires all quota transfer applicants to identify whether they are individuals or business entities, and requires all business entities to annually report their ownership interests. NMFS uses this information to ensure that no halibut and sablefish quota holdings, whether individually or collectively, exceed the accumulation limits.

- *Owner-on-board requirements*. According to fishery experts we spoke with, requiring quota holders to be onboard their vessels could be impractical, especially for small businesses where the same person would have to be on board at all times. Furthermore, such a rule would require so many exceptions, such as for emergencies and illness, that it could become meaningless.

- *Requirements to bring catch into ports in a particular geographic area.* These requirements may not be healthy for a community's economy in the long term. For example, such a requirement may subsidize inefficient local fish processors that cannot compete on the open market. With reduced competition, these processors may offer less money for the catch, thus reducing the fishermen's income and ultimately harming the community. According to Shetland Islands fishery managers we spoke with, had fishermen been required to land their catch in the Shetland Islands, they would have been forced to sell their catch at a price far below the market value and the processor would have had no incentive to restructure into the competitive business it is today.

- *Leasing provisions*. According to some fishery managers and experts, leasing reduces stewardship incentives, which may impact the community's long-term economic viability. Quota leasing separates the person holding the quota from the person fishing the quota. In some cases, quota leasing may diminish stewardship incentives by creating a class of absentee quota holders who rely on independent fishermen. While owner-on-board rules, such as those in Alaska, may minimize the risk of creating this class of absentee quota holders, fishermen who lease quota have only a temporary privilege to catch fish. Thus, they have less interest in the long-term health of the fishery, especially as the end of their lease term approaches. Consequently, incentives may exist to catch more fish than their quota allows and sell this over-quota fish on the black market or to fish using nonsustainable methods. For example, according to New Zealand fishery experts, quota holders in the high-value abalone fishery found that unskilled fishermen who leased quota were jeopardizing the fish by extracting them in ways that harmed the abalone beds.

Given the issues raised by quota transfer and other program rules, as well as the potential loss of economic efficiency resulting from these rules, some fishery managers and experts view freely transferable quota as being the best way to maintain economically viable communities and therefore place few or no restrictions on quota sales or leases. For example, New Zealand allows free trade in quota on the theory that free trade is needed to maximize returns from the fishery and enhance stewardship of the resource. Similarly, the surfclam/ocean quahog IFQ program has relatively few restrictions on quota transfers.

New Entry Methods Present Design and Implementation Challenges

As with community protection methods, new entry methods also present a variety of design and implementation challenges to fishery managers. Allowing quota to be transferred through sales or leases provides the opportunity for new entry but quota prices may increase over time, making quota less affordable. In the New Zealand IFQ program, for example, the average price per metric ton of rock lobster quota in one management area skyrocketed from NZ$23,265 to NZ$222,500 over an 8-year period.

While leasing helps make quota available at prices lower than the sales price, the lease price may still be unaffordable or unprofitable to fish and thus not practical for new entrants. For example, according to New Zealand fishing industry representatives, the lease price for rock lobster in 2003 was about NZ$22.50 per kilo, but fishermen needed to sell the fish for at least NZ$30 per kilo to cover their costs.[14] To minimize the risk associated with leasing, the Shetland Islands community quota program levied fees based on the sales revenue from the quota fished, rather than setting a fixed lease price that fishermen would have to pay, regardless of the amount of quota fish caught.

Set-asides to make quota available for new entrants also raise challenges, according to fishery experts. In setting aside quota for new entrants, fishery managers have to decide how much quota to reserve and who would be eligible to receive it, such as owners of small boats or young fishermen. If a set-aside occurs when a program is first established, managers do not have to take quota away from existing quota holders. However, there are many challenges associated with setting aside quota after a program is implemented.

- *Buying back quota*. Buying back quota may not be possible because the government may not find quota holders willing to sell their quota. For example, New Zealand funded a buyback program to obtain quota as part of its settlement with the Maori tribes. However, the government was not able to obtain the amount of quota it was seeking, and, as a result, had to give the tribes money in place of some of the quota.

- *Issuing quota for a fixed period of time*. Issuing quota with expiration dates could make it less likely that fishermen would accept the IFQ system or make investments in efficiency. Fishermen could also find it difficult to invest in boats and gear because banks may be less willing to lend money and fishermen may be less willing to borrow. Furthermore, as with leasing, stewardship incentives could decline as the quota expiration date draws near.

[14]Rock lobster traditionally sells for high prices, particularly in the large Asian market. However, the Asian market price temporarily collapsed in 2003 when the Severe Acute Respiratory Syndrome epidemic broke out and fewer Asians were eating in restaurants.

- *Setting aside TAC increases*. Replenishing quota by using TAC increases might not always be feasible because quota would not be available to reserve as a set-aside when the TAC remains the same or declines. Setting aside TAC increases would also dilute the interests of existing quota holders, who would hold a smaller percentage of the TAC.

Fishery managers also face challenges in deciding which new entrants would be eligible to receive quota from the set-aside. If fishery managers decide to auction quota to the highest bidder, they cannot be assured that quota would be affordable to new entrants.[15] Fishery managers could auction the quota in small amounts, which would make the quota more affordable and thereby open up opportunities to new entrants. However, the value of the quota would decrease to reflect the inherent inefficiency of this distribution mechanism. In addition, while lotteries could provide potential entrants an equal chance to obtain quota and resolve some of the equity issues raised by auctions, they would also create more uncertainty for existing quota holders. Current quota holders would no longer have control over quota purchases and would have to depend on the luck of the draw. This uncertainty is a disincentive to invest in boats or gear.

Economic assistance methods are designed to provide new entrants with the capital needed to purchase quota and are the most direct method of helping new entrants. However, they raise the following concerns, according to fishery experts we spoke with:

- The financial assistance may not be sufficient for a potential new entrant to enter the fishery or buy enough quota to earn a living.

- Providing economic assistance could contribute to an increased demand for quota and further price increases, thereby defeating the primary purpose of trying to make quota more affordable.

- Government entities may not be willing or able to fund economic assistance programs.

[15] As we noted previously, the Magnuson-Stevens Act's limitation on fees may effectively preclude auctions.

Evaluations of Community Protection and New Entry Methods Would Enable Managers to Determine Their Effectiveness

Fishery managers have not conducted comprehensive evaluations of how IFQ programs protect communities or facilitate new entry, because few IFQ programs were designed with community protection or new entry as objectives. This lack of information, combined with the concerns about economic efficiency and fairness, makes it more difficult to decide which community protection and new entry methods to use. In order to determine whether the chosen methods are working or how they should be improved, fishery managers would have to clearly define community protection or new entry as an objective, identify data that isolate the impact of community protection and new entry methods, collect these data before implementing the program—baseline data—and compare these data with data collected over the course of the program. This effort would then allow managers to determine whether their community protection or new entry methods are accomplishing their objectives and whether they need adjustments to promote effectiveness or respond to any unintended consequences.

Under the Magnuson-Stevens Act, fishery managers are required to analyze the social and economic conditions of the fishery in developing fishery management plans.[16] These data could be used as a baseline for the social and economic conditions in a fishing community. In addition to baseline data, fishery managers need to collect data once the IFQ program is established. For example, some fishery experts told us that many fishing communities in Iceland collapsed when quota was sold and left the community. However, other fishery experts and Icelandic officials said that these communities would have collapsed regardless of the IFQ, in part, due to the lack of educational and employment opportunities and the movement of people to Reykjavik, the capital, as the country modernized during this time period. This difference in opinion exists partly because Iceland did not collect the data needed to determine whether the IFQ program, or other factors, led to the communities' demise. Recognizing the need for additional information, Alaskan fishery managers will collect data each year on the amount of halibut and sablefish quota held in each community to help assess the effectiveness of its recent amendment

[16]In particular, National Standard 8 of the Magnuson-Stevens Act, as amended by the Sustainable Fisheries Act, requires that fishery conservation and management measures take into account the importance of fishery resources to fishing communities in order to provide for the sustained participation of fishing communities, and to the extent practicable, minimize adverse economic impacts on fishing communities. A fishing community, in turn, is defined as one that is substantially dependent on or engaged in the harvesting or processing of fishery resources to meet social and economic needs.

allowing communities to purchase quota. Similar issues arise in trying to collect data that distinguishes new entrants from existing quota holders. Without the data to clearly understand the changes occurring in a fishery or community, fishery managers cannot effectively modify their community protection or new entry methods.

IFQ Programs and Fishery Cooperatives Have Advantages and Disadvantages

During the moratorium on new IFQ programs in the United States, two fishery cooperatives, among others, emerged as an alternative fishery management approach—the Whiting Conservation Cooperative and the Pollock Conservation Cooperative. (See app. III for a description of each cooperative.) These cooperatives are voluntary contractual agreements among fishermen to apportion shares of the catch among themselves. In comparing the key features of IFQ programs and these U.S. fishery cooperatives, we identified the advantages and disadvantages of each approach in key areas. Given these differences, an IFQ program combined with some characteristics of a cooperative, such as provisions of New Zealand's cooperative-like stakeholder organizations, may be beneficial.

IFQ Programs and Fishery Cooperatives Differ in Several Respects

While both IFQ programs and fishery cooperatives can vary widely, the general characteristics of IFQ programs and fishery cooperatives differ in the areas of regulatory and management framework, number of participants, quota allocation and transfer, and monitoring and enforcement. (See table 1.)

Table 1: Differences between U.S. IFQ Programs and Fishery Cooperatives in Key Areas

Key areas	IFQ programs	Fishery cooperatives
Regulatory and management framework	• Established (and terminated) by regulations • Subject to fishery management council process	• Established (and terminated) by voluntary contractual agreements[a] • Not subject to fishery management council process
Number of participants	• Number may be large	• Number generally small
Allocation and transfer of quota	• NMFS allocates quota to eligible entities • Quota traded on the open market • New entry requirements established by regulation	• NMFS allocates quota to cooperative, which, through negotiated contract, allocates quota among members • Quota traded only within the cooperative • New entry closed at cooperative's discretion
Monitoring and enforcement	• NMFS monitors individual participants for compliance with individual TAC limits and other program rules • NMFS enforces	• NMFS monitors cooperative for compliance with TAC limits • NMFS enforces • Cooperative monitors its members for compliance with individual TAC limits and contract terms • Cooperative members can bring legal action against another member for breach of contract

Source: GAO's analysis.

[a]Certain aspects of the pollock cooperative are governed by the American Fisheries Act. For specific information on the whiting and pollock cooperatives, see appendix III.

With respect to their regulatory and management framework and number of participants, IFQ programs generally have greater stability, take longer to establish, and manage larger numbers of participants than cooperatives. IFQ programs have greater stability than fishery cooperatives because they are established and terminated by federal regulations, while cooperatives are established and terminated by voluntary contractual agreements.

IFQ programs generally take longer to establish than fishery cooperatives because of the fishery management council process. Fishery councils must review the IFQ proposal, develop alternatives and options, and analyze their potential social and economic effects before submitting the proposal to the Secretary of Commerce for approval. While the secretary is reviewing the proposal, NMFS must publish draft regulations for public comment before the secretary makes a final decision and the regulations are implemented. This process can be quite lengthy; for example, it took 3 years for the North Pacific Council to review, analyze, and adopt the proposed Alaskan halibut and sablefish IFQ program and another 3 years to implement the program. In comparison, because fishery cooperatives are voluntary, agreements can be reached within a shorter period of time. For example, the contract to form the whiting cooperative was negotiated in less than a day.

Finally, IFQ programs can manage larger numbers of diverse participants. At the end of 2002, for example, the Alaskan halibut and sablefish IFQ program had about 3,500 participants, ranging from crewmembers on small boats to owners of large freezer vessels. In contrast, according to fishery experts, fishery cooperatives work better with fewer and relatively homogeneous participants because it is difficult for members to reach agreement where there are many participants with diverse interests. For example, the whiting cooperative has four participants and the pollock cooperative has eight participants.[17] In both cooperatives, the participants are large harvesting and processing companies that own catcher-processor vessels.[18]

With respect to allocating and transferring fishing privileges, IFQ programs provide greater transparency than fishery cooperatives. Under an IFQ program, NMFS uses widely published criteria established by fishery councils to allocate quota to individual entities, such as individual fishermen or fishing firms. Under a fishery cooperative, NMFS allocates quota to the cooperative, which, through negotiated contract, distributes the quota among its members. For example, the four companies that operated catcher-processor vessels in the Pacific whiting fishery negotiated a private contract to divide up the sector's quota using catch history, vessel capacity, and number of vessels.

When quota can be transferred, IFQ programs are less exclusive than cooperatives, because they provide entry opportunities for fishermen who can find and afford to buy or lease quota. In comparison, cooperatives are exclusive contractual arrangements where quota is transferred among the members, and potential entrants may have difficulty entering the cooperative.

[17]Nine companies formed the Pollock Conservation Cooperative. One company later transferred its allocation to other member companies.

[18]Some cooperatives have more participants. In 2002, for example, 77 permit holders in the state of Alaska's Chignik salmon purse seine fishery joined a cooperative to fish sockeye salmon.

Finally, regarding monitoring and enforcement, IFQ programs are viewed as being more difficult for NMFS to administer than fishery cooperatives, because NMFS must monitor individual participants for compliance with program rules, such as quota accumulation and catch limits. In contrast, cooperatives are viewed as being simpler for NMFS to monitor and enforce, because NMFS monitors one entity—the cooperative—and the cooperative is responsible for monitoring the actions of its members.

A Combined Approach May Provide Benefits in Some Cases

For some fisheries, establishing a cooperative of quota holders within the overall framework of an IFQ program to help manage fishing may maximize the benefits of IFQ programs and fishery cooperatives while minimizing their downsides. Some of the benefits of a combined IFQ/cooperative approach are illustrated in the examples below, where groups of New Zealand quota holders formed cooperative-like organizations to help manage their fisheries, such as abalone, hoki, orange roughy, scallops, and rock lobster.

With respect to regulatory and management framework and number of participants, a cooperative of IFQ holders offers the following advantages:

- A combined approach provides the stability of an IFQ program. Because the IFQ program is set by regulations, it will remain in place even if the cooperative dissolves. Also, should the cooperative fail to perform, its management authority and responsibilities would revert to the government. For example, according to New Zealand fishery managers we spoke with, the Challenger Scallop Enhancement Company (Scallop Company) has managed the scallop fisheries effectively, but should it fail to perform, its responsibilities would return to the government.

- A combined approach can provide a way for large numbers of participants to organize into smaller groups to help manage their fisheries collectively. For example, New Zealand's rock lobster IFQ quota holders formed nine regional cooperative groups under the umbrella of the New Zealand Rock Lobster Industry Council. The council and the regional groups provide advice on management of rock lobster fisheries.

- A combined approach can provide the opportunity for fishery participants to pool information, assess stocks, achieve economies of scale in production and try other forms of cooperation. For example, a cooperative of quota holders could decide to pool their quota and fish in more economical ways, such as having only certain members fish and then distributing the proceeds among all members. Similarly, a cooperative of quota holders could agree to stop fishing in certain areas or leave some of the quota unfished to protect the resource. In New Zealand, for example, abalone quota holders agreed not to fish some of their quota, because they believed that the TAC had been set too high.

In terms of allocating and transferring fishing privileges, a combined approach offers the following advantages:

- Under a combined approach, the fishery council, rather than the cooperative, could make the difficult and often contentious decisions regarding who can hold quota and how much quota an individual receives.

- A combined approach would also provide transparency, because the IFQ program's quota allocation and transfer rules could be used to allocate quota to members of the cooperative.

- Fishery managers could reduce the exclusivity of a cooperative by requiring that the cooperative give each new quota holder the opportunity to join. For example, membership in New Zealand's stakeholder organizations is open to any entity that holds quota in the particular fishery.[19] Moreover, quota allocations are not lost if a cooperative of quota holders dissolves, because each member retains the quota allocated under the IFQ program.

In terms of monitoring and enforcement, under a combined approach, the government could give some management responsibilities to the cooperative, such as monitoring the actions of individual members for compliance with certain program rules. New Zealand officials told us that their government reduced its monitoring costs for its scallop fisheries because the Scallop Company now performs this function. Because of the size and common interests of cooperatives, members often create peer pressure to conform to program rules. Self-regulation might also decrease overall enforcement costs. Finally, a combined approach would provide the enforcement mechanisms of an IFQ program should self-regulation fail and/or should the cooperative fail to perform its other management responsibilities. New Zealand, for example, devolved most IFQ management responsibilities to the Scallop Company, but the government has not lost its management authority.

[19]These organizations can also have members who do not hold quota, such as fish processors and exporters.

Conclusions

No method will protect communities or facilitate new entry if the fishery collapses. While an IFQ is a fishery management tool put in place to protect the resource, as well as reduce overcapacity, these laudable goals may have unintended consequences: the loss of communities historically engaged in or reliant on fishing and reduced participation opportunities for entry-level fishermen or fishermen who did not qualify for quota under the initial allocation. New IFQ programs or modifications to existing programs may be designed to address these problems by incorporating community protection and new entry goals. However, because the goals of community protection and new entry run counter to the economic efficiency goals, fishery councils face a delicate balancing act to achieve all goals. It is therefore critically important for fishery councils to tailor IFQ programs to achieve efficiency and conservation as well as social objectives. However, without collecting and analyzing data on the effectiveness of the approaches used, fishery councils will not know if the program is meeting its intended goals and if mid-course adjustments need to be made.

Recommendations for Executive Action

To protect fishing communities and facilitate new entry into new or existing IFQ fisheries, we recommend that the Director of the National Marine Fisheries Service ensure that regional fishery management councils that are designing community protection and new entry methods take the following three actions:

- Develop clearly defined and measurable community protection and new entry objectives.
- Build performance measures into the design of the IFQ program.
- Monitor progress in meeting the community protection and new entry objectives.

Agency Comments and Our Evaluation

We provided a draft of this report to the Department of Commerce for review and comment. We received a written response from the Under Secretary of Commerce for Oceans and Atmosphere that included comments from the National Oceanic and Atmospheric Administration (NOAA). NOAA stated that our report was a fair and thorough assessment of community protection and new entry issues in IFQ programs. NOAA generally agreed with the report's accuracy and conclusions and agreed with the substance of the report's recommendations. NOAA's comments and our detailed responses are presented in appendix IV of this report.

NOAA indicated that it currently does not have the authority to direct the councils to adopt the report's recommendations, because it cannot direct councils to take actions that are not mandated by the Magnuson-Stevens Act. We have revised our recommendations accordingly. However, NOAA agreed with our recommendation to develop clearly defined and measurable community protection and new entry objectives. NOAA noted that clearly defined and measurable objectives are often hard to identify, objectives may vary by IFQ program, and measurable objectives require data that are not always available or regularly collected. Nonetheless, it recognized that management objectives are important and should be used as much as possible as yardsticks in developing IFQ programs. NOAA agreed with our recommendation to build performance measures into the design of the IFQ program, noting the importance of selecting feasible and appropriate performance measures. Finally, NOAA agreed with our recommendation to monitor progress in meeting the community protection and new entry objectives. NOAA wrote that provisions for the monitoring and review of new IFQ program operations are addressed in the administration's Magnuson-Stevens Act reauthorization proposal. NOAA also provided technical comments that we incorporated in the report as appropriate.

We are sending copies of this report to the Secretary of Commerce and the Director of the National Marine Fisheries Service. We will also provide copies to others upon request. In addition, the report will be available at no charge on the GAO Web site at http://www.gao.gov.

If you or your staff have any questions about this report, please call me at (202) 512-3841 or Keith Oleson at (415) 904-2218. Key contributors to this report are listed in appendix V.

Anu K. Mittal
Director, Natural Resources
and Environment

Appendix I: Scope and Methodology

This is the second in a series of reports on individual fishing quota (IFQ) programs. For this report, we reviewed foreign and domestic quota programs and fishery cooperatives to determine (1) the methods available for protecting the economic viability of fishing communities and facilitating new entry into IFQ fisheries, (2) the key issues raised by community protection and new entry methods, and (3) the comparative advantages and disadvantages of the IFQ system and the fishery cooperative approach.

For all three objectives, we visited Iceland, New Zealand, Scotland's Shetland Islands, and Alaska and Maine in the United States, where we interviewed fishery management officials, quota program participants, researchers, and industry and community representatives and visited fishing communities. We also visited the fishing communities of Kodiak and Old Harbor, Alaska; and Jonesport, Portland, Stonington, and Vinalhaven, Maine. In these communities, we interviewed fishery participants, local government officials, and community representatives, and visited fishing and fishing-related businesses. We selected these countries and U.S. fishing communities in accordance with suggestions from program managers and industry experts to obtain coverage of a range of quota-based programs and fishing communities. We also reviewed the literature on IFQ and other quota-based programs and fishery cooperatives.

To determine the methods available for protecting the economic viability of fishing communities and facilitating new entry into IFQ fisheries and the potential limitations of each method, we identified foreign and domestic programs with community protection or new entry provisions. We interviewed and obtained the views of foreign and domestic fishery management officials, program participants, researchers, and industry and community representatives on methods that are being used or could be used to protect communities and facilitate new entry, as well as the potential benefits and limitations of each method. We also searched for, but could not find, any studies and assessments of the extent to which each program has met its community protection or new entry objectives.

To determine the comparative advantages and disadvantages of the IFQ system and the fishery cooperative approach, we identified and reviewed fishery management plans, laws, and regulations related to existing IFQ and fishery cooperative programs. We also reviewed and analyzed studies and assessments of these programs and interviewed foreign and domestic fishery management officials, researchers, and industry representatives on the comparative benefits and downsides of each approach.

We conducted our review from February through October 2003 in accordance with generally accepted government auditing standards.

Appendix II: Descriptions of Selected Individual Fishing Quota (IFQ) Programs

This appendix describes IFQ programs in Iceland, New Zealand, and Scotland's Shetland Islands, as well as the U.S. Mid-Atlantic surfclam/ocean quahog IFQ program and the U.S. Alaskan halibut and sablefish IFQ program. The term individual fishing quota as used in this report includes individual transferable quota (ITQ) and individual vessel quota (IVQ).

Iceland

Iceland's economy depends heavily on the fishing industry, which provides 70 percent of export earnings and employs 12 percent of the work force. Iceland excluded foreign fishermen from its waters in the 1970s, when it introduced its exclusive economic zone. Nevertheless, cod, Iceland's main commercial fish stock, had collapsed and other essential stocks were reported to be near collapse by the 1980s.

In 1984, Iceland introduced individual fishing quotas for its major fisheries. Fishermen indirectly hold quota in Iceland because Iceland's individual fishing quotas are linked to fishing vessels rather than persons. In 1990, Iceland allowed quota to be sold and leased, transforming IFQs into individual transferable fishing quota. According to fishery experts and managers, the fish in Iceland are property of the Icelandic people rather than individual quota holders. As such, quota allocations are indefinite in duration and could be revoked by the Icelandic Parliament at any time.

While not explicitly designed with such objectives, Iceland's IFQ program used the following provisions to protect communities and encourage new entry:

- *Community right of first refusal.* This rule provides communities with the right to veto the transfer of fishing vessels and associated quota to someone outside of the community. To stop the sale, the community must purchase the vessel at the market rate.

- *Emergency community quota allocations*. Iceland allocates small blocks of quota to communities hurt by the transfer of quota from their area.

- *Separate quota markets for large and small vessels*. To help protect small vessels, Iceland divided its IFQ system into two quota markets—one for large vessels and another for small vessels. Quota allocated to small vessels cannot be transferred to large vessels, and quota allocated to large vessels cannot be transferred to small vessels. Also, small-vessel fishermen can choose to fish a pre-set number of fishing days (days-at-sea), instead of participating in the IFQ system.

New Zealand

Seafood is New Zealand's fourth largest export, after dairy, meat, and forestry. In 2000, seafood exports were worth about NZ$1.43 billion and accounted for 90 percent of industry revenue.

New Zealand introduced individual fishing quotas in 1986 for some of the most economically significant species to prevent overfishing in the inshore fisheries while developing the unexplored deepwater fisheries. Under the resulting quota management system, New Zealand manages about 50 species, such as hoki, orange roughy, and scallops. New Zealand's IFQ fish accounted for about 95 percent of the fishing industry's value in 2003.

New Zealand's system allows fishermen to buy or sell quota, as well as lease quota on an annual basis.[1] Fishery managers initially established quota accumulation limits for the inshore and deepwater fisheries. Furthermore, the allocation of quota changed from weight to a percentage of the total allowable commercial catch in 1990.

According to New Zealand fishery managers, community protection was not an objective of the quota management system, and New Zealand has few fishing-dependent communities. However, the New Zealand government allocated quota to the indigenous Maori tribes as part of the settlement agreements resolving claims of ownership of the fisheries under the Treaty of Waitangi Fisheries Commission. The commission is leasing quota to fishermen while it develops a formula to distribute quota to the Maori. Key barriers to reaching agreement on this distribution formula include identifying membership in tribes and agreeing on how much quota each tribe should receive.

In recent years, groups of quota holders have joined together in cooperative-like organizations to help manage some of the fish stocks under the quota management system. This co-management by government and industry has led to the formation of key stakeholder groups in fisheries such as hoki, orange roughy, rock lobster, and scallops.

Shetland Islands, Scotland (United Kingdom)

Fishing is integral to the economy and culture of Scotland's Shetland Islands. In 1999, the value of the Shetland Islands' fishing industry accounted for approximately one-fifth of the Shetland Islands' economy

[1] New Zealand allows individuals to buy or sell an annual catch entitlement (ACE). This trading of ACE is theoretically equivalent to leasing quota for 1 year.

and provided over 2,500 jobs. As part of the United Kingdom, Scotland is party to the Common Fisheries Policy of the European Union. The United Kingdom receives catch quotas for each species from the European Union and then allocates portions of these quotas to groups of fishermen known as producer organizations, such as the Shetland Fish Producers Organization. The United Kingdom manages quotas under a fixed quota allocation, an individual fishing quota that, in practice, allows quota trades.

In the 1990s, because of concerns about high quota prices and foreigners holding local quota, the Shetland Islands' fishing industry developed the Shetland Community Fish Quota scheme to protect its fishermen.[2] The Shetland Fish Producers Organization created and manages two pools of quota for Shetland Islands fishermen, one for member fishermen and one for new entrants. Using oil settlement monies, the local government purchased quota for the community fish quota pool. This quota pool is available to those who have no quota as well as those who need additional quota to participate in the fishery. In 2002, 13 vessels used the pool, more than half receiving their entire quota from the pool. The producers organization charges a fee based on gross earnings rather than a fixed-term lease. Thus, new entrants are charged only for fish landed and are not penalized for leasing quota they cannot fish. The fee is based on the ratio of quota held to quota borrowed. Table 2 shows how this fee is charged.

Table 2: Leasing Fees under the Shetland Community Fish Quota Scheme

Percent of quota borrowed	Percent of quota already held	Fee charged (based on revenues from landings)
100	0	6.0% of all landings
80	20	4.8% on 80% of the landings
50	50	3.0% on 50% of the landings
20	80	1.2% on 20% of the landings

Source: GAO analysis of Shetland Fish Producers' Organization data.

[2]The European Union found that parts of this scheme were noncompliant, largely because it gives preferential treatment to Shetland fishermen. Fishery managers are currently working to modify the scheme in order to continue community ownership of quota.

U.S. Mid-Atlantic Surfclam/Ocean Quahog IFQ Program

The surfclam/ocean quahog fishery is a small, industrialized fishery primarily located in the waters from Maine to Virginia, with commercial concentrations found off the Mid-Atlantic states. The ocean quahog fishery arose as a substitute for surfclams when the surfclam fishery declined in the mid 1970s. While ocean quahogs are found further off shore than surfclams, the same vessels are largely used in each fishery. The surfclam fishery developed after World War II and was being overfished by the mid 1970s. Disease and industry overfishing led the Mid-Atlantic Fishery Management Council to develop a plan to manage the fishery. The surfclam/ocean quahog fishery consists of small, independent fishermen and vertically integrated companies.

Individual fishing quotas were established for the surfclam/ocean quahog fishery in 1990; it was the first IFQ program in the United States. The program was not designed nor does it have specific objectives aimed at protecting fishing communities or facilitating new entry; rather, it was designed to help stabilize the fishery and reduce excessive investment in fishing capacity. The program included no specific and measurable limits on how much quota an individual could accumulate. However, allowing quota to be sold and leased provides the opportunity for entry into the fishery.

U.S. Alaskan Halibut and Sablefish IFQ Program

The Pacific halibut and sablefish fisheries are located off the coast of Alaska. The fishing fleets are primarily owner-operated vessels of various lengths that use hook and line or pot (fish trap) gear. Some vessels catch both halibut and sablefish, and, given the location of both species, they are often caught as incidental catch of one another. Overcapacity of fishing effort led to fishing seasons that lasted less than 3 days and a race to catch fish.

The Alaskan halibut and sablefish IFQ program was implemented in 1995, shortly before Congress placed a moratorium on new IFQ programs. The program was designed, in part, to help improve safety for fishermen, enhance efficiency, and reduce excessive investment in fishing capacity. The IFQ program includes the following community protection or new entry provisions:

- *Community quota*. When the program was implemented, the council set aside quota for a community development program to develop fishing and fishing-related activities in villages in western Alaska. In 2002, the council amended the IFQ program to allow certain Gulf of Alaska coastal communities to buy Alaskan halibut and sablefish quota.

- *Accumulation limits*. The North Pacific Council adopted accumulation limits ranging from 0.5 percent to 1.5 percent, depending on the fishing area, to help protect the fisheries' owner-operator fleet, which operates out of smaller communities.

- *Vessel categories*. The quota for each person eligible to receive quota was permanently assigned to one of four vessel categories based on vessel type and length.

- *Quota blocks*. The council permanently placed small amounts of quota in blocks, in part, to help make quota available and affordable for entry-level fishermen. Large amounts of quota remained unblocked. Blocks can only be bought or transferred in their entirety. An individual can hold two quota blocks; an individual who holds any amount of unblocked quota can only hold one quota block.

- *Crew consideration*. Eligibility to obtain most quota by transfer is limited to those who have 150 days of experience participating in any U.S. fishery.

Appendix III: Descriptions of Selected U.S. Fishery Cooperatives

A fishery cooperative is a group of fishermen who agree to work together for their mutual benefit. Two fishery cooperatives emerged as an alternative to IFQ programs in U.S. federal waters: (1) the Whiting Conservation Cooperative, established in 1997 and (2) the Bering Sea Pollock Conservation Cooperative, established in 1998. These cooperatives are voluntary contractual agreements among fishermen to apportion shares of the catch among themselves. Fishery cooperatives operate under the Fishermen's Collective Marketing Act of 1934 (15 U.S.C. § 521), which provides an antitrust exemption to fishermen, allowing them to jointly harvest, market, and price their product.

Whiting Conservation Cooperative

The Pacific whiting fishery, located off the coasts of Washington, Oregon, and California, is under the jurisdiction of the Pacific Fishery Management Council. Whiting is harvested using mid-water trawl nets (cone-shaped nets towed behind a vessel) and primarily processed into surimi. The council has divided the Pacific whiting total allowable catch (TAC) among three sectors—vessels that deliver to onshore processors, vessels that deliver to processing vessels, and vessels that catch and also process.

In the 1990s, the fishery was overcapitalized and fishing companies were engaged in a race for fish. In 1997, four companies operating the 10 catcher-processor vessels in the fishery voluntarily formed the Whiting Conservation Cooperative, which is organized as a nonprofit corporation under the laws of the state of Washington. The overall purposes of the cooperative are to (1) promote the intelligent and orderly harvest of whiting, (2) reduce waste and improve resource utilization, and (3) reduce incidental catch of species other than whiting. The specific goals are to (1) eliminate the race for fish and increase efficiency, (2) improve the efficiency of the harvest by using an independent monitoring service and sharing catch and incidental catch information, and (3) conduct and fund research for resource conservation. The cooperative is not involved in matters relating to pricing or marketing of whiting products.

The cooperative's contract allocates the Pacific whiting TAC for the catcher-processor sector among the cooperative's members, who agree to limit their individual harvests to a specific percentage of the TAC. Once individual allocations are made, the contract allows for quota transfers among member companies. To monitor the catch, the contract requires the members to maintain full-time federal observers on their vessels. Member companies bear the cost of observer coverage. The contract also requires members to report catches to a private centralized monitoring service. To ensure compliance, the contract contains substantial financial penalties for members exceeding their share of the quota.

Pollock Conservation Cooperative

The pollock fishery off the coast of Alaska is the largest U.S. fishery by volume. The fishery is under the jurisdiction of the North Pacific Fishery Management Council, which sets the TAC each year. About 5 percent of the TAC is held in reserve to allow for the incidental taking of pollock by other fisheries, 10 percent is allocated to Alaska's community development quota program, and the remainder, called the directed fishing allowance, is allocated to the pollock fishery. Like whiting, pollock is harvested using mid-water trawl nets. Pollock swim in large, tightly packed schools and do not co-mingle with other fish species. Pollock are primarily processed into surimi and fillets. In the 1990s, the Bering Sea pollock fishery was severely overcapitalized, producing a race for fish. As a result, the fishing season was reduced from 12 months in 1990 to 3 months in 1998.

The fishery is composed of three sectors—inshore, offshore catcher-processor, and offshore mothership (large processing vessel).[1] The American Fisheries Act[2] statutorily allocated the pollock fishery TAC among these three sectors and specified the eligible participants in each sector.[3] The nine companies that operated the 20 qualified catcher-processor vessels formed the Pollock Conservation Cooperative in December 1998.[4] The purpose of the cooperative was to end the race for fish.

Under the cooperative's agreement, members limit their individual catches to a specific percentage of the total allowable catch allocated to their sector. Once the catch is allocated, members can freely transfer their

[1]The inshore sector is comprised of catcher vessels harvesting pollock for processing plants located on or near the shore. The offshore catcher-processor sector is comprised of catcher-processor vessels (vessels that both catch and process pollock) and catcher vessels catching pollock for processing by catcher-processors. The offshore mothership sector consists of catcher vessels harvesting pollock for processing by motherships (large vessels that process but do not catch fish).

[2]Pub. L. No. 105-277, Division C, tit. II (1998).

[3]The inshore sector received 50 percent of the directed fishing allowance; the offshore catcher-processor sector received 40 percent; and the offshore mothership sector received 10 percent.

[4]Four of the companies are also members of the Whiting Conservation Cooperative.

quota to other members. The American Fisheries Act requires each catcher-processor vessel to have two federal observers on board at all times. Member companies bear the cost of observer coverage on their vessels. A private sector firm also tracks daily catch and incidental catch data to ensure that each member stays within its agreed upon harvest limits. To ensure compliance, the contract contains substantial financial penalties for members exceeding their share of the quota. The cooperative is not involved in matters relating to pricing or marketing of pollock products.

In addition to operating under the terms of the cooperative's contract, members of the cooperative must conduct fishing activities in compliance with certain NMFS and council requirements. Specifically, NMFS is responsible for closing the fishery when the sectoral allocation is reached. NMFS and the council set the season, impose restrictions against fishing in certain areas and at certain times, and set incidental catch limits for other species.

Appendix IV: Comments from the Department of Commerce

Note: GAO comments supplementing those in the report text appear at the end of this appendix.

UNITED STATES DEPARTMENT OF COMMERCE
The Under Secretary of Commerce
for Oceans and Atmosphere
Washington, D.C. 20230

FEB - 6 2004

Ms. Anu K. Mittal
Director, Natural Resources
and Environment
United States General Accounting Office
Washington, D.C. 20548

Dear Ms. Mittal:

Thank you for the opportunity to review and comment on the General Accounting Office's draft report entitled, "Individual Fishing Quotas: Methods for Community Protection and New Entry Require Periodic Evaluation," GAO-04-277. Enclosed is the National Oceanic and Atmospheric Administration's comments on the draft report.

These comments were prepared in accordance with the Office of Management and Budget Circular A-50.

Sincerely,

Conrad C. Lautenbacher, Jr.
Vice Admiral, U.S. Navy (Ret.)
Under Secretary of Commerce for
Oceans and Atmosphere

Enclosure

THE ADMINISTRATOR

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NOAA Comments on the Draft GAO Report Entitled "Individual Fishing Quotas: Methods for Community Protection and New Entry Require Periodic Evaluation" (GAO-04-277/February 2004)

Recommended Changes for Factual Information

NOAA finds that the draft GAO report on individual fishing quotas (IFQs) was well researched through field trips and literature searches and did not contain any significant errors of factual information.

General Comments

The draft GAO report on IFQs does a fair and thorough job in assessing community protection and new entrant issues in IFQ programs. The report's discussion of the various methods available to the Regional Fishery Management Councils (hereafter referred to "Councils") and the Secretary of Commerce as delegated to the National Marine Fisheries Service (hereafter referred to "NOAA Fisheries") to achieve these objectives is generally well-informed, thorough, and balanced. At the same time, the draft report seems to draw almost exclusively from information on programs in Alaska, New Zealand, and Iceland, while the United States also has IFQ programs in the Mid-Atlantic and South Atlantic. In addition, the Gulf of Mexico Fishery Management Council has worked for years on an IFQ program in the red snapper fishery. Finally, the draft report did not review the British Columbia (Canada) individual vessel quota program for Pacific halibut, which served as a model for the Alaskan halibut and sablefish IFQ program.

NOAA believes that the most important sections of the report deal with remedial measures and the issues raised by these programs. There are many methods of dealing with community protection and new entrants, and practically all of them present a host of policy and implementation issues. The most serious issue is the tension that many of these protective measures create between economic efficiency and social equity. Notably, the draft report acknowledges that managers will have a difficult time choosing between the two goals, in large part, because the practical outcomes of proposed measures may be unknown. In light of all these uncertainties, the draft report correctly avoids endorsing any specific policy or course of action, but calls instead on NOAA Fisheries and the Councils to develop more clearly defined objectives, to build performance measures into IFQ programs, and to monitor progress. Given all the questions attached to the proposed remedies, NOAA Fisheries finds that these kinds of recommendations are probably as far as we can go at the present time and in the foreseeable future.

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See comment 1.

See comment 2.

See comment 3.

See comment 4.

Specific Comments

Page 6, bulleted list:
The list of National Standards could be expanded by adding National Standards 7, 9, and 10 (dealing respectively with cost minimization, by-catch, and safety-at-sea), which also have implications for IFQ programs.

Page 7, paragraph 1:
At the end of the first paragraph, add the following: "Additionally, NMFS is preparing a draft proposed rule to implement a Council recommendation to include the guided sport sector in the commercial halibut IFQ program (this is the first known application of an IFQ program to a sport fishery). Up to two percent of the combined commercial and guided sport halibut quota will be set aside for certain Gulf of Alaska coastal communities for two years to encourage development of additional guided sport operators."

Page 8, paragraph 1, line 2:
Note that the fishing season was increased to eight (not ten) months. It has since been expanded by an additional two weeks.

Page 18, bottom of page:
Footnote 13 is not completely accurate. The North Pacific Council, while managing fisheries in waters off one state (Alaska), still manages access by fishermen from other states (e.g., Washington).

NOAA Response to GAO Recommendations

The GAO report states, "To protect fishing communities and facilitate new entry into new or existing IFQ fisheries, we recommend that the Director of the National Marine Fisheries Service direct regional fishery management councils that are designing community protection and new entry methods to take the following three actions:"

NOAA Response: NOAA agrees in substance with this recommendation, but notes one important point relating to the relationship between NOAA Fisheries and the Councils. The current obligations of the Councils with respect to fishing communities and new entrants in IFQ programs are spelled out in the Magnuson-Stevens Fishery Conservation and Management Act (MSA), especially in sections 301(a)(8) and 303(d). NOAA Fisheries can only "direct" the Councils to develop plans that are in conformity with the MSA and other applicable law. Conversely, the Councils cannot be directed to undertake actions that are not mandated. However, it should be noted that the Administration's June 2003 MSA re-authorization proposal would require new Council IFQ programs to the extent practicable to maintain the basic cultural and social framework of the fishery and the sustained participation of dependent fishing communities. The proposal also includes requirements for measures to assist participation of entry-level and small scale fishermen, captains, and crew, and provisions for the regular review

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and monitoring of program operations. These proposed legislative requirements are consistent with the intent of the GAO recommendations.

Recommendation 1: "Develop clearly defined and measurable community protection and new entry objectives."

NOAA Response: NOAA agrees that management objectives are important and should be used as much as possible as yardsticks in developing IFQ programs. However, "clearly defined and measurable... objectives" are often hard to identify. Objectives may vary from one IFQ program to another (a fact noted in the draft report's discussion of the surfclam/ocean quahog and Alaskan halibut/sablefish programs), and measurable objectives require data that are not always available or regularly collected. NOAA Fisheries will formally request that all Councils preparing new IFQ programs include clearly defined and measurable objectives that address community protection and new entrants.

Recommendation 2: "Build performance measures into the design of the IFQ program."

NOAA Response: NOAA agrees with this recommendation and will formally request that all Councils preparing new IFQ programs include performance measures in the design of these programs. A critical task will then be the selection of feasible and appropriate performance measures. "Performance standards" already exist in the Alaskan halibut and sablefish IFQ program and the western Alaska and community development quota (CDQ) programs. However, it is not clear that these "performance standards" are the same as "performance measures" proposed by GAO. More fundamentally, the term "performance measures" could be used, perhaps inappropriately, as yardsticks to judge the success or failure of IFQ programs. For example, performance measures could place too much responsibility on IFQs for changes in the structure of fishing communities that were brought about by other factors. Finally, performance measures may be a crude and inexact way to distinguish between efficiency and equity objectives. For example, measures to protect communities and facilitate new entrants may succeed, but at the expense of excessive lost efficiency.

Recommendation 3: "Monitor progress in meeting the community protection and new entry objectives."

NOAA Response: NOAA agrees with this recommendation and notes that provisions for the monitoring and review of new IFQ program operations are addressed in the Administration's MSA re-authorization proposal. NOAA will write to the Councils, formally urging them to implement this recommendation.

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The following are GAO's comments on NOAA's written comments provided by the Under Secretary of Commerce for Oceans and Atmosphere's letter dated February 6, 2004.

GAO Comments

1. The report provided examples of National Standards relating to issues discussed in the report (overfishing, equity, efficiency, community protection, and new entry). We did not include National Standards relating to cost minimization, by-catch, and safety-at-sea, because we did not discuss these issues in the report.

2. We revised the text to make it clear that we were providing examples of commercial fisheries where new IFQ programs were being considered.

3. We revised the text to reflect that the halibut season was increased to 8 months.

4. We deleted the footnote relating to the uniqueness of Alaska, which is regulated by the North Pacific Council, from states covered by the other fishery councils, which regulate fisheries in multiple states.

Appendix V: GAO Contact and Staff Acknowledgments

GAO Contact

Keith W. Oleson, (415) 904-2218

Staff Acknowledgments

In addition to those named above, Doreen S. Feldman, John S. Kalmar, Jr., Susan J. Malone, Mark R. Metcalfe, Carol Herrnstadt Shulman, and Tama R. Weinberg made key contributions to this report.

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PRINTED ON RECYCLED PAPER

59296 **Federal Register** / Vol. 70, No. 196 / Wednesday, October 12, 2005 / Proposed Rules

SUPPLEMENTARY INFORMATION: This is a synopsis of the Commission's *Report and Order*, MB Docket No. 02–295, adopted September 23, 2005, and released September 26, 2005. The full text of this Commission decision is available for inspection and copying during normal business hours in the FCC's Reference Information Center at Portals II, 445 12th Street, SW., Room CY–A257, Washington, DC, 20554. The document may also be purchased from the Commission's duplicating contractor, Best Copy and Printing, Inc., Portals II, 445 12th Street, SW., Room CY–B402, Washington, DC 20554, telephone 1–800–378–3160 or *http://www.BCPIWEB.com*. This document is not subject to the Congressional Review Act. (The Commission is, therefore, not required to submit a copy of this *Report and Order* to GAO pursuant to the Congressional Review Act, *see* 5 U.S.C. 801(a)(1)(A), because the proposed rule is dismissed.)

Federal Communications Commission.

John A. Karousos,

Assistant Chief, Audio Division, Media Bureau.

[FR Doc. 05–20210 Filed 10–11–05; 8:45 am]

BILLING CODE 6712–01–P

DEPARTMENT OF COMMERCE

National Oceanic and Atmospheric Administration

50 CFR Part 660

[Docket No. 050921244–5244–01; I.D. 091305A]

RIN 0648–AP38

Fisheries Off West Coast States and in the Western Pacific; Pacific Coast Groundfish Fishery; Limited Entry Fixed Gear Sablefish Fishery Permit Stacking Program

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

ACTION: Proposed rule; request for comments.

SUMMARY: NMFS issues this proposed rule to implement portions of Amendment 14 to the Pacific Coast Groundfish Fishery Management Plan (FMP) for 2007 and beyond. Amendment 14, approved by NOAA in August 2001, created a permit stacking program for limited entry permits with sablefish endorsements. This proposed rule would implement regulatory measures from Amendment 14 that the agency could not set in place in time for the 2001 through 2006 primary sablefish seasons. Amendment 14 was intended to improve safety in the primary sablefish fishery and to provide greater season flexibility for sablefish fishery participants.

DATES: Comments must be submitted in writing by December 12, 2005.

ADDRESSES: You may submit comments on the proposed rule to implement further limited entry sablefish permit stacking program regulations, identified by 091305A, by any of the following methods:

- E-mail: *Amendment14b.nwr@noaa.gov*. Include I.D 091305A in the subject line of the message.
- Federal eRulemaking Portal: *http://www.regulations.gov*. Follow the instructions for submitting comments.
- Fax: 206–526–6736, Attn: Jamie Goen
- Mail: D. Robert Lohn, Administrator, Northwest Region, NMFS, 7600 Sand Point Way NE., Seattle, WA 98115–0070

Copies of Amendment 14 and its Environmental Assessment/Regulatory Impact Review (EA/RIR) are available from Donald McIsaac, Executive Director, Pacific Fishery Management Council (Council), 7700 NE Ambassador Place, Portland, OR 97220. Copies of the Supplemental Initial Regulatory Flexibility Analysis (IRFA) are available from D. Robert Lohn, Administrator, Northwest Region, NMFS, 7600 Sand Point Way NE., Seattle, WA 98115–0070.

Send comments on the reporting burden estimate or any other aspect of the collection-of-information requirements in this proposed rule to Jamie Goen or Kevin Ford, Northwest Region, NMFS, and to David Rostker, Office of Management and Budget (OMB), by e-mail at *David__Rostker@omb.gov*,or fax to 202–395–7285.

FOR FURTHER INFORMATION CONTACT: Jamie Goen or Kevin Ford (Northwest Region, NMFS), phone: 206–526–4646 or 206–526–6115; fax: 206–526–6736 and; e-mail: *jamie.goen@noaa.gov* or *kevin.ford@noaa.gov*.

SUPPLEMENTARY INFORMATION:

Electronic Access

This **Federal Register** document is also accessible via the internet at the website of the Office of the **Federal Register**: *http://www.gpoaccess.gov/fr/index.html*.

NMFS is proposing this rule to implement those portions of Amendment 14 to the FMP that NMFS was unable to implement in time for the 2001 through 2006 primary sablefish seasons. Amendment 14 implemented a permit stacking program for limited entry permits with sablefish endorsements. This proposed rule is based on recommendations of the Council, under the authority of the Pacific Coast Groundfish FMP and the Magnuson-Stevens Fishery Conservation and Management Act (Magnuson-Stevens Act). The portions of Amendment 14 that were implemented for the 2001 primary sablefish season significantly increased safety in the fishery, allowed individual fishery participants to more fully use their existing vessel capacity, and reduced overall capacity in the primary fixed gear sablefish fishery. This proposed rule would not change any of those benefits, but would further complete the implementation of Amendment 14 by preventing excessive fleet consolidation, ensuring processor access to sablefish caught in the primary season, and maintaining the character of the fleet through owner-on-board requirements. The background and rationale for the Council's recommendations are summarized below. The discussion below also explains why NMFS will not be implementing the Council's recommendation for a hail-in requirement for vessels delivering primary season sablefish. Furthermore, it summarizes some modifications to the permit stacking program that the Council is considering for future implementation.

Further detail appears in the EA/RIR prepared by the Council for Amendment 14 and in the proposed and final rule to implement Amendment 14 for the 2001 primary sablefish season. The proposed rule for the 2001 season was published on June 8, 2001 (66 FR 30869), the final rule was published on August 7, 2001 (66 FR 41152), and a correction to the final rule was published on August 30, 2001 (66 FR 45786).

Background

For many years, sablefish harvested by the limited entry, fixed gear fleet north of 36° N. lat. has been separated into a small, year-round daily trip limit fishery and a primary season fishery (from April 1 through October 31). Annually, about 85 percent of the limited entry fixed gear sablefish allocation has been taken in the primary season fishery. Before 1997, the Council managed harvest in the primary season fishery without vessel cumulative limits by setting the season length short enough to ensure that the fishery would not exceed its quota. Capitalization in the fixed gear sablefish fleet increased over time and the Council needed to set ever shorter primary seasons to control catch levels. By 1996, the fleet was able to take the bulk of the primary season sablefish catch in a 5 day fishery.

This evolution to a derby-style fishery induced the Council to make a series of management changes intended to rationalize fishing effort and improve safety for primary season fishery participants. Amendment 9 to the FMP introduced a sablefish endorsement program that limited the number of vessels allowed to participate in the primary season fishery. Limited entry permit holders with at least 16,000 lb (7,257 mt) of sablefish landed in any one year from 1984 through 1994 received sablefish endorsements. This program was intended to restrict primary season fishery participation to those permit holders with historical participation in and dependence upon the sablefish fishery.

Following Amendment 9, the Council further separated participation in the primary season sablefish fishery by introducing the three-tier program in 1998. This program divided sablefish-endorsed permits into 3 tiers based on historical landings associated with those permits. Under the three-tier program, a participant in the primary season may land an amount of sablefish up to the cumulative limit associated with his/her permit. Qualifications for each of the 3 tiers were based on the cumulative sablefish landings associated with a permit over the same 1984 through 1994 period: at least 898,000 lb (407.33 mt) to qualify for Tier 1, less than 898,000 lb (407.33 mt) but more than 380,000 lb (172.36 mt) to qualify for Tier 2, and less than 380,000 lb (172.36 mt) but at least the minimum 16,000 lb (7,257 mt) to qualify for Tier 3. The three-tier system also set a between-tier ratio to describe the relationship between the cumulative limits that would be available to each tier during the primary season fishery. That ratio is 1 (Tier 3): 1.75 (Tier 2):3.85 (Tier 1). For example, if Tier 3 had a cumulative limit of 10,000 lb (4,536 mt), Tier 2 would have a corresponding cumulative limit of 17,500 lb (7,938 mt), and Tier 1 would have a corresponding cumulative limit of 38,500 lb (17,463 mt).

While the three-tier program somewhat slowed the pace of the primary season fishery, the season was still less than 10 days long in each of the primary seasons from 1998 to 2000. Even under the three-tier program, the Council had to set the seasons short enough to ensure that not all participants would be able to catch the full cumulative limits of sablefish associated with their permits. A fishery where all participants have the opportunity to catch a cumulative limit and all are able to catch that limit is an Individual Fishing Quota (IFQ) fishery as defined by the Magnuson-Stevens Act. At the time, the Magnuson-Stevens Act, as amended by Public Law 106–554, included a moratorium on the implementation of new IFQ programs through October 1, 2002. (The moratorium has since been lifted). However, via Public Law 106–554, Congress exempted from the moratorium a Pacific Council IFQ program for the fixed gear sablefish fishery that: (1) allows the use of more than one limited entry groundfish permit per vessel; and/or (2) sets cumulative trip limit periods, up to 12 months in any calendar year, that allow fishing vessels a reasonable opportunity to harvest the full amount of the associated trip limits. Amendment 14 to the FMP implements a permit stacking program that meets these moratorium exemption requirements.

Amendment 14

The Council approved Amendment 14 at its November 2000 meeting and clarified its intent on implementing Amendment 14 at its November 2001 and April 2002 meetings. Amendment 14 introduced a permit stacking program to the limited entry, fixed gear primary sablefish fishery. Under this permit stacking program, a vessel owner may register up to 3 sablefish-endorsed permits for use with their vessel to harvest each of the primary season sablefish cumulative limits associated with the stacked permits. By exempting the Pacific Coast fixed gear permit stacking program from the IFQ moratorium, Congress removed the need to set short seasons designed to prevent participants from catching their full cumulative limits. Amendment 14 allows a season up to 7 months long, from April 1 through October 31, which allows an ample period for vessels to pursue their primary season sablefish cumulative limits. Beginning in 2002, NMFS implemented the full April 1 through October 31 season via the Pacific Coast groundfish final specifications and management measures published on March 7, 2002 (67 FR 10490).

Provisions subject to the regulatory review process required under the Paperwork Reduction Act (PRA) and a longer NMFS application and permitting process were reserved for a second set of proposed regulations for 2002 and beyond. In its June 8, 2001, proposed rule, NMFS announced its intention to divide Amendment 14 implementation into two separate regulatory processes. Implementation of this latter portion of Amendment 14 was further postponed in 2002 to allow time for NMFS to return to the Council for further clarification. On February 14, 2002, NMFS notified fixed gear permit holders by letter to let them know the agency would be requesting further clarification from the Council. NMFS received further clarification at the Council's April 2002 meeting.

The regulatory changes proposed with this **Federal Register** document would implement permit stacking regulations that include the following provisions: permit owners and permit holders would be required to document their ownership interests in their permits to ensure that no person holds or has ownership interest in more than 3 permits; an owner-on-board requirement for permit owners who did not own sablefish-endorsed permits as of November 1, 2000; an opportunity for permit owners to add a spouse as co-owner; vessels that do not meet minimum frozen sablefish historic landing requirements would not be allowed to process sablefish at sea; permit transferors would be required to certify sablefish landings during mid-season transfers; and, a definition of the term ''base permit.''

Documenting Permit Ownership Interest and Adding a Spouse as Co-owner

Amendment 14 includes several ownership-related provisions. (1) No partnership or corporation may own a sablefish-endorsed limited entry permit unless that partnership or corporation owned a sablefish-endorsed permit as of November 1, 2000 (also referred to as grandfathered or first generation permit owner). NMFS announced this November 1, 2000, control date in an Advance Notice of Proposed Rulemaking on April 3, 2001 (66 FR 17681). Partnerships or corporations that owned permits as of November 1, 2000, may continue to have ownership interest in those same permits and may purchase or hold additional permits up to the 3–permit limit; however, partnerships or corporations that owned a permit before November 1, 2000, and subsequently sell all of their sablefish-endorsed permits, will lose the privilege of continuing to own sablefish-endorsed permits if they do not buy another permit within one year. Any permits sold after November 1, 2000, may only be sold to an individual person or to partnerships or corporations that had ownership interest in a sablefish-endorsed permit before November 1, 2000.

(2) No person, partnership, or corporation in combination may have ownership interest in or hold more than 3 sablefish-endorsed permits either simultaneously or cumulatively over the primary season, except for an individual person, or partnerships or corporations that had ownership interest in more than 3 sablefish-endorsed permits as of November 1, 2000. An individual person, or partnerships or corporations that had ownership interest in 3 or more sablefish-endorsed permits as of November 1, 2000, may not acquire additional permits either by purchase or holding beyond those sablefish-endorsed permits owned on November 1, 2000, until they own fewer than 3 permits; at that time they may acquire additional permits but may not exceed the ownership cap of 3 permits.

(3) A partnership or corporation will lose the exemptions provided in paragraphs (1) and (2) of this section on the effective date of any change in the ownership of a corporation or partnership from that which existed on November 1, 2000. [Note: In cases where multiple corporations or partnership are listed on a permit, NMFS will treat them as one new entity for purposes of the permit count and grandfathered status. For example, if Smith, Inc. and Jones, Inc. are listed as owning a permit together since before November 1, 2000, they will be grandfathered as ''Smith, Inc. and Jones, Inc.'' and this entity will be counted as owning that 1 permit. If Jones, Inc. did not also own a permit on its own before November 1, 2000, it would not be a grandfathered corporation and could not own a permit after November 1, 2000. Any change in Smith, Inc. and/or Jones, Inc. would affect ''Smith, Inc. and Jones, Inc.'' as listed on the permit.] A ''change'' in the partnership or corporation means the addition of a partner or shareholder to the corporate or partnership membership. This definition of ''change'' will apply to any person added to the corporation or partnership since November 1, 2000, including any family member of an existing shareholder or partner. A change in membership is not considered to have occurred if a member dies or becomes legally incapacitated and a trustee is appointed to act on his behalf, nor if the ownership of shares among existing members changes, nor if a member leaves the corporation or partnership and is not replaced. Changes in the ownership of publicly held stock will not be deemed changes in ownership of the corporation. Changes in the partnership or corporation must be reported to NMFS' Sustainable Fisheries Division (SFD) within 15 days of the addition of a new partner or shareholder.

(4) An individual person who did not own a sablefish-endorsed permit as of November 1, 2000, and who purchases a sablefish-endorsed permit after November 1, 2000, will be required to be on board the vessel registered for use with the permit when that vessel is fishing for sablefish against the primary sablefish tier limits associated with the permit(s) registered for use with that vessel. (Also known as the ''owner-on-board'' requirement.)

To implement these four major permit ownership provisions, NMFS will need to determine which individuals have an ownership interest in the partnerships and corporations that own and/or hold sablefish-endorsed permits. As of November 2000, about 40 partnerships or corporations were owners of sablefish-endorsed permits (this number only includes business entities denoted as corporation, general partnership, limited partnership, etc.). Similarly, about 40 partnerships or corporations were holders of sablefish-endorsed permits with seven of those being different from the partnerships or corporations that were given as permit owners. Once NMFS obtains the names of all of the individuals who had ownership interest in a sablefish-endorsed permit as of November 1, 2000, as well as all of the individuals that had ownership interest in or held a sablefish endorsed permit after November 1, 2000, the agency will be better able to implement the Amendment 14 provision that restricts the number of permits each person has ownership interest in or holds to three permits. If a person who has not owned all their permits since November 1, 2000, is found to have ownership interest in or hold more than 3 permits, NMFS will void all current permits, including any grandfathered permits owned or held by partnerships or corporations, and reissue all permits in an ''unidentified'' status meaning that the permits cannot be fished, until such time as that individual can prove they have ownership interest in or hold no more than 3 permits. [Note: A permit cannot be fished if it is in ''unidentified'' status. The permit must be registered for use with the vessel being used to land the groundfish as specified in 50 CFR 660.333(a).] For example, if a person is found to have ownership interest in five permits, three of which were owned as of November 1, 2000, NMFS will issue all five permits, including any permits shared with other individuals, partnerships or corporations, into ''unidentified'' status until that person sells at least two of their permits so that they own or hold no more than three permits. If a person had ownership interest in five permits as of November 1, 2000, and still has ownership interest in those five permits and does not own or hold additional permits, none of the permits would be moved into the ''unidentified'' status.

While the Council recommended that permit owners would be required to document their ownership interests in their permits to ensure that no person holds or has ownership interest in more than 3 permits, NMFS has determined that permit holders that are corporations or partnerships would also be required to document their ownership interests for purposes of the permit count which was implemented with the first round of permit stacking regulations in August 2001. Therefore, NMFS has interpreted the Council's recommendation to not just require permit owners, but also permit holders to document their ownership interests in their permits to ensure that no person holds or has ownership interest in more than 3 permits. For purposes of establishing the permit count for each permit owner and permit holder, each individual who is listed as owner on the permit or is listed as having an ownership interest as part of a corporation or partnership will be counted as owning or holding one permit. In cases where a husband and wife are listed as co-owners of the same permit, both individuals will be counted as owning one permit each. However, if the husband is listed on the permit as the sole owner of that permit, only the husband will be counted as owning that permit for purposes of restrictions and exemptions on the number of permits a person may own or hold.

If a permit owner who owned the permit as of November 1, 2000, conveys a permit to their spouse upon their death, the conveyed permit will count toward the permit ownership limits for that spouse. ''Spouse'' means a person who is legally married to another person as recognized by state law (i.e., one's wife or husband). If the spouse already owns or holds 3 permits, he/she will not be permitted to retain this additional permit, unless he/she conveys ownership of or no longer holds one of his/her existing permits.

If a couple were married as of November 1, 2000, but only one spouse was listed on the permit as the permit owner at that time, the spouse of the listed permit owner would not be exempt from the owner-on-board requirement. However, NMFS realizes permit owners could not have foreseen the implications of not listing their spouse under the detailed provisions of the permit stacking program adopted by the Council. Therefore, permit owners who were married as of the control date (November 1, 2000) and who wish to add their spouse as co-owner on their permit(s) may correct NMFS' permit ownership records as of that control date. Permit owners may add a not-listed spouse as a co-owner without losing their grandfathered status. As previously mentioned, in cases where a couple, married as of November 1, 2000, are listed as co-owners of the same permit, both individuals will be counted as owning one permit each and will have grandfathered status as a partnership as defined at § 660.302. An individual within the married couple will not, however, be able to retain their exemption from owner-on-board requirements if they choose to buy another permit as an individual and did not own a permit as an individual as of the control date in NMFS ''corrected'' records (i.e., NMFS records after allowing a not-listed spouse to be added as co-owner). Members of partnerships and corporations will not be allowed to add their spouses to the corporate ownership listing as of November 1, 2000, for purposes of exempting them from the owner-on-board requirements. (Note: NMFS defines a ''partnership'' as two or more individuals, partnerships, or corporations, or combinations thereof, who have ownership interest in a permit, including married couples and legally recognized trusts and partnerships, such as limited partnerships (LP), general partnerships (GP), and limited liability partnerships (LLP).)

Upon publication of these regulations in the **Federal Register**, NMFS will send a form to permit owners with one individual listed as of November 1, 2000, to allow married individuals who wish to declare their spouses as having permit ownership interest as of November 1, 2000. If the permit owner fails to return the form by July 1, 2006, the permit name on record with SFD as of November 1, 2000, will remain on the permit. If the permit owner has been married since the control date, chooses not to add their spouse as a co-owner and the permit owner listed on the permit thereafter dies, the spouse will not be exempt from the owner-on-board requirement should the spouse inherit the permit. SFD will not accept any declarations to add a spouse as co-owner for couples married as of the control date after the July 1, 2006, deadline.

For corporations and partnerships, NMFS will send a form to legally recognized corporations and partnerships (i.e., permit owners other than individuals) that currently own or hold sablefish-endorsed permits that requests a listing of the names of all shareholders or partners as of November 1, 2000, and a second listing of that same information as of the current date in 2006. NMFS may require a copy of the United States Coast Guard Abstract of Title as proof of vessel ownership for permit holders and/or owners and may require articles of incorporation or other documentation deemed necessary for proof of corporate or partnership ownership. If a corporation or partnership fails to return the completed form by the deadline date of July 1, 2006, NMFS will send a second written notice to delinquent entities requesting the completed form be returned by a revised deadline date of August 1, 2006. If the permit owning entity fails to return the completed form by that second deadline date, August 1, 2006, NMFS will void their existing permit(s) and reissue the permit(s) with a vessel registration given as ''unidentified'' until such time that the completed form is provided to NMFS. For purposes of determining changes in partnerships/corporations in succeeding years, NMFS will send the form to corporations and partnerships as part of the annual permit renewal process.

Failure to report or false reporting of ownership interest in federal limited entry groundfish permits to NMFS may be subject to federal civil or criminal penalties.

Owner-on-board Requirement

As mentioned above, an individual person who owns sablefish-endorsed permits, but who did not have an ownership interest in a sablefish-endorsed permit as of November 1, 2000, would be required to be on board the vessel registered for use with that permit during any groundfish fishing operations within the primary season fishery while that permit's primary sablefish season limits are being taken. (Note: An individual person, or partnerships or corporations that hold(s) a sablefish-endorsed permit, but does not own a sablefish-endorsed permit, are not subject to the owner-on-board requirements.) The Council included this provision in Amendment 14 as a way of ensuring that the fixed gear sablefish fleet would maintain its character, by requiring that only fishermen control sablefish-endorsed permits and moving toward a fishery where permit owners are working onboard the vessel during fishing operations.

The sablefish permit stacking program is essentially an IFQ program. A concern about IFQ programs is that if fishing privileges are for sale, individuals or business entities who do not fish could buy those privileges. Allowing individuals or business entities who do not fish to own fishing privileges and then rent those privileges out to fishers is often referred to as ''share-cropping'' the fishing privileges. Members of the West Coast sablefish fleet were concerned that without an owner-on-board provision, permit ownership could flow out of fishing communities and into the hands of speculative non-fishing buyers. To ensure that only fishers could buy into the sablefish fleet, the Council included an owner-on-board provision in Amendment 14.

Under this proposed rule, an individual who purchased a sablefish-endorsed permit after November 1, 2000, would be required to be on board the vessel registered for use with that permit when the vessel is participating in any groundfish fishery during the primary season and fishing on that permit's sablefish limits until that vessel has taken that permit's primary sablefish season limits. Once the primary sablefish season starts, any sablefish landings made by a vessel registered for use with a sablefish-endorsed permit count against that vessel's primary season limit(s). This aspect of the owner-on-board requirement prevents unnecessary sablefish discard by ensuring that if sablefish is taken incidentally in fisheries targeting other groundfish, that sablefish will not be discarded and will count against the primary season fishery limits. All permit owners who are subject to the owner-on-board requirements would be notified in a letter from NMFS in 2006 and prior to the start of the primary sablefish season on April 1, 2007.

Permit owners who are subject to the owner-on-board requirement may request an emergency exemption from the requirement in cases of death, illness, or injury of the permit owner that prevents the permit owner from participating in the fishery. This exemption would ensure that a permit owner's family could receive the sablefish income associated with a permit if the permit owner himself is unable to participate in the groundfish fishery through death, illness, or injury. In the case of death of a permit owner, the estate of the deceased permit owner is afforded a grace period from the owner-on-board requirement for up to 3 years after the death of the individual or until such time as there is settlement of the permit owner's estate and the permit is transferred to the beneficiary, whichever is earlier. In the interim before the estate is settled, if the deceased permit owner was subject to the owner-on-board requirements, the estate of the deceased permit owner can send a letter to NMFS with a copy of the death certificate, requesting an exemption from the owner-on-board requirements until either the estate is settled or for up to 3 years after the time of death, whichever is earlier. An exemption from the owner-on-board requirements would be conveyed in a letter from NMFS to the estate of the permit owner and this letter would be required to be on the vessel during fishing operations. This grace period allows the estate a period of time in which to transfer the permit to an individual and also allows the estate to hire a skipper to fish the permit while the estate is being settled. Once the permit is transferred, the new owner would be subject to the owner-on-board requirements. If, after the estate is settled, the spouse inherits and therefore owns the permit and the deceased permit owner was grandfathered, but the spouse was not listed on the permit as grandfathered, the spouse would be a second generation owner and would be required to be on board the vessel while the permit is being fished.

An exemption due to injury or illness would be effective only through the end of the calendar year in which it was granted. In order to receive an exemption due to injury or illness, the permit owner must submit a letter to NMFS requesting an exemption from the owner-on-board requirement, explaining the need for the exemption, and providing documentation from a certified medical practitioner detailing why the permit owner is unable to continue to be onboard a fishing vessel. In order to extend an emergency medical exemption for a succeeding year, the permit owner must submit a new request to NMFS and provide documentation from a certified medical practitioner detailing why the permit owner is still unable to be onboard a fishing vessel. An emergency exemption would be conveyed in a letter from NMFS to the permit owner and this letter would be required to be on the vessel during fishing operations. All emergency exemptions will be evaluated by NMFS and a decision will be made by SFD in writing to the permit owner within 60 days of receipt of the original exemption request. Emergency medical exemptions will be granted by NMFS for no more than three consecutive or total years. NMFS will consider any exemption granted for less than 12 months in a year to count as one year against the 3–year cap.

An individual person, or partnerships or corporations who continue to own at least one sablefish-endorsed permit that was owned as of November 1, 2000, would be exempt from the owner-on-board requirement. If a person, partnership, or corporation that is exempt from the owner-on-board requirement no longer owns at least one sablefish-endorsed permit for a period greater than one year, that permit owner would no longer be exempt from the owner-on-board requirement. However, a person, partnership, or corporation that is exempt from the owner-on-board requirement could sell all of its permits, buy another sablefish-endorsed permit within 1 year of the date the last permit was approved for transfer, and retain its exemption from the owner-on-board requirements. A person that is part of a grandfathered partnership or corporation could buy additional permits as an individual, up to the limit of three per individual, but the individual would not be exempt from the owner-on-board requirements with the new permit. However, if the individual was part of grandfathered partnership or corporation in which they were the only remaining individual (i.e., all other individuals with ownership interest had left the partnership or corporation), this individual would still be considered as a grandfathered partnership or corporation in NMFS records. Thus, permits owned by this individual under the partnership or corporation would be exempt from the owner-on-board requirements. This individual could also buy additional permits under the partnership or corporation, up to the limit of 3 per individual, and would remain exempt from the owner-on-board requirements with the additional permits.

Additionally, a person, partnership, or corporation that qualified for the owner-on-board exemption, but later divested their interest in a permit or permits, may retain rights to an owner-on-board exemption as long as that person, partnership, or corporation purchases another permit within one year of the date that the final rule for these owner-on-board requirements is implemented. A partnership or corporation could only purchase a permit if it has not added or changed individuals since November 1, 2000, excluding individuals that have left the partnership or corporation or that have died. NMFS would send out a letter to all individuals, partnerships or corporations who owned a permit as of November 1, 2000, and who no longer own a permit to notify them that they would qualify as a grandfathered permit owner if they choose to buy a permit within one year from the date the final rule for these owner-on-board requirements is effective.

If the individuals who have an ownership interest in the corporation or partnership change from those owning the partnership or corporation as of November 1, 2000, by adding another individual(s), that partnership or corporation will lose its exemption from both the owner-on-board requirements and from the provision that allows only an individual person to own a sablefish-endorsed permit. Thus, a husband and wife who own a permit could not add a sibling or child to the permit without losing their first generation status and losing their exemption from the provision that only allows an individual person to own permits. Similarly, a fisherman who wants to take on a new partner because an existing partner is retiring could not add that new partner without losing his first generation status and his exemption from the provision that only allows an individual to own permits. In the case of a grandfathered corporation such as ''Smith, Inc. and Jones, Inc.,'' viewed as one corporation in NMFS records, Jones, Inc. could not add a new member without causing ''Smith, Inc. and Jones, Inc.'' to lose it's grandfathered status. However, an individual person, or partnerships and corporations may continue to hold sablefish-endorsed permits (e.g., through a lease arrangement) from any permit owner (exempt from owner-on-board or not) and remain exempt from the owner-on-board requirements, even if their membership has changed or they did not hold a sablefish-endorsed permit as of November 1, 2000.

As mentioned above, if a couple was married as of November 1, 2000, but only one spouse was listed as the permit owner at that time, the spouse of the listed permit owner would not be exempt from the owner-on-board requirement. NMFS will allow an opportunity for those grandfathered permit owners who wish to add their spouses as co-owners on their permits to correct NMFS' permit ownership records as of that control date (November 1, 2000). Permit owners may then add not-listed spouses as co-owners without losing their grandfathered statuses. Their new grandfathered status will be as a partnership, as defined at § 660.302, which includes married couples. Individual permit owners will lose their individual grandfathered status when they add their not-listed spouse unless they also owned at least one permit as an individual and did not retroactively add a spouse as co-owner on that permit. The process that NMFS will follow for adding a spouse as co-owner is described in the ownership interest section of this proposed rule. As previously mentioned, in cases where married couples are listed as co-owners of the same permit, both individuals will be counted as owning one permit each and will have grandfathered status as a partnership, as defined at § 660.302. An individual within the married couple will not, however, be able to retain their exemption from owner-on-board requirements if they choose to buy another permit as an individual and did not own a permit as an individual as of the control date in NMFS ''corrected'' records (i.e., NMFS records after allowing a not-listed spouse to be added as co-owner). Members of partnerships and corporations will not be allowed to add their spouses as of November 1, 2000, for purposes of exempting those spouses from the owner-on-board requirements or the provision that only allows individuals to own or hold permits.

Because only the owners of non-exempt permits that are being fished during the trip are required to be on board, enforcement agents must be able to determine which permits are being fished and which owner should be on board. In order to enforce the owner-on-board provision, NMFS is requesting that the states require that the groundfish Federal limited entry permit number be written on state fish landing receipts (i.e., fish tickets). At the April 2002 Council meeting in Portland, OR, the Council and NMFS requested that the States of Washington, Oregon, and California modify their fish tickets to require a space for recording the permit number under which a landing is made. The states agreed to consider modifying their fish tickets, but requested time to consider the implications of such a modification and could not guarantee that action would be taken in time for implementation of the second set of the permit stacking regulations. Currently, only the State of California has added a line for permit information on their state fish tickets and enters that information into the fish ticket database, PacFIN. Until a new fish ticket design is available, states should require that permit numbers be written somewhere on the fish ticket, as appropriate. Ultimately, it would be beneficial to have these Federal limited entry permit numbers entered into the PacFIN database so that enforcement could query a given permit number and their associated fish ticket landings. However, until such time, having the permit number on the paper fish ticket would allow hand searching of paper fish tickets for investigations. This request is also being made to aid in enforcement of mid-season transfers, discussed later in this proposed rule. Adding a permit number to the fish ticket is expected to aid enforcement by creating a record of which sablefish permit was being fished on a given fishing trip. Thus, if enforcement boarded a vessel at sea or as they were coming into port, enforcement could record which owners were on board. At a later time, they could then verify which permit the sablefish landings were credited to on the fish ticket and double check that the owner of that permit was on board if they were not exempt from the owner-on-board provisions.

At a minimum, the permit number associated with a landing should be recorded on the fish ticket and entered into the PacFIN database for tracking and enforcement reasons. If Washington and Oregon do not require that permit numbers be written on the fish tickets and entered into the PacFIN database, NMFS may require all permit owners who are subject to the owner-on-board requirement to be onboard the vessel when that vessel is fishing for groundfish until all sablefish tiers associated with that vessel during the primary season have been fished (e.g., even if landings are only being attributed to one permit at a time but all three permits are subject to the owner-on-board requirement, all three permit owners would be required to be onboard the vessel until that vessel has finished the primary season and completed their landings against all three permits). Conversely, if Washington and Oregon require the permit number on the fish ticket, only those permit owners who are subject to the owner-on-board requirement need to be onboard the vessel when that vessel is fishing for sablefish against a specific sablefish permit (e.g., if landings are only being attributed to one permit at a time and that permit is subject to the owner-on-board requirement, only that permit owner would be required to be onboard the vessel when that vessel is fishing against that permit).

Exemptions for Vessels Processing Sablefish at Sea

Sablefish caught off the West Coast are often processed and frozen for the Japanese market, but the manner of processing varies along the West Coast. Because of the varied ocean bottom topography, some sablefish fishing grounds are closer to shoreside processing plants than others. Larger-sized sablefish tend to bring higher prices, but those large fish are usually found in deep water farther offshore. In areas where the sablefish grounds are within a single day's round trip from port, fishers might bring their sablefish to the processor whole. Processors remove the landed fish's head and guts, then glaze and freeze the sablefish body as quickly as possible to ensure that the processed product meets the high standards of the Japanese fish market. Fishers who operate farther than a day's trip from port might remove the head and guts from their sablefish before landing them at the processor to preserve the quality of the fish's flesh throughout fishing and processing operations. Depending on the care that a fisher takes in heading and gutting his/her sablefish, the processor may have to re-clean the fish before freezing and glazing it for sale.

Because of the primary sablefish fishery's history as a short season, fishers have traditionally pulled sablefish out of the ocean as quickly as possible and have left most or all of the processing to the processors. With a longer primary sablefish season, fishers could operate at a more leisurely pace and do more of their own processing. If a significant portion of the sablefish-endorsed fishers were to begin operating as their own processors, however, the shoreside processing plants would be deprived of their traditional sablefish-generated income. The value of sablefish taken with fixed gear and sold as processed product by West Coast processors was $9–10 million in 1999 and $10–11 million in 2000. Those amounts include sablefish taken in the daily trip limit fisheries and are based on round weight of sablefish landed in 1999 and 2000 with a product recovery rate range of 56–60 percent of round weight. With implementation of a prohibition on processing sablefish at sea, revenues in sold sablefish product for shoreside processors would be expected to remain similar to those amounts reported before the control date of November 1, 2000.

To ensure that shoreside processing plants would continue to have access to sablefish landed from the primary sablefish fishery, the Council included a provision in Amendment 14 that prohibits vessels from processing their sablefish at sea. ''Processing'' is defined at 50 CFR 660.302 as, ''the preparation or packaging of groundfish to render it suitable for human consumption, retail sale, industrial uses or long-term storage, including, but not limited to, cooking, canning, smoking, salting, drying, filleting, freezing, or rendering into meal or oil, but does not mean heading and gutting unless additional preparation is done.''

Although most West Coast sablefish vessels have not traditionally processed their sablefish catch, there are a few vessels that may have a history of processing sablefish. To acknowledge investments these vessel owners have made in on board freezing and processing equipment, Amendment 14 includes an exception to the at-sea processing prohibition for vessels that froze at least 2,000 lb (907.2 mt) round weight of sablefish landings in any one year of 1998, 1999, or 2000. Because the control date for this exemption is also November 1, 2000, frozen sablefish landings from 2000 would have to have occurred before that date. The best evidence of a vessel having made frozen sablefish landings would be state fish tickets for landed sablefish accompanied by receipts for frozen sablefish from fish buyers or exporters. The qualifying landings of frozen sablefish must have occurred during the primary sablefish fishery season, must have been taken in waters from 0–200 nautical miles offshore of the states of Washington, Oregon or California, and the vessel owner must have had a valid sablefish-endorsed limited entry permit at the time the qualifying fish were landed.

NMFS expects that fewer than five vessels owners will apply for an at-sea processing exemption. NMFS SFD will send a letter to sablefish-endorsed permit owners and/or fixed gear vessel owners announcing the qualification requirements for the at-sea processing exemption. Permit and/or vessel owners who believe that they qualify for an at-sea processing exemption would have at least 60 days to provide NMFS SFD with evidence of their frozen sablefish landings via an application to be provided by NMFS. The permit and/or vessel owner must submit an application and supporting evidence to SFD no later than July 1, 2006. The application will be available from NMFS in hard copy and online at *http://www.nwr.noaa.gov/1sustfsh/permits/prmits01.htm*. NMFS SFD would then have 30 days to review the submitted evidence and make determinations on whether an applicant vessel qualifies for the at-sea processing exemption. Persons whose vessels qualify for the at-sea processing exemption will be issued a letter from NMFS to carry aboard their vessels.

Permit and/or vessel owners who are initially denied the at-sea processing exemption but who believe that they have further evidence to demonstrate their qualifications for the exemption will have 30 days from the NMFS SFD denial decision to appeal the decision to the Regional Administrator. No appeals will be accepted after September 1, 2006. An at-sea processing exemption would be issued if the permit and/or vessel owner demonstrates that his vessel has met the exemption qualification requirements. Unlike the initial limited entry permitting process, there are no hardship allowances for appealing denials and there will be no industry appeal board to review appeals of exemption denials. A complete list of the vessels exempted from the at-sea processing prohibition would be published in the **Federal Register** in the fall of 2006. This exemption would apply only to the vessel while it is registered for use with a sablefish-endorsed limited entry permit. The exemption would not be associated with any of the permits registered for use with the vessel and would not be transferable to any other vessel, including other vessels belonging to that same permit and/or vessel owner. Further, the exemption would expire if the vessel itself is sold or otherwise transferred to a new owner.

Mid-season Transfers

With the longer season, there are more opportunities for permit owners to transfer their permits mid-season. Permit transfers will still be constrained by limited entry program regulations at 50 CFR 660.335(e) and (f), which allow a permit to be transferred between vessels only once per calendar year and which make all permit transfers effective on the first day of a major cumulative limit period. Major cumulative limit periods begin on January 1, March 1, May 1, July 1, September 1 and November 1. While permits may only be transferred between vessels once per calendar year, changes in the permit owner or holder may occur at any time during the calendar year and as often as necessary. However, regardless of whether there is a change in the vessel registered to the permit and the permit owner/holder or just a change in the permit owner/holder, any of these actions would require a certification from the permit owner of the amount of sablefish landings to date. If a permit owner wishes to transfer a sablefish-endorsed permit mid-season, he/she will have to certify the cumulative amount of sablefish taken to date with that permit on a NMFS permit transfer form. In addition, the individual either leasing or buying the permit (the transferee) must acknowledge the cumulative amount of sablefish landed to date by signing the transfer form and maintaining the permit onboard the vessel. Under already existing regulations at 660.303(c), the transferee would also be required to retain onboard any fish tickets associated with landings made against that transferred permit, including any landings made previously on the permit during the cumulative limit period (i.e., the primary sablefish season). This mid-season certification is required for enforcement purposes as it is a means to associate specific amounts of landings to date with an aggregate amount reported on fish tickets for a particular permit owner.

In addition to the certification of sablefish landings to date, a space will be provided on the landings certification portion of the permit transfer form that requests the sale or lease price of the permit. Providing this sale or lease price to NMFS is optional. This information is being requested so that NMFS may build a database on permit sale prices. This database would be useful in analyzing economic trends and the value of the sablefish fishery.

If during a post-season audit of landings associated with a permit, the landings exceed the amount available to be landed on the permit, enforcement measures may be taken against any party that had ownership interest in the permit during the calendar year. The vessel owner or operator may also be held liable. It is a violation of both state and Federal law to give false or incomplete information on fish tickets.

At the April 2002 Council meeting in Portland, OR, the Council and NMFS requested that the States of Washington, Oregon, and California modify their fish tickets to require a space for recording the permit number under which a landing is made. The states agreed to consider modifying their fish tickets, but requested time to consider the implications of such a modification and could not guarantee that action would be taken in time for implementation of the second set of the permit stacking regulations. Currently, only the State of California has added a line for permit information on their state fish tickets. Until a new fish ticket design is available, states should require that permit numbers be written somewhere on the fish ticket, as appropriate, and that the permit number be added into the PacFIN database. If Washington and Oregon do not require that permit numbers be written on the fish tickets and entered into the PacFIN database, NMFS may not allow mid-season transfers due to this provision being unenforceable.

Defining the Term ''Base Permit''

Under Amendment 14, each vessel participating in the primary sablefish fishery must be registered for use with at least one permit with a length endorsement appropriate to that vessel. Any additional permits need not match the vessel's length (50 CFR 660.334(c)). At Section 14.2.4, the FMP describes a base permit in a permit stacking program as the initial permit needed to participate in the limited entry fishery, and subject to all of the requirements for limited entry permit ownership qualifications, and permit gear and length endorsements. The FMP further allows that any requirements and additional privileges for permits stacked on to base permits may be authorized in a Federal rulemaking. Amendment 14 and its implementing regulations describe the requirements and privileges associated with stacking sablefish-endorsed limited entry permits.

This proposed rule would clarify that the permit registered for use with a vessel that is appropriate to that vessel's length is considered the ''base'' permit. If more than one permit registered for use with the vessel has an appropriate length endorsement for that vessel, NMFS SFD will designate a base permit by selecting the permit that has been registered to the vessel for the longest time. If the permit owner objects to NMFS selection of the base permit, the permit owner may send a letter to NMFS SFD requesting the change and the reasons why. If the permit requested to be changed to the base permit matches the length of the vessel, NMFS SFD will reissue the permit with the new base permit.

At least one sablefish-endorsed permit must match the length of the vessel that will be fishing against the permit's landing limits, as required by current regulations at 50 CFR 660.334(c). Outside of the primary season, the vessel would operate under the per vessel cumulative limit restrictions appropriate to the gear of the base permit. Defining this term would not change the effect of limited entry permit regulations, but would provide further clarity in the regulations for both NMFS and for the public.

Hail-in Requirement - Initial Council Recommendation not Proposed by NMFS

In adopting Amendment 14, the Council also recommended several regulatory measures to implement the permit stacking program. One of those recommendations was to require fishers to provide 6 hours advance notice to NMFS Enforcement when making a sablefish landing in the primary sablefish season. Fishers were to provide landings times, hail weights, and landings locations as part of the hail-in procedure. This hail-in requirement was based on a similar requirement in place for the sablefish/halibut fisheries off Alaska. For the Alaska fisheries, the hail-in requirement was intended to prevent quota landings violations by giving enforcement officers an opportunity to meet the incoming vessel to inspect its catch.

NMFS has subsequently determined that this hail-in requirement would be unnecessarily burdensome for fishers and less useful in enforcing West Coast fisheries regulations than it may be in Alaska waters. Over 1,000 vessels participate in the sablefish/halibut IFQ fisheries off Alaska, each landing a vessel-specific amount of fish based on that vessel's particular quota share amount with many landings occurring in remote locations. In the West Coast primary sablefish fishery, there are only 164 sablefish-endorsed permits, which means that no more than 164 vessels could participate in the fishery. Additionally, each permit is assigned to one of 3 tiers, which means that there is a limited number of possible landings amounts available to the vessels participating in the primary fishery. This relatively simple cumulative limit system and the small number of vessels involved make a hail-in requirement unnecessary. NMFS does not now have hail-in requirements for any other West Coast groundfish species or fishery and does not believe that primary sablefish season cumulative limit management differs significantly enough from the rest of the groundfish fishery's cumulative limit management to warrant this additional enforcement and reporting burden.

NMFS consulted with the Council on this issue at the Council's October 29 through November 2, 2001, meeting in Millbrae, CA. The Council, its Enforcement Consultants and its Groundfish Advisory Subpanel concurred with the NMFS decision to not propose the hail-in requirement for implementation in the West Coast sablefish fishery.

Owner-in-Board Requirement - Future Implementation

The Council is considering another qualifier to the owner-on-board exemptions for grandfathered individuals in partnerships or corporations based on the Groundfish Advisory Panel's recommendation. As previously mentioned, at the Council's April 2002 meeting, NMFS returned to the Council to seek clarification on the Council's intent with the owner-on-board requirement, including duration of owner-on-board exemptions, time allotted to settle the estate of deceased owners, loss of exemption, and joint ownership of permits. While clarifying these issues, the Council stated that it also wished to consider allowing a person who had 30 percent or greater ownership interest in a partnership or corporation that was a first generation owner to be exempt from the owner-on-board provision if he/she wishes to own a permit under his/her own name, even if he/she did not own a permit under his/her own name as of November 1, 2000. The EA for the permit stacking program, dated October 2000, did not analyze the effects of allowing exemptions from the owner-on-board requirement for those individuals who had only 30 percent or greater ownership interest in a permit. Thus, further analysis and Council discussion is required before NMFS could consider this provision for implementation.

NMFS is also considering implementing a phone-in declaration system to aid in enforcement of the owner-on-board requirement, if having the permit numbers on the fish tickets is not sufficient. The declaration system would require all sablefish endorsed permit owners, including those exempt from the owner-on-board requirement, to call into a phone-in system and declare which permit(s) they will be fishing. Fishers would not need to call back into the system until they change the sablefish permit(s) they are currently fishing. For any permits reported on the phone-in declaration system, if not exempt from the owner-on-board requirement, the permit owner(s) would be expected to be onboard the vessel while fishing for sablefish. In addition to having permit numbers on state fish tickets, this would aid enforcement to determine, in a more timely manner, if the appropriate person was onboard.

Cap on Number of Permits Held - Future Implementation

Under the Council's initial regulatory recommendations for implementing Amendment 14, no more than three sablefish-endorsed permits may be owned by an individual person, partnership or corporation, unless that individual person, partnership or corporation held more than 3 permits as of November 1, 2000. In June 2001, the Council clarified this recommendation, saying that it had intended to restrict each individual person, partnership or corporation to holding (owning or leasing) no more than 3 permits. The Council further clarified that the grandfathered exception to the three permits restriction allowed only those individuals, partnerships or corporations that had owned more than 3 permits as of November 1, 2000, to continue to own those particular permits without acquiring (through owning or leasing) additional permits. This restriction was implemented through a final rule at 66 FR 41152, August 7, 2001.

In 2002, the Council and NMFS received a request from a limited entry permit owner to revisit the limit on the number of permits an entity may own or hold. This permit owner wished to hold (lease) additional permits beyond those he already owned. During the Council's April 2002 meeting, the Council's Groundfish Advisory Subpanel (GAP) discussed the issue and voted to retain the current regulations, which limits the number of permits that can be owned or held to no more than three permits, unless a person, partnership or corporation owned more than three permits as of November 1, 2000. An individual person, or partnerships or corporations that owned more than three permits as of November 1, 2000, are limited to the number of permits owned as of that date. Of the GAP members present, eight favored the current regulations (status quo), four favored recommending a regulatory change and four abstained. After the GAP meeting, this issue was brought before the Council. The Council requested that the GAP look into alternatives that would revise the accumulation cap on the total permits an individual person, partnership or corporation could hold through leasing and report back to the Council at a later meeting. Due to the busy agenda of the GAP and the Council, this issue has not yet been revisited and would require further analysis before it could be implemented.

Permit Stacking Program Fee - Future Implementation

NMFS is required under Section 304(d)(2) of the Magnuson-Stevens Act to collect fees from participants in an IFQ program to recover the actual costs directly related to the management and enforcement of the program. These fees shall not exceed 3 percent of the ex-vessel value of sablefish harvested under this IFQ program, to be collected as landings fees.

NMFS implemented a fee system for its sablefish/halibut IFQ fishery in Alaska on March 20, 2000 (65 FR 14919) after a lengthy consultation with the fishing industry and in a rulemaking specific just to fee implementation. NMFS would like an opportunity to assess the Alaska fee program and the analyses associated with its implementation before proposing a fee system for West Coast sablefish-endorsed limited entry permit holders.

NMFS has not yet analyzed the cost of managing and enforcing the sablefish endorsement program and will be better able to predict this cost once all of the other provisions of Amendment 14 are implemented. NMFS will issue a separate proposed rule to implement a fee system after assessing the applicability of the Alaska fee system to West Coast fisheries, estimating the NMFS cost of managing and enforcing the sablefish endorsement program, and consulting on the fee system with the Council and West Coast industry.

Classification

NMFS has determined that the proposed rule is consistent with the Pacific Coast Groundfish FMP and preliminarily determined that the rule is consistent with the Magnuson-Stevens Act and other applicable laws.

This proposed rule has been determined to be not significant for purposes of Executive Order 12866.

As required by section 603 of the Regulatory Flexibility Act (RFA), NMFS prepared a supplement to the IRFA originally prepared by the Council as part of the EA. The IRFA describes the economic impact this proposed rule, if adopted, would have on small entities. A description of the action, why it is being considered, and the legal basis for this action are contained at the beginning of this section in the preamble and in the **SUMMARY** section of the preamble. A copy of this analysis is available from the NMFS (see **ADDRESSES**). A summary of the analysis follows.

This proposed rule would affect only the owners of the 164 limited entry permits with sablefish endorsements. These permit holders use longline or pot gear to participate in the limited entry, primary sablefish fishery. All of the permit owners and vessels in the Pacific Coast, limited entry, fixed gear fleet are considered small entities under Small Business Administration (SBA) standards.

NMFS and the SBA have already considered whether Amendment 14 would significantly affect the small entities involved in the limited entry, fixed gear sablefish fishery. The agencies concluded that while Amendment 14 would have significant effects on the limited entry, fixed gear sablefish fleet, those effects would be positive improvements in the safety of the fishing season, and in business planning flexibility. These conclusions were described in the final rule to implement Amendment 14 for the 2001 fishing season (August 7, 2001, 66 FR 41152) and in the Final Regulatory Flexibility Analysis prepared for that rule.

The regulatory changes proposed with this rule follow out of the regulations implementing Amendment 14 (August 7, 2001, final rule) for 2007 and beyond. The regulatory changes in the August 7, 2001, final rule brought greater operational safety and more business planning flexibility to the participants in both the primary sablefish fishery and the daily trip limit fishery for sablefish. It allowed participants with greater harvest capacity to better match their sablefish cumulative limits with individual vessel capacity, it reduced overall primary fishery capacity, and it allowed the fishermen to use the longer season to fish more selectively and to increase their incomes by improving the quality of their ex-vessel product.

The regulatory changes with this proposed rule will require permit owners and permit holders to document their ownership interests in sablefish-endorsed limited entry permits and is expected to have no effect on permit owners and permit holders beyond the time required to complete that documentation. The owner-on-board requirement will not affect the fishing behavior of persons who owned sablefish-endorsed permits before November 1, 2000, and will only affect those who consider purchasing permits after that time in that persons who do not wish to participate in fishing activities aboard a vessel may not wish to purchase sablefish-endorsed permits. Prohibiting vessels from processing sablefish at sea, if they do not meet minimum frozen sablefish historic landing requirements, is expected to simply maintain current sablefish landing and processing practices for both fishers and processors, therefore ensuring shore-based processors will continue to receive business from sablefish harvesters. Certification of current sablefish landings on a permit when conducting a mid-season permit transfer to another person is not expected to have any effect on permit owners or holders beyond the time required to complete the documentation. Defining the term ''base permit'' consistent with the FMP is not expected to have any effect on any participant in the groundfish fishery because it is only an administrative change. This rule is also not expected to have any effect on the 66 limited entry, fixed gear permit holders without sablefish endorsements because this program only applies to sablefish fishery participants with sablefish endorsements (i.e., primary sablefish fishery participants). No Federal rules duplicate or conflict with these permit stacking regulations.

The criteria used to evaluate whether this proposed rule would impose ''significant economic impacts'' are disproportionality and profitability. Disproportionality means that the regulations place a substantial number of small entities at a significant competitive disadvantage to large entities. Profitability means that the regulation significantly reduces profit for a substantial number of small entities. These criteria relate to the basic purpose of the RFA, i.e., to consider the effect of regulations on small businesses and other small entities. This proposed rule will not impose disproportionate affects between small and large business entities because all limited entry fixed gear vessels, including the sablefish endorsed vessels affected by this rule, are small business entities. As described in the above paragraph, Amendment 14 to the FMP and implementing regulations, including the August 7, 2001, final rule, increased business planning flexibility and profitability overall for the affected small businesses. This rule further implements provisions of Amendment 14, making the regulations more enforceable and maintaining the small business character of the fleet, and, therefore, is not expected to change the overall increased profitability of the fleet gained through the August 7, 2001, final rule. However, the owner-on-board requirement may decrease the overall profitability gained from implementation of the initial permit stacking provisions from Amendment 14. An economic analysis of the owner-on-board provision from the supplemental IRFA (see **ADDRESSES**) shows that the owner-on-board requirement may cost second generation permit owners approximately $40,400 per person per year or approximately $15 million in lost income for all second generation permit owners collectively discounted over a 20 year period. In addition, the permit value may decrease over time due to the reduced flexibility associated with use of the permit. Overall, when considering all of the provisions associated with Amendment 14, those implemented with the August 7, 2001, final rule and those that would be implemented through this rulemaking, profitability is still expected to increase over the previous sablefish 3–tier management system.

The actions considered in this document are not expected to have significant impacts on small entities. Public comment is invited on adjustments that would reduce the impacts on small entities while achieving the regulatory objectives and on whether the analysis adequately takes into account impacts on small entities.

In the EA/RIR prepared by the Council for this action (see **ADDRESSES**), two main alternatives were considered, a no action alternative and a permit stacking regime alternative. The topics considered under each of these alternatives were permit stacking, accumulation, season length, at-sea processing, permit ownership/owner-on-board, and foreign control. Under the no action alternative, the primary limited entry, fixed gear sablefish fishery would continue under the 3–tier management program, with one permit associated with each participating vessel. In addition, permit stacking would not be allowed, the number of permits owned would not be limited, the season length would be 9–10 days and would likely shorten over time, vessels without sablefish endorsements would not be allowed to fish during the primary season, at-sea processing would be permitted, permit owners would not be required to be onboard their vessel during fishing operations, and any legal entity allowed to own a U.S. fishing vessel may own a permit.

Under the permit stacking regime alternative, 12 provisions, many of which include suboptions, were considered for the topics (permit stacking, accumulation, season length, etc.). Thus, the permit stacking regime alternative consists of many sub-alternatives, depending on the combination of provisions and suboptions adopted by the Council. Provisions 1 (allow a basic permit stacking program), 2 (gear usage), 4 (unstacking permits), and 8 (stacking non-sablefish limits and sablefish daily trip limits) address permit stacking. Provision 3 (accumulation limits) addresses accumulation. Provisions 5 (season duration), 9 (opportunities for unendorsed vessels), 11 (advanced notice of landings), and 12 (stacking deadline) address season length. Provision 6 (processing prohibition and freezer vessel length) addresses at-sea processing. Provision 7 (individual ownership only and owner-on-board requirement) addresses permit ownership/owner-on-board. Provision 10 (U.S. citizenship requirement) addresses foreign control. As mentioned previously, the final rule for Amendment 14 implemented most of these provisions. This proposed rule would implement parts of the following provisions: 2, 6, and 7. The preferred alternative recommended by the Council and implemented by NMFS was the permit stacking regime alternative with only certain options within each provisions being adopted as preferred.

The preferred alternative was selected because it best met the objectives of the action, which for the provisions implemented through this action (i.e., provisions 2, 6, and 7) included directing benefits towards fishing communities and preventing excessive concentration of harvest privileges. The EA/RIR for this action reviewed alternatives for their economic impacts. Of the provisions that would be implemented by this action, only provisions 6 and 7 may have economic effects. Provision 6 may prevent economic efficiencies from developing by restricting at-sea processing to vessels that processed at-sea as of November 1, 2000, and may limit a rise in permit prices from what they would have been if at-sea processing were allowed. Provision 7 may reduce flexibility which may in turn reduce efficiency and limit the rise in permit prices compared to if owner-on-board were not required and permits were not limited to ownership by individuals.

This proposed rule contains a collection-of-information requirement subject to the PRA. This collection-of-information requirement has been submitted to OMB for approval. Proposed regulations further implementing provisions of Amendment 14 will require information collections to determine ownership interests of corporations/partnerships that own or hold sablefish permits, to determine unlisted spouses wishing to be listed as co-owner of sablefish permits as of a prior date, to certify mid-season transfers and to determine eligibility of sablefish freezer longliner vessels to obtain an exemption from the ban on at-sea processing. A summary of the information requirements and burden estimates follows.

To determine ownership interests, SFD would send an ownership interest form to the limited entry sablefish-endorsed permits that are owned or held by a corporation or partnership. The business entity would be requested to provide a list of all individuals who have an ownership interest in the corporation or partnership. The ownership interest form would document all individuals with an ownership interest in the partnership or corporation that owned a permit as of the control date, November 1, 2000, and would request a list of all individuals with an ownership interest in the partnership or corporation that owned or held a permit as of the current date. An authorized individual representing the corporation/partnership would certify (by signing/dating the form) that no additional individual with ownership interest had been added since the control date. The applicant would be required to provide a corporate resolution or other authorizing document that authorizes the person signing the form to do so on behalf of the business entity. NMFS may require a copy of the United States Coast Guard Abstract of Title as proof of ownership for permit holders and/or owners and may require articles of incorporation or other documentation deemed necessary for proof of corporate or partnership ownership. SFD would compare the ownership interest reported on the form from the two dates to determine if an additional individual(s) with ownership interest had been added to the business entity. If so, the business entity would lose its exempted status and be required to divest the permit to an individual owner or other eligible entity. Also, SFD staff would establish a permit count for every individual who owns or holds a sablefish endorsed permit as an individual or as part of a business entity to ensure limits on the number of permits that can be owned or held are not exceeded.

After this initial mailing, future forms would be included in the annual permit renewal packages for those business entities that continue to own or hold a sablefish endorsed permit or would be required whenever a change in permit owner, permit holder, or vessel registration is requested. The estimated burden for this collection is 70 respondents at 0.5 hours each, or 35 hours total. The U.S. Census Bureau's Nonemployer Statistics, 2001, is the most recent data available for determining burden costs for fishermen. Using an estimate from the U.S. Census Bureau's Nonemployer Statistics, 2001, as a proxy for annual income from sablefish fishing of $35,416 and breaking that into an hourly wage of $17.02, the burden for this collection would cost approximately $8.51 per respondent for the respondent's time, or $595.70 total.

For the provision to add a not-listed spouse as permit co-owner, SFD would mail a cover letter and form to those permit owners who list one person as owner and where the owner has continued to own a sablefish endorsed permit since November 1, 2000. SFD would afford the opportunity to add a spouse as a co-owner on a voluntary, one-time only basis. Members of partnerships and corporations who have an interest in a permit owned since November 1, 2000, would not be allowed to add their spouses as a co-owner of the permit. The current permit owner would be required to provide a copy of the marriage certificate. SFD would allow the addition of a spouse who was married according to state law to an exempted permit owner as of November 1, 2000. After review and approval of the application, SFD would reissue the permit in the names of both spouses. SFD would use this information to update the list of permit owners and the permit counts associated with these individuals. Additionally, SFD would revise the list of permit owners entitled to grandfather privileges (i.e.; exempt from owner on board requirements). Spouses listed as co-owner would be subject to the limits on the number of permits that can be owned or held. The estimated burden for this collection is 12 respondents at 0.33 hours each, or 4 hours total. Using an estimate from the U.S. Census Bureau's Nonemployer Statistics, 2001, as a proxy for annual income from sablefish fishing of $35,416 and breaking that into an hourly wage of $17.02, the burden for this collection would cost approximately $5.62 per respondent for the respondent's time, or $68.08 total.

For mid-season transfers of sablefish-endorsed permits, a new section would be added to the existing permit transfer form, also known as ''Change of Vessel Registration, Permit Owner/Holder Application'' (i.e.; transfer form). All permit owners are currently required to use this form to request these changes to their permit. The new section to the existing transfer form would require the permit owner to provide the cumulative amount of pounds of sablefish harvested on the permit during the current primary sablefish season. The permit owner would certify that the cumulative landing amount is correct by signing and dating the form. Similarly, the individual either buying the permit or seeking to hold the permit (if different from owner) will be required to sign an acknowledgment of the cumulative amount of sablefish landed as given in this section. Further, SFD would request on a voluntary basis the permit sale price or lease price and term of the lease. The estimated burden for this collection is 25 respondents at 0.5 hours each, or 12.5 hours total. Using an estimate from the U.S. Census Bureau's Nonemployer Statistics, 2001, as a proxy for annual income from sablefish fishing of $35,416 and breaking that into an hourly wage of $17.02, the burden for this collection would cost approximately $8.51 per respondent for the respondent's time, or $212.75 total.

For the sablefish at-sea processing exemption, SFD would prepare a one-time application for the purpose of determining which vessels are qualified for an exemption from the ban on at-sea processing. SFD would mail applications to all sablefish endorsed permit owners. Applicants would be required to provide evidence to support the number of pounds of sablefish processed at-sea as indicated on the form. Best evidence supporting the landings of processed sablefish would be state fish tickets for sablefish accompanied by sales receipts for frozen sablefish. A list of vessels that qualified for the exemption from the ban on processing and freezing sablefish at sea would be published in the **Federal Register**. The exemption would not be transferrable and would expire upon transfer of the vessel to a new owner. The estimated burden for this collection is 2 respondents at 30 minutes each, or 1 hour total. Using an estimate from the U.S. Census Bureau's Nonemployer Statistics, 2001, as a proxy for annual income from sablefish fishing of $35,416 and breaking that into an hourly wage of $17.02, the burden for this collection would cost approximately $8.51 per respondent for the respondent's time, or $17.02 total.

Operations and maintenance costs (copying, fax, mailing, notary) to the respondents are estimated to be less than $250 for all respondents on an annual basis. No fees will be charged to the respondents for any of the above information collections. Send comments regarding these burden estimates or any other aspect of the data requirements, including suggestions for reducing the burden, to NMFS (see **ADDRESSES**) and to David Rostker, OMB, by e-mail at *David__Rostker@omb.gov*,or fax to 202–395–7285.

Notwithstanding any other provision of the law, no person is required to respond to, and no person shall be subject to penalty for failure to comply with, a collection of information subject to the requirements of the PRA, unless that collection of information displays a currently valid OMB control number.

Public comment is sought regarding: Whether this proposed collection of information is necessary for the proper performance of the functions of the agency, including the practical utility of the information collection; the accuracy of the burden estimate; ways to enhance the quality, utility, and clarity of the information to be collected; and ways to minimize the burden of the collection of information, including through the use of automated collection techniques or other forms of information technology.

List of Subjects in 50 CFR Part 660

Administrative practice and procedure, American Samoa, Fisheries, Fishing, Guam, Hawaiian Natives, Indians, Northern Mariana Islands, Reporting and recordkeeping requirements.

Dated: October 4, 2005.

William T. Hogarth,

Assistant Administrator for Fisheries, National Marine Fisheries Service.

For the reasons set out in the preamble, 50 CFR part 660 is proposed to be amended as follows:

PART 660—FISHERIES OFF WEST COAST STATES AND IN THE WESTERN PACIFIC

1. The authority citation for part 660 continues to read as follows:

Authority: 16 U.S.C. 1801 *et seq.*

2. In § 660.302, new definitions for ''Base permit,'' ''Change in partnership or corporation,'' ''Corporation,'' ''Partnership,'' ''Spouse,'' and ''Stacking'' are added and the definition of ''Permit holder'' is revised in alphabetical order to read as follows:

§ 660.302 Definitions.

* * * * *

Base permit, with respect to a limited entry permit stacking program, means a limited entry permit described at § 660.333(a) registered for use with a vessel that meets the permit length endorsement requirements appropriate to that vessel, as described at § 660.334(c).

* * * * *

Change in partnership or corporation, means the addition of a new shareholder or partner to the corporate or partnership membership. This definition of a ''change'' will apply to any person added to the corporate or partnership membership since November 1, 2000, including any family member of an existing shareholder or partner. A change in membership is not considered to have occurred if a member dies or becomes legally incapacitated and a trustee is appointed to act on his behalf, nor if the ownership of shares among existing members changes, nor if a member leaves the corporation or partnership and is not replaced. Changes in the ownership of publicly held stock will not be deemed changes in ownership of the corporation.

* * * * *

Corporation, is a legal, business entity, including incorporated (INC) and limited liability corporations (LLC).

* * * * *

Partnership, is two or more individuals, partnerships, or corporations, or combinations thereof, who have ownership interest in a permit, including married couples and legally recognized trusts and partnerships, such as limited partnerships (LP), general partnerships (GP), and limited liability partnerships (LLP).

* * * * *

Permit holder means a vessel owner as identified on the United States Coast Guard form 1270 or state motor vehicle licensing document.

* * * * *

Spouse, means a person who is legally married to another person as recognized by state law (i.e., one's wife or husband).

* * * * *

Stacking, is the practice of registering more than one limited entry permit for use with a single vessel (See § 660.335(c)).

* * * * *

3. In § 660.303, paragraph (c) is revised to read as follows:

§ 660.303 Reporting and Recordkeeping.

* * * * *

(c) Any person landing groundfish must retain on board the vessel from which groundfish is landed, and provide to an authorized officer upon request, copies of any and all reports of groundfish landings containing all data, and in the exact manner, required by the applicable state law throughout the cumulative limit period during which a landing occurred and for 15 days thereafter. For participants in the primary sablefish season (detailed at § 660.372(b)), the cumulative limit period to which this requirement applies is April 1 through October 31.

* * * * *

4. In § 660.306, paragraph (b)(3) is added and paragraphs (e) and (g)(2) are revised to read as follows:

§ 660.306 Prohibitions.

* * * * *

(b) * * *

(3) Fail to retain on board a vessel from which sablefish caught in the primary sablefish season is landed, and provide to an authorized officer upon request, copies of any and all reports of sablefish landings against the sablefish endorsed permit's tier limit, or receipts containing all data, and made in the exact manner required by the applicable state law throughout the primary sablefish season during which such landings occurred and for 15 days thereafter.

* * * * *

(e) *Fixed gear sablefish fisheries.* (1) Take, retain, possess or land sablefish under the cumulative limits provided for the primary limited entry, fixed gear sablefish season, described in § 660.372, from a vessel that is not registered to a limited entry permit with a sablefish endorsement.

(2) Take, retain, possess or land sablefish in the primary sablefish season described at § 660.372(b) unless the owner of the limited entry permit registered for use with that vessel and authorizing the vessel to participate in the primary sablefish season is on board that vessel. Exceptions to this prohibition are provided at § 660.372(b)(4)(i) and (ii).

(3) Process sablefish taken in the limited entry primary sablefish fishery defined at § 660.372 at sea, from a vessel that does not have a sablefish at-sea processing exemption, defined at § 660.334(e).

* * * * *

(g) * * *

(2) Make a false statement on an application for issuance, renewal, transfer, vessel registration, replacement of a limited entry permit, or a declaration of ownership interest in a limited entry permit.

* * * * *

5. In § 660.334, paragraph (e) is redesignated as paragraph (f), and is revised; paragraphs (c)(3), d)(4)(ii) and (iii) are revised, and paragraphs (d)(4)(iv) through (vi) and new paragraph (e) are added to read as follows:

§ 660.334 Limited entry permits endorsements.

* * * * *

(c) * * *

(3) *Size endorsement requirements for sablefish-endorsed permits.* Notwithstanding paragraphs (c)(1) and (2) of this section, when multiple permits are ''stacked'' on a vessel, as described in § 660.335(c), at least one of the permits must meet the size requirements of those sections. The permit that meets the size requirements of those sections is considered the vessel's ''base'' permit, as defined in § 660.302. If more than one permit registered for use with the vessel has an appropriate length endorsement for that vessel, NMFS SFD will designate a base permit by selecting the permit that has been registered to the vessel for the longest time. If the permit owner objects to NMFS's selection of the base permit, the permit owner may send a letter to NMFS SFD requesting the change and the reasons for the request. If the permit requested to be changed to the base

permit is appropriate for the length of the vessel as provided for in paragraph (c)(2)(i) of this section, NMFS SFD will reissue the permit with the new base permit. Any additional permits that are stacked for use with a vessel participating in the limited entry primary fixed gear sablefish fishery may be registered for use with a vessel even if the vessel is more than 5 feet (1.5 meters) longer or shorter than the size endorsed on the permit.

* * * * *

(d) * * *

(4) * * *

(ii) No individual person, partnership, or corporation in combination may have ownership interest in or hold more than 3 permits with sablefish endorsements either simultaneously or cumulatively over the primary season, except for an individual person, or partnerships or corporations that had ownership interest in more than 3 permits with sablefish endorsements as of November 1, 2000. The exemption from the maximum ownership level of 3 permits only applies to ownership of the particular permits that were owned on November 1, 2000. An individual person, or partnerships or corporations that had ownership interest in 3 or more permits with sablefish endorsements as of November 1, 2000, may not acquire additional permits beyond those particular permits owned on November 1, 2000. If, at some future time, an individual person, partnership, or corporation that owned more than 3 permits as of November 1, 2000, sells or otherwise permanently transfers (not holding through a lease arrangement) some of its originally owned permits, such that they then own fewer than 3 permits, they may then acquire additional permits, but may not have ownership interest in or hold more than 3 permits.

(iii) A partnership or corporation will lose the exemptions provided in paragraphs ((d)(4) (i) and (ii) of this section on the effective date of any change in the corporation or partnership from that which existed on November 1, 2000. A ''change'' in the partnership or corporation is defined at § 660.302. A change in the partnership or corporation must be reported to SFD within 15 days of the addition of a new shareholder or partner.

(iv) During 2006 when a permit's ownership interest is requested for the first time, NMFS anticipates sending a form to legally recognized corporations and partnerships (i.e., permit owners or holders that do not include only individual's names) that currently own or hold sablefish-endorsed permits that requests a listing of the names of all shareholders or partners as of November 1, 2000, and a listing of that same information as of the current date in 2006. Applicants will be provided at least 60 days to submit completed applications. If a corporation or partnership fails to return the completed form by the deadline date of July 1, 2006, NMFS will send a second written notice to delinquent entities requesting the completed form by a revised deadline date of August 1, 2006. If the permit owning or holding entity fails to return the completed form by that second date, August 1, 2006, NMFS will void their existing permit(s) and reissue the permit(s) with a vessel registration given as ''unidentified'' until such time that the completed form is provided to NMFS. For the 2007 fishing year and beyond, any partnership or corporation with any ownership interest in or that holds a limited entry permit with a sablefish endorsement shall document the extent of that ownership interest or the individuals that hold the permit with the SFD via the Identification of Ownership Interest Form sent to the permit owner through the annual permit renewal process defined at § 660.335(a) and whenever a change in permit owner, permit holder, and/or vessel registration occurs as defined at § 660.335(d) and (e). SFD will not renew a sablefish-endorsed limited entry permit through the annual renewal process described at § 660.335(a) or approve a change in permit owner, permit holder, and/or vessel registration unless the Identification of Ownership Interest Form has been completed. Further, if SFD discovers through review of the Identification of Ownership Interest Form that an individual person, partnership, or corporation owns or holds more than 3 permits and is not authorized to do so under paragraph (d)(4)(ii) of this section, the individual person, partnership or corporation will be notified and the permits owned or held by that individual person, partnership, or corporation will be void and reissued with the vessel status as ''unidentified'' until the permit owner owns and/or holds a quantity of permits appropriate to the restrictions and requirements described in paragraph (d)(4)(ii) of this section. If SFD discovers through review of the Identification of Ownership Interest Form that a partnership or corporation has had a change in membership since November 1, 2000, as described in paragraph (d)(4)(iii) of this section, the partnership or corporation will be notified, SFD will void any existing permits, and reissue any permits owned and/or held by that partnership or corporation in ''unidentified'' status with respect to vessel registration until the partnership or corporation is able to transfer those permits to persons authorized under this section to own sablefish-endorsed limited entry permits.

(v) For permit owners with one individual listed and who were married as of November 1, 2000, and who wish to add their spouse as co-owner on their permit(s), NMFS will accept corrections to NMFS' permit ownership records. Permit owners may add a not-listed spouse as a co-owner without losing their exemption from the owner-on-board requirements (i.e., grandfathered status). Their new grandfathered status will be as a partnership, as defined at § 660.302 which includes married couples. Individual permit owners will lose their individual grandfathered status when they add their not-listed spouse unless they also owned at least one permit as an individual and did not retroactively add a spouse as co-owner on that permit. In cases where married couples are listed as co-owners of the same permit, both individuals will be counted as owning one permit each and will have grandfathered status as a partnership. An individual within the married couple will not, however, be able to retain their exemption from owner-on-board requirements if they choose to buy another permit as an individual and did not own a permit as an individual as of the control date in NMFS ''corrected'' records (i.e., NMFS records after allowing a not-listed spouse to be added as co-owner). Members of partnerships and corporations will not be allowed to add their spouses to the corporate ownership listing as of November 1, 2000, for purposes of exempting them from the owner-on-board requirements. NMFS will send a form to permit owners with one individual listed on the permit as of November 1, 2000, to allow married individuals who wish to declare their spouses as having permit ownership interest as of November 1, 2000. Applicants will be required to submit a copy of their marriage certificate as evidence of marriage. Applicants will be provided at least a 60 day period to submit an application to add a spouse as co-owner. Failure to return the completed form to NMFS SFD by July 1, 2006, will result in the individual listed on the permit in SFD records as of November 1, 2000, remaining on the permit. SFD will not accept any declarations to add a spouse as co-owner for couples married as of

November 1, 2000, postmarked after the July 1, 2006, deadline.

(vi) For an individual person, partnership, or corporation that qualified for the owner-on-board exemption, but later divested their interest in a permit or permits, they may retain rights to an owner-on-board exemption as long as that individual person, partnership, or corporation obtains another permit within one year from the date the final rule for these owner-on-board requirements is effective. An individual person, partnership or corporation could only obtain a permit if it has not added or changed individuals since November 1, 2000, excluding individuals that have left the partnership or corporation or that have died. NMFS would send out a letter to all individuals, partnerships or corporations who owned a permit as of November 1, 2000, and who no longer own a permit to notify them that they would qualify as a grandfathered permit owner if they choose to buy a permit within one year from the date the final rule is effective.

(e) *Sablefish at-sea processing prohibition and exemption*—

(1) *General.* Vessels are prohibited from processing sablefish at sea that were caught in the primary sablefish fishery without sablefish at-sea processing exemptions at § 660.306(e)(3). A permit and/or vessel owner may get an exemption to this prohibition if his/her vessel meets the exemption qualifying criteria provided in paragraph (e)(2) of this section. The sablefish at-sea processing exemption is issued to a particular vessel and the permit and/or vessel owner who requested the exemption. The exemption is not part of the limited entry permit. The exemption is not transferable to any other vessel, vessel owner, or permit owner for any reason. The sablefish at-sea processing exemption will expire upon transfer of the vessel to a new owner or if the vessel is totally lost, as defined at § 660.302.

(2) *Qualifying criteria.* A sablefish at-sea processing exemption will be issued to any vessel registered for use with a sablefish-endorsed limited entry permit that meets the sablefish at-sea processing exemption qualifying criteria and for which the owner submits a timely application. The qualifying criteria for a sablefish at-sea processing exemption are: at least 2,000 lb (907.2 mt), round weight, of frozen sablefish landed by the applicant vessel during any one calendar year in either 1998 or 1999, or between January 1 and November 1, 2000. The best evidence of a vessel having met these qualifying criteria will be receipts from frozen product buyers or exporters, accompanied by the fish tickets or landings receipts appropriate to the frozen product. Documentation showing investment in freezer equipment without also showing evidence of how poundage qualifications have been met is not sufficient evidence to qualify a vessel for a sablefish at-sea processing exemption. All landings of sablefish must have occurred during the regular and/or mop-up seasons and must have been harvested in waters managed under this part. Sablefish taken in tribal set aside fisheries or taken outside of the fishery management area, as defined at § 660.302, does not meet the qualifying criteria.

(3) *Issuance process for sablefish at-sea processing exemptions.*

(i) The SFD will mail sablefish at-sea processing exemption applications to all limited entry permit owners with sablefish endorsements and/or fixed gear vessel owners and will make those applications available online at *http://www.nwr.noaa.gov/1sustfsh/permits/prmits01.htm*. Permit and/or vessel owners will have at least 60 days to submit applications. A permit and/or vessel owner who believes that their vessel may qualify for the sablefish at-sea processing exemption will have until July 1, 2006, to submit evidence showing how their vessel has met the qualifying criteria described in this section at paragraph (e)(2) of this section. Paragraph (e)(4) of this section sets out the relevant evidentiary standards and burden of proof. SFD will not accept applications for the sablefish at-sea processing exemption postmarked after July 1, 2006.

(ii) Within 30 days of the deadline or after receipt of a complete application, the SFD will notify applicants by letter of determination whether their vessel qualifies for the sablefish at-sea processing exemption. A person who has been notified by the SFD that their vessel qualifies for a sablefish at-sea processing exemption will be issued an exemption letter by SFD that must be onboard the vessel at all times. After the deadline for the receipt of applications has expired and all applications processed, SFD will publish a list of vessels that qualified for the sablefish at-sea processing exemption in the **Federal Register**.

(iii) If a permit and/or vessel owner chooses to file an appeal of the determination under paragraph (e)(3)(ii) of this section, the appeal must be filed with the Regional Administrator within 30 days of the issuance of the letter of determination. The appeal must be in writing and must allege facts or circumstances, and include credible evidence demonstrating why the vessel qualifies for a sablefish at-sea processing exemption. The appeal of a denial of an application for a sablefish at-sea processing exemption will not be referred to the Council for a recommendation, nor will any appeals be accepted by SFD after September 1, 2006.

(iv) Absent good cause for further delay, the Regional Administrator will issue a written decision on the appeal within 30 days of receipt of the appeal. The Regional Administrator's decision is the final administrative decision of the Department of Commerce as of the date of the decision.

(4) *Evidence and burden of proof.* A permit and/or vessel owner applying for issuance of a sablefish at-sea processing exemption has the burden to submit evidence to prove that qualification requirements are met. The following evidentiary standards apply:

(i) A certified copy of the current vessel document (USCG or state) is the best evidence of vessel ownership and LOA.

(ii) A certified copy of a state fish receiving ticket is the best evidence of a landing, and of the type of gear used.

(iii) A copy of a written receipt indicating the name of their buyer, the date, and a description of the product form and the amount of sablefish landed is the best evidence of the commercial transfer of frozen sablefish product.

(iv) Such other relevant, credible evidence as the applicant may submit, or the SFD or the Regional Administrator request or acquire, may also be considered.

(f) *Endorsement and exemption restrictions.* ''A'' endorsements, gear endorsements, sablefish endorsements and sablefish tier assignments may not be transferred separately from the limited entry permit. Sablefish at-sea processing exemptions are associated with the vessel and not with the limited entry permit and may not be transferred at all.

* * * * *

6. In § 660.335, paragraphs (g)(2) through (g)(6) are redesignated as paragraphs (g)(3) through (g)(7) and a new paragraph (g)(2) is added; paragraphs, (c), (d)(1), (e)(1) and (e)(3) are revised; and paragraphs (a)(4) and (e)(4) are added to read as follows:

§ 660.335 Limited entry permits renewal, combination, stacking, change of permit owner or holder, and transfer.

(a) * * *

(4) Limited entry permits with sablefish endorsements, as described at

§ 660.334(d), will not be renewed until SFD has received complete documentation of permit ownership as required under § 660.334(d)(4)(iv).

* * * * *

(c) *Stacking limited entry permits.* ''Stacking'' limited entry permits, as defined at § 660.302, refers to the practice of registering more than one permit for use with a single vessel. Only limited entry permits with sablefish endorsements may be stacked. Up to 3 limited entry permits with sablefish endorsements may be registered for use with a single vessel during the primary sablefish season described at § 660.372. Privileges, responsibilities, and restrictions associated with stacking permits to participate in the primary sablefish fishery are described at § 660.372 and at § 660.334(d).

(d) * * *

(1) *General.* The permit owner may convey the limited entry permit to a different person. The new permit owner will not be authorized to use the permit until the change in permit ownership has been registered with and approved by the SFD. The SFD will not approve a change in permit ownership for limited entry permits with sablefish endorsements that does not meet the ownership requirements for those permits described at § 660.334 (d)(4). Change in permit owner and/or permit holder applications must be submitted to SFD with the appropriate documentation described at § 660.335(g).

* * * * *

(3) *Sablefish-endorsed permits.* If a permit owner submits an application to transfer a sablefish-endorsed limited entry permit to a new permit owner or holder (transferee) during the primary sablefish season described at § 660.372 (generally April 1 through October 31), the initial permit owner (transferor) must certify on the application form the cumulative quantity of primary season sablefish landed against that permit as of the application signature date for the then current primary season. The transferee must sign the application form acknowledging the amount of landings to date given by the transferor. This certified amount should match the total amount of primary season sablefish landings reported on state fish tickets. As required at § 660.303(c), any person landing sablefish must retain on board the vessel from which sablefish is landed, and provide to an authorized officer upon request, copies of any and all reports of sablefish landings from the primary season containing all data, and in the exact manner, required by the applicable state law throughout the primary sablefish season during which a landing occurred and for 15 days thereafter.

* * * * *

(e) * * *

(1) *General.* A permit may not be used with any vessel other than the vessel registered to that permit. For purposes of this section, a permit transfer occurs when, through SFD, a permit owner registers a limited entry permit for use with a new vessel. Permit transfer applications must be submitted to SFD with the appropriate documentation described at § 660.335(g). Upon receipt of a complete application, and following review and approval of the application, the SFD will reissue the permit registered to the new vessel. Applications to transfer limited entry permits with sablefish endorsements, as described at § 660.334(d), will not be approved until SFD has received complete documentation of permit ownership as required under § 660.334(d)(4)(iv).

* * * * *

(3) *Effective date.* Changes in vessel registration on permits will take effect no sooner than the first day of the next major limited entry cumulative limit period following the date that SFD receives the signed permit transfer form and the original limited entry permit. No transfer is effective until the limited entry permit has been reissued as registered with the new vessel.

(4) *Sablefish-endorsed permits.* If a permit owner submits an application to register a sablefish-endorsed limited entry permit to a new vessel during the primary sablefish season described at § 660.372 (generally April 1 through October 31), the initial permit owner (transferor) must certify on the application form the cumulative quantity of primary season sablefish landed against that permit as of the application signature date for the then current primary season. The new permit owner or holder (transferee) associated with the new vessel must sign the application form acknowledging the amount of landings to date given by the transferor. This certified amount should match the total amount of primary season sablefish landings reported on state fish tickets. As required at § 660.303(c), any person landing sablefish must retain on board the vessel from which sablefish is landed, and provide to an authorized officer upon request, copies of any and all reports of sablefish landings from the primary season containing all data, and in the exact manner, required by the applicable state law throughout the primary sablefish season during which a landing occurred and for 15 days thereafter.

* * * * *

(g) *Application and supplemental documentation.* * * *

(2) For a request to change a vessel registration and/or change in permit ownership or permit holder for sablefish-endorsed permits with a tier assignment for which a corporation or partnership is listed as permit owner and/or holder, an Identification of Ownership Interest Form must be completed and included with the application form.

* * * * *

7. In § 660.372, paragraph (b)(1) is revised and paragraph (b)(4) is added to read as follows:

§ 660.372 Fixed gear sablefish fishery management.

* * * * *

(b) * * *

(1) *Season dates.* North of 36E N. lat., the primary sablefish season for the limited entry, fixed gear, sablefish-endorsed vessels begins at 12 noon l.t. on April 1 and ends at 12 noon l.t. on October 31, unless otherwise announced by the Regional Administrator through the routine management measures process described at § 660.370(c).

* * * * *

(4) *Owner-on-Board Requirement.* Any person who owns or has ownership interest in a limited entry permit with a sablefish endorsement, as described at § 660.334(d), must be aboard the vessel registered for use with that permit at any time that the vessel has sablefish on board the vessel that count toward that permit's cumulative sablefish landing limit. This person must carry government issued photo identification while aboard the vessel. A permit owner is not obligated to be on board the vessel registered for use with the sablefish-endorsed limited entry permit during the primary sablefish season if:

(i) The person, partnership or corporation had ownership interest in a limited entry permit with a sablefish endorsement prior to November 1, 2000. A person who has ownership interest in a partnership or corporation that owned a sablefish-endorsed permit as of November 1, 2000, but who did not individually own a sablefish-endorsed limited entry permit as of November 1, 2000, is not exempt from the owner-on-board requirement when he/she leaves the partnership or corporation and purchases another permit individually. A person, partnership, or corporation that is exempt from the owner-on-board requirement may sell all of their permits, buy another sablefish-endorsed permit within up to a year from the date the last permit was approved for transfer, and retain their exemption from the owner-on-board requirements. Additionally, a person, partnership, or corporation that qualified for the owner-on-board exemption, but later divested their interest in a permit or permits, may retain rights to an owner-on-board exemption as long as that person, partnership, or corporation purchases another permit within one year of the date the final rule for these owner-on-board requirements is effective. A person, partnership or corporation could only purchase a permit if it has not added or changed individuals since November 1, 2000, excluding individuals that have left the partnership or corporation, or that have died.

(ii) A person who owns or who has ownership interest in a sablefish-endorsed limited entry permit, in cases of death, illness, or injury of the permit owner, that prevents the permit owner from being onboard a fishing vessel. The person requesting the exemption must send a letter to NMFS requesting an exemption from the owner-on-board requirements, with appropriate evidence as described at § 660.372(b)(4)(ii)(A) or (B). All emergency exemptions for death, injury, or illness will be evaluated by NMFS and a decision will be made in writing to the permit owner within 60 days of receipt of the original exemption request.

(A) Evidence of death of the permit owner shall be provided to NMFS in the form of a copy of a death certificate. In the interim before the estate is settled, if the deceased permit owner was subject to the owner-on-board requirements, the estate of the deceased permit owner may send a letter to NMFS with a copy of the death certificate, requesting an exemption from the owner-on-board requirements. An exemption due to death of the permit owner will be effective only until such time that the estate of the deceased permit owner has conveyed the deceased permit owner's permit to a beneficiary or up to three years after the date of death as proven by a death certificate, whichever is earlier. An exemption from the owner-on-board requirements will be conveyed in a letter from NMFS to the estate of the permit owner and is required to be on the vessel during fishing operations.

(B) Evidence of illness or injury that prevents the permit owner from participating in the fishery shall be provided to NMFS in the form of a letter from a certified medical practitioner. This letter must detail the relevant medical conditions of the permit owner and how those conditions prevent the permit owner from being onboard a fishing vessel during the primary season. An exemption due to injury or illness will be effective only for the calendar year of the request for exemption, and will not be granted for more than three consecutive or total years. NMFS will consider any exemption granted for less than 12 months in a year to count as one year against the 3–year cap. In order to extend an emergency medical exemption for a succeeding year, the permit owner must submit a new request and provide documentation from a certified medical practitioner detailing why the permit owner is still unable to be onboard a fishing vessel. An emergency exemption will be conveyed in a letter from NMFS to the permit owner and is required to be on the vessel during fishing operations.

* * * * *

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UNITED STATES DEPARTMENT OF COMMERCE
National Oceanic and Atmospheric Administration
NATIONAL MARINE FISHERIES SERVICE
Sustainable Fisheries Division
7600 Sand Point Way N.E., Bldg. #1
Seattle, Washington 98115-0070

OCT 12 2005

Mr. Don Hansen, Chair
Pacific Fishery Management Council
7700 NE Ambassador Place, suite 200
Portland, OR 97220-1384

Dear Mr. Hansen,

We are not able to completely implement the groundfish inseason adjustments recommended by the Pacific Fishery Management Council (Pacific Council) in September because one of the recommended adjustments (the 250-fm boundary line south of 38° N. lat) is not a "routine management measure." We are, however, immediately implementing management measures (boundary lines, trip limits and petrale retention prohibition) that meet the Pacific Council's recommendations as much as possible. By March 1, 2006, we expect to be able to implement the 250-fm boundary line as a "routine management measure."

The Pacific Council adopted inseason adjustments at their September 19-23, 2005, meeting in Portland, OR, under Agenda items, F.1. and F.5., that the National Marine Fisheries Service (NMFS) could not implement in a timely manner. Part of the Pacific Council's recommendation for the inseason adjustments was to modify the boundaries of the trawl RCA in order to further reduce the take of canary rockfish and petrale sole in the trawl fishery. The Pacific Council recommended increasing the size of the area closed to fishing with trawl gear, in part by modifying the seaward boundary of the trawl RCA to be at a boundary line approximating the 250-fm depth contour coastwide. However, NMFS is not able to implement this line south of 38° N. lat. to the U.S./Mexico border because there are no coordinates, or latitude/longitude waypoints, for this line in Federal regulations.

In order for NMFS to implement inseason adjustments to the 2005-2006 Pacific Coast groundfish specifications and management measures, they must be "routine management measures" as described at 50 CFR 660, Subpart G. Section 660.370 (c)(3) describes routine changes to the rockfish conservation areas (RCAs) by stating, "Depth-based management measures, particularly the setting of closed areas known as Groundfish Conservation Areas, may be imposed on any sector of the groundfish fleet using specific boundary lines that approximate depth contours with latitude/longitude waypoints."

Therefore, for NMFS to implement coordinates for the 250-fm boundary line south of 38° N. lat. to the U.S./Mexico border, coordinates would have to go through a full rulemaking process, proposed and final rule, which could take 90 days or more. Because catch of petrale sole was approaching its acceptable biological catch (ABC) for 2005 in September, action needed to be taken as soon as possible, and during October, to reduce the harvest of petrale sole to near zero.

The next closest RCA boundary line for this area with coordinates published in Federal regulations is a boundary line approximating the 200-fm depth contour. Therefore, in order to implement the intent of the Pacific Council recommendation as much as possible, NMFS is implementing a boundary line approximating the 200-fm depth contour and a prohibition on the retention of petrale sole in this area.

Because there is catch of petrale between 200-fm and 250-fm, including some targeting on petrale sole, moving the RCA boundary line from 150-fm to 200-fm for October through December will likely not keep total catch of petrale sole within its ABC for the year. A reduction of the petrale sole trip limit during the middle of a cumulative trip limit period (in this case, September through October) is not possible for enforcement reasons. Therefore, in addition to the boundary line change, NMFS also planned to implement a prohibition on the retention of petrale sole between 38° N. lat. and the U.S./Mexico border during the month of October in order to prevent targeting on petrale sole. NMFS discussed these changes with Council staff on a September 28, 2005, conference call to confer on ensuring that our changes most closely implemented the Pacific Council's intent for inseason changes. Unfortunately, the inseason action published in the Federal Register on October 5, 2005 (70 FR 58066) contained an error in the limited entry trawl trip limit table, Table 3 (South), on page 58076. The trip limit for petrale sole on line 16 should have been closed only south of 38° N. lat., as stated in the preamble, rather than south of 40°10' N. lat. Currently, NMFS is in the process of filing a correction to the October inseason action to make the October prohibition on retention of petrale sole apply only south of 38° N. lat. We should also note that the Pacific Council recommendation to decrease the trip limit for petrale sole to 2,000 lb per 2 months for November and December is being implemented.

In addition, in preparation for the November 2005 Pacific Council meeting, NMFS will be working with CDFG staff to develop coordinates for the 250-fm line south of 38° N. lat. to the U.S./Mexico border, both modified to accommodate petrale fishing and unmodified, and coordinates that would apply around the islands. These coordinates can then go through the proposed and final rulemaking process that will come after the November meeting for any changes to 2006 management measures that would be effective after March 1, 2006.

Sincerely,

Step P. Freese

Stephen P. Freese
Acting Assistant Regional
Administrator
NMFS Northwest Region

Agenda Item H.1.a
Supplemental Attachment 3
November 2005

ESTABLISHING A MAXIMIZED RETENTION AND MONITORING PROGRAM IN THE SHORE-BASED PACIFIC WHITING FISHERY

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) analyzes the effects of establishing a maximized retention and monitoring program in the Pacific whiting fishery off the coasts of Washington, Oregon, and California. A maximized retention program enables 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 maximized retention program helps ensure quality whiting products by enabling catch to be placed in refrigerated seawater tanks immediately after capture. Additionally, maximized 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) by the shore-based whiting fleet. This EA analyzes the effects of establishing different retention and monitoring programs on the socioeconomic, biological, and physical environment of the Pacific Coast groundfish fishery.

At its September 8-12, 2003, meeting in Seattle, Washington, the Pacific Fishery Management Council (Pacific Council) reviewed a range of retention and monitoring program 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 Council reviewed an earlier version of this EA and adopted a revised range of alternatives for public review. After the June meeting, Alternatives 3 and 4 were revised according to the guidance provided by the Pacific Council. But because of new information regarding the operations of the shore-based whiting fishery generated by the 2004 EFP, in combination with evolving management goals of this retention and monitoring program, NMFS decided against sending out the revised range of alternatives for public review. Instead, NMFS chose to incorporate the new information and further revise the range of alternatives.

The Pacific Council is tentatively scheduled to review the new range of alternatives at their March 5-10, 2005, meeting in Seattle, Washington and select a preferred alternative at their April 2-7, 2006, meeting in Sacramento, California. After the Pacific Council's April 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 maximized retention and monitoring program prior to the April start of the 2007 primary whiting season. Establishing maximized 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.

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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 nautical 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.

NEPA regulations 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, need, and the 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.

1.2 Summary of Proposed Action

The proposed action is to establish a maximized 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 the Proposed Action

The need for establishing a maximized retention program and monitoring requirements in the shore-based Pacific whiting fishery is to provide for efficient prosecution of the shore-based whiting fishery and meet the requirements of and guidance from the Endangered Species Act, Pacific Coast groundfish FMP, the Magnuson-Stevens Act.

The needs for the proposed action are as follows:

- ➢ Provide for the shore-based Pacific whiting fleet, comprised exclusively of catcher vessels, to deliver unsorted catch to processing plants in Washington, Oregon, and California, a practice necessary to ensure that whiting landings are of market quality.
- ➢ 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.
- ➢ Maintain the integrity of Pacific Coast groundfish rebuilding plans for overfished species by accurately tracking overfished species incidentally taken in the shore-based whiting fishery.
- ➢ Create a management framework for the shore-based whiting fleet that will both implement the groundfish FMP's bycatch management measures recommendations for increased retention programs and that will facilitate future implementation of either a sector total catch limit program and/or an individual fishing quota program.

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 maximized 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 catch harvested by catcher vessels in the shore-based Pacific whiting fishery.
- ➢ Promote a targeted Pacific whiting fishery while eliminating incentives to target other groundfish species.
- ➢ Develop a standardized reporting methodology to estimate the total catch of whiting, other groundfish species, and prohibitied species, both retained and discarded, in the shore-based whiting fishery.
- ➢ Establish monitoring requirements to support maximized retention in the shore-based whiting fishery. Monitoring requirements may serve as a model for monitoring needs in future increased retention groundfish fisheries.

1.4 Background to the Purpose and Need

The proposed action is to implement a permanent monitoring program that provides for a maximized retention opportunity in the shore-based whiting fishery. This program is intended to meet the coverage needs of a maximized retention fishery and will aid in the sustainable management of Pacific Coast salmon and groundfish stocks.

1.4.1 Management History of the Shore-based Whiting Fishery

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.

The whiting stock is the most abundant of any managed groundfish resource off the coasts of Washington, Oregon, and California. Whiting landings in 2004 represented approximately 89% of the total groundfish landings by weight for the year (PacFIN 2004). 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 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).

The whiting fishery consists of at-sea and shore-based components. 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. 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. Owing to vessel configuration and approximately 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 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 directly 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 and sampling of the catch as well as the removal of prohibited species. This handling of salmon species and groundfish species taken in excess of cumulative trip limits by the shore-based whiting fleet was not in accordance with the 1996 Pacific Coast salmon or groundfish FMPs or under Federal regulation at 50 CFR 660.306. At that time, the salmon FMP prohibited the use of nets, other than hand-held nets used to lift hooked salmon aboard a vessel, to harvest salmon and the groundfish FMP classified salmon harvested by trawl gear as prohibited species. As a prohibited species, salmon would need to be returned to the sea as soon as practicable, after allowing for sampling by an observer, with a minimum of injury. (Owing to the high mortality rate of trawl caught salmon, all salmon discards are presumed dead.)

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 groundfish 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 ocean 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 salmon in the whiting fishery is to ensure compliance with the Chinook incidental take statement in the updated 1999 Biological Option analyzing the effects of the groundfish fishery on salmon stocks. Monitoring needs could change if additional salmon species are listed or additional incidental take data are needed for other management purposes.

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 of the whiting fishery. 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.

1.4.2 The Shore-based Whiting Fishery and the FMP

To address the permanent treatment and disposition of salmon in the shore-based component of the whiting fishery, the Pacific Council drafted amendments both the groundfish and salmon FMPs in 1996. The 1996 EA for these conjoined amendments 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 (i.e., 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. The Pacific Council took final action to implement the preferred alternative to maintain a viable shore-based whiting fishery using EFPs to temporarily monitor the incidental take of salmon until a permanent monitoring program could be implemented. NMFS approved Amendment 10 to the groundfish FMP and Amendment 12 to the Pacific salmon FMP on April 29, 1997.

Based on Amendment 10 to the groundfish FMP and Amendment 12 to the salmon FMP, changes to the catch restrictions, prohibited species, and net prohibition sections of these FMPs were made and the current language is shown below.

Excerpts from **The Pacific Coast Groundfish FMP** for the California, Oregon, and Washington groundfish fishery (PFMC 2004). These citation are current as of September 2005. If the Pacific Council adopts Amendment 18 (bycatch mitigation) in November 2005, the excerpts below will move to Section 6.7.

6.5.2.2 Catch Restrictions

Prohibited Species. It is unlawful for any person to retain any species of salmonid or Pacific halibut caught by means of fishing gear authorized under this FMP, except where a Council approved monitoring program is in effect.

Retention of salmonids and Pacific halibut caught by means of other groundfish fishing gear is also prohibited unless authorized by 50 CFR Part 300, Subparts E or F; or Part 600, Subpart H. Specifically, salmonids are prohibited species for longline and pot gear.

Salmon taken by troll gear may be retained and landed only as specified in troll salmon regulations.

6.5.5.4 Prohibited Species

Prohibited species means salmonids, Pacific halibut, Dungeness crab, and any species of fish which that vessel is not specifically authorized to retain, including fish received in excess of any authorization, landing limit, or quota. These species must be immediately returned to the sea with a minimum of injury after allowing for sampling by an observer, if any. This FMP authorizes the designation of other prohibited species in the future, or the removal of a species from this classification if consistent with the applicable law for that species.

Excerpt from **The Pacific Coast Salmon Plan** (PFMC 2003).

6.6.2 Net Prohibition

No person shall use nets to fish for salmon in the EEZ except that a hand-held net may be used to bring hooked salmon on board a vessel. Salmon caught incidentally in trawl nets while legally fishing under the groundfish FMP are a prohibited species as defined by the groundfish regulations (50 CFR Part 660, Subpart G). However, in cases where the Council determines it is beneficial to the management of the groundfish and salmon resources, salmon bycatch may be retained under the provisions of a Council-approved program which defines the handling and disposition of the salmon. The provisions must specify that salmon remain a prohibited species and, as a minimum, include requirements that allow accurate monitoring of the retained salmon, do not provide incentive for fishers to increase salmon bycatch, and assure fish do not reach commercial markets. In addition, during its annual regulatory process for groundfish, the Council must consider regulations which would minimize salmon bycatch in the monitored fisheries.

At the same time that the Pacific Council was finalizing its recommendations for Amendment 10 to the groundfish FMP and Amendment 12 to the salmon FMP, the U.S. Congress was finalizing the Sustainable Fisheries Act (SFA). The SFA significantly revised legislative guidance on U.S. marine fisheries management, amending and re-naming the Magnuson-Stevens Act. One of the notable changes to the Magnuson-Stevens Act was a greater emphasis on minimizing bycatch and bycatch mortality. The SFA added a new National Standard 9 to read:

> *Conservation and management measures shall, to the extent practicable, (A) minimize byatch and (B) to the extent bycatch cannot be avoided, minimize the mortality of such bycatch.*

Additionally, the Magnuson-Stevens Act requires at 16 U.S.C. §1803(a)(11) that FMPs:

> *Establish a standardized reporting methodology to assess the amount and type of bycatch occurring in the fishery, and include conservation and management measures that, to the extent practicable and in the following priority – (A) minimize bycatch; and (B) minimize the mortality of bycatch which cannot be avoided.*

To meet these requirements for the Pacific Coast groundfish fishery, the Pacific Council initially developed Amendment 13 to the FMP. Amendment 13 attempted to comply with the bycatch requirements by providing that NMFS could implement an observer program to gather data on bycatch, and could also take a variety of measures to reduce bycatch. Amendment 13 and its accompanying Environmental Assessment (EA) were subsequently disapproved by the federal district court as inadequate in Pacific Marine Conservation Council v. Evans, 200 F.Supp.2d 1194 (N.D. Calif. 2002) [hereinafter PMCC.]

In August 2001, NMFS began the West Coast Groundfish Observer Program (WCGOP,) which collects data at sea from vessels participating in the commercial groundfish fisheries. Background information on the development of WCGOP and the use of data from this program is provided in the preambles to the proposed rules for the 2004 and 2005-2006 groundfish harvest specifications and management measures (69 FR 1380, January 8, 2004; 69 FR 56550, September 21, 2004.) WCGOP data reports are available online at: http://www.nwfsc.noaa.gov/research/divisions/fram/observer/

Amendment 16-1 to the FMP, which the Pacific Council completed in August 2003 and which primarily addressed the process for developing and implementing overfished species rebuilding plans, made an observer program mandatory for West Coast groundfish fisheries. By this time, WCGOP had been in place for two years and the Pacific Council's Scientific and Statistical Committee had completed its review of a bycatch model for the fisheries that used WCGOP data. The Pacific Council developed the 2004 groundfish harvest specifications and management measures using WCGOP data in the bycatch model to structure management measures that would more effectively maximize fishing opportunities for the more abundant groundfish stocks while reducing opportunities for intercepting and discarding overfished groundfish stocks.

Also in 2003, NMFS and the Pacific Council began to look at bringing the Pacific Council's 1996 recommendation on Amendment 10 to the FMP into a contemporary management program. The relatively broad guidance provided in 1996 by Amendment 10 did not meet the specific needs of a 2003 fishery managed under the constraints of various recent court orders. NMFS had begun an environmental impact statement (EIS) on a bycatch mitigation program for the West Coast groundfish fisheries in 2001 and was planning on finishing that EIS by autumn 2004. Thus, the Pacific Council proceeded to develop a new management program for the shore-based sector of the whiting fishery using the guidance of Amendment 10 as a base, but with the intent of meeting more recent requirements on bycatch monitoring and mitigation.

In September 2004, NMFS completed the final EIS on bycatch mitigation in the West Coast groundfish fisheries. The Pacific Council's preferred alternative in that EIS included, among other things: a baseline accounting of bycatch by fishery sector for the purpose of establishing future bycatch program goals; the development and adoption of vessel and sector-specific caps for overfished and depleted groundfish species where practicable, and; support for the future use of individual fishing quota (IFQ) programs for appropriate sectors of the fishery. To bring their preferred alternative from the EIS into the FMP, the Pacific Council has been developing Amendment 18 to the FMP. Draft FMP amendatory language for Amendment 18 was considered at the Pacific Council's September 2005 meeting and is scheduled to be finalized at their November 2005 meeting. The maximized retention and monitoring program analyzed in this EA is intended to implement both Amendment 10 and the principles of and requirements from Amendment 18 for the shore-based sector of the Pacific whiting fishery.

Much of the time designing and implementing such a bycatch retention and monitoring program for the shore-based whiting fishery has been spent resolving such issues as understanding how the shore-based fishery operates, determining appropriate levels of monitoring, incorporating emerging monitoring technology, and establishing a program given the dwindling management budgets of state and Federal agencies. In response to new information and the dynamic nature of fisheries management, the scope of this project has been revised several times. This latest draft of the program represents NMFS best effort of how to develop and implement a retention and monitoring program for the shore-based fishery given the constantly evolving framework of the Pacific Coast groundfish fishery.

1.4.3 Issues Affecting Management of the Shore-based Whiting Fishery

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. Based on the Biological Opinion analyzing the effects of the Pacific Coast groundfish fishery on salmon stocks listed under the ESA, the current expected incidental take of Chinook salmon in the whiting fishery is 11,000 individuals per year. In 2004, 4,206 Chinook salmon were incidentally taken in the shore-based whiting fishery (Wiedoff and Parker 2004).

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 August 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 so that NMFS and the states can obtain information necessary to make future management decisions. 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 "maximized" retention fishery. The Observer Program's coverage plan is designed to make the most efficient of limited funding to collect total catch data that will be of greatest value to fishery managers. It is not an efficient use of the Observer Program's resources to place observers onboard vessels that immediately dump their catch into holding tanks without sorting. Therefore, in order for the shore-based whiting fishery to operate efficiently, it needs a monitoring program appropriately designed for a maximized retention fishery.

As defined at 50 CFR 600.745, EFPs authorize, for limited testing, public display, data collection, exploratory, health and safety, environmental cleanup, and/or hazard removal purposes, the target or incidental harvest of species managed under an FMP or fishery regulations that would otherwise be prohibited. EFPs for the shore-based whiting fishery were intended to provide for limited testing of a fishing strategy and monitoring program that could eventually be implemented on a fleet-wide scale and were not intended to be 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 monitor the incidental take of salmon in the shore-based whiting fishery, it is now appropriate to establish maximized retention and monitoring requirements for the shore-based whiting fishery in Federal regulations.

In addition to tracking the salmon incidentally 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. This requires accurate accounting of catch in the shore-based whiting fishery. There are currently eight groundfish species along the Pacific Coast that are being managed under overfished species rebuilding plans and at least seven of these species (widow rockfish, darkblotched rockfish, Pacific ocean perch, canary rockfish, yelloweye rockfish, bocaccio, and lingcod) are incidentally taken in the shore-based whiting fishery. In 2004, the incidental catch of overfished species in the shore-based fishery was as follows: 28,590 kg of widow rockfish, 3,700 kg of lingcod, 830 kg of canary rockfish, 750 kg of Pacific ocean perch, 740 kg of darkblotched rockfish, 400 kg of lingcod, 20 kg of bocaccio, and 10 kg of yelloweye rockfish (Wiedoff and Parker 2004). 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.

Besides the initial use of on-board observers, there was no at-sea monitoring of shore-based whiting vessels prior to 2004 to verify whether all catch is retained and/or to document the frequency of catch being dumped at sea. The incidental catch of widow rockfish, canary rockfish, darkblotched rockfish and Pacific ocean perch in the shore-based whiting fishery is of particular concern. 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 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 (Parker 2004), there are additional incentives to not place rockfish in the refrigerated seawater tanks with whiting.

Because of 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 maximized retention requirement. In 2004, the EFP was used to learn more about discard in the shore-based whiting fishery and to evaluate whether or not an electronic monitoring system would be an appropriate tool to verify retention and/or document discard in the shore-based whiting fishery. Results of that pilot project indicated that electronic monitoring is likely a useful tool to document retention versus non-retention of catch. However, these results also indicated that the shore-based fishery was not conducted like a full retention fishery, meaning that all fish caught are retained, but instead some discard occurred during approximately 20% of all fishing events. Of these discard events, almost 74% were estimated to be events with discarding of over 450 kilograms of fish and about 30% were estimated to be events with discarding of over 4,500 kilograms of fish. The percentage of discarding events to total fishing events ranged from 0% to 44%, with five vessels accounting for over 50% of the discarding events (McElderry et al. 2004). While it is not clear that electronic monitoring systems are effective in differentiating the species composition of catch, EFP results suggest that selective discard is not occurring. This new information on discard in the shore-based whiting fishery helped shape the 2005 EFP. For example, one of the purposes of the 2005 EFP was to evaluate the level of operational discard in the shore-based whiting fishery. Is there a difference between "avoidable" and "unavoidable" discard? Is the shore-based whiting fishery a "maximized" retention/ "minimized" discard fishery? These are the types of questions that the 2005 EFP will be used to answer.

Another purpose of the 2005 EFP is to evaluate if an electronic monitoring system is an appropriate tool to distinguish between different types and/or amounts of discard. Currently, the amount of discard assumed for the shore-based whiting fishery is zero. The ability to estimate the type and/or amount of discard in the shore-based whiting fishery would improve NMFS's ability to track total catch in the Pacific Coast groundfish fishery. In the future, annual discard estimates for the shore-based whiting fishery could possibly be subtracted from the next year's shore-based whiting allocation. This method of total catch accounting is possible provided that the species composition of discard is primarily whiting. Additionally, the ratio of whiting to non-whiting groundfish species and/or prohibited species observed at the plant and documented on fish tickets could be used to estimate the amount of non-whiting groundfish species and/or prohibited species discarded at sea. Estimates of discarded salmon and overfished rockfish species (e.g., canary rockfish and widow rockfish) could be counted inseason against the whiting fishery's salmon incidental take amount and bycatch limits.

While the stocks of overfished species are rebuilding, the availability of certain overfished species, such as Pacific ocean perch, canary rockfish, darkblotched rockfish, and widow rockfish, as incidental catch in the whiting fishery may constrain the harvest of whiting. In order to provide the whiting industry with a maximized harvest opportunity, the Pacific Council recommended bycatch limits for certain overfished species. When operating under bycatch limits, the whiting industry has the opportunity to harvest a larger amount of whiting, provided they do so while keeping the incidental catch of overfished species within adopted bycatch limits. In recent years, the most constraining overfished species for the whiting fishery have been darkblotched rockfish, canary rockfish, and widow rockfish. In the final rule for the 2005–2006 Pacific Coast groundfish specifications and management measures, whiting sector bycatch limits were put into place for canary rockfish and widow rockfish (50 CFR 660.373 (b)(4)). The need to track the catch of canary rockfish and widow rockfish against these bycatch limits is further support for developing and implementing a monitoring program in the shore-based whiting fishery.

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 maximized retention program in the Pacific Coast groundfish fishery as well as an associated monitoring program would satisfy the Magnuson-Steven Act bycatch minimization and standardized reporting methodology requirement for the shore-based whiting fishery.

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. 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 alternative to maintain a viable shore-based whiting fishery by 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.

As discussed above, the shore-based whiting fishery continued to be managed under an EFP for several years after the Pacific Council's 1996 adoption of Amendment 10 to the Groundfish FMP and Amendment 12 to the salmon FMP. During the Pacific Council's fall 2002 discussions of potential EFPs for 2003, Pacific Council members began asking how the shore-based whiting fishery might be moved from an EFP to a permanent regulatory regime. In 2003, NMFS discussed how to integrate to integrate the Pacific Council's 1996 recommendations into the contemporary management regime with the states of Washington, Oregon, and California. These discussions focused on: appropriate monitoring tools, how to implement an at-sea maximized retention program, disposition of fish on land, and reporting requirements for the program.

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 prior to public review. In keeping with the Pacific Council's recommendation, 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, a world leader in the field of fisheries monitoring and marine environmental assessment, and the shore-based whiting industry to discuss a retention and monitoring program in the shore-based whiting fishery. Additionally, NMFS and Archipelago staff attended 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 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 Council reviewed an earlier draft of this EA and adopted a revised range of alternatives for public review. After the June meeting, Alternatives 3 and 4 were revised according to the guidance provided by the Pacific Council. At the same time, data gathered during the 2004 EFP were becoming available and these data caused NMFS to question whether the revised range of alternatives was adequate to address the management needs of this fishery. Because of new information regarding the operations of the shore-based whiting fishery, generated by the EFP, in combination with evolving management goals of this retention and monitoring program, NMFS decided against sending out the range of alternatives for public review. Instead, NMFS chose to incorporate the new information and further revise the range of alternatives. To aid the revision of alternatives and discuss how the results of the 2004 EFP could be used to design the 2005 EFP, NMFS, ODFW, WDFW, and CDFG staff met with industry on April 5, 2005, in Tacoma, Washington.

The Pacific Council is tentatively scheduled to review this EA and, if appropriate, adopt a range of alternatives for public review at their March 5-10, 2006, meeting in Seattle, Washington. Consideration of a preferred alternative is tentatively scheduled for the Pacific Council's April 2-7, 2006, meeting in Sacramento, California.

1.5.2 Issues and Concerns Raised Through Scoping

While the initial purpose of the proposed action was to allow the shore-based whiting fishery to land unsorted catch by developing and implementing a monitoring program for the treatment and disposition of incidentally taken salmon, the importance of establishing maximized retention and monitoring options to track multiple aspects of the shore-based whiting fishery became apparent through the scoping process.

Issues and concerns identified by Federal and state staff during the pre-scoping period 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;
- valuable data could be collected dock-side but logistics of port sampling is difficult for the NMFS Observer Program;
- 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.

Issues and concerns identified during NMFS's April 5, 2005, meeting for participants in the 2005 shore-based whiting EFP include:

- what is avoidable and unavoidable discard;
- would gear requirements (e.g., net sensors, blow-out panels) be effective;
- what are the options for funding the monitoring;
- is electronic monitoring able to quantify the discard;
- how can "best practices" be encouraged; and
- how will retention requirements be enforced.

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 monitoring program for the shore-based whiting fishery that is appropriate to the fishing style, product recovery needs, and biological data gathering needs associated with the 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 maximized 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 the 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 maximized 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 monitoring system is appropriate for the shore-based whiting fishery, the advantages and disadvantages associated with four different components of a maximized retention and monitoring program in the shore-based whiting fishery and four different maximized retention and monitoring options for that fishery should be considered.

The four different components of a monitoring program for shore-based whiting fishery that should be considered are:

- how to establish retention and monitoring requirements
- retention and gear requirements,
- discard monitoring requirements, and
- disposition of overage and prohibited species requirements.

These four different components of the shore-based whiting fishery are termed "issues" in this EA.

The four different monitoring options to provide for monitoring program for the shore-based whiting fishery are:

- cumulative trip limits and partial groundfish observer coverage,
- an EFP with maximized retention and no at-sea monitoring,
- maximized retention and either a partial or full groundfish observer coverage, and
- maximized retention and full electronic monitoring coverage with the possibility of supplemental groundfish observer coverage.

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 the Alternatives and How the Alternatives are Structured

As discussed in Chapter One, because of the need to provide for the landing of unsorted catch at processing plants, meet the terms and conditions of the 1992 Biological Opinion analyzing the effects of the groundfish fishery on salmon stocks listed under the ESA, maintain the integrity of the groundfish rebuilding plans for overfished species, and satisfy the FMP's Magnuson-Stevens Act bycatch reporting requirements, a maximized retention and monitoring program is needed in the shore-based whiting fishery.

The how to establish retention and monitoring requirements component addresses the specifics of how requirements are implemented (e.g., cumulative trip limits, exempted fishing permit, Federal regulations). The retention and gear requirements component addresses defining operational discard, how to encourage "best practice" techniques, and discouraging selective discard. The discard monitoring component addresses different monitoring options, the ability to estimate discard, and discard accounting. The disposition of overage fish component addresses options for disposing of overage fish at the processing plant (e.g., not entering stream of commerce, rendered for non-human consumption) .

Analysis of the alternatives will weigh the effects of establishing maximized 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.

2.3 Alternatives Eliminated from Detailed Study

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 relates to the treatment and disposition of salmon in groundfish trawl fisheries. Currently, the groundfish and salmon FMPs, as amended by Amendments 10 and 12, allow the retention of salmon in certain groundfish trawl fisheries when those fisheries have approved monitoring programs (PFMC 2004; PFMC 2003). 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 allowing retention of salmon only if 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, 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 and accurately tracking the amount of salmon and overfished groundfish species incidentally taken in the shore-based whiting fishery.

The range of alternatives reviewed by the Pacific Council at their June 13-18, 2004, meeting in Foster City, California contained two components that have subsequently been modified in this EA. The first of these is the assumption that the shore-based whiting fishery is prosecuted like a full retention fishery, meaning that all fish caught are retained. In 2004, the shore-based whiting EFP was used to learn more about discard in the shore-based whiting fishery and to evaluate whether or not an electronic monitoring system would be an appropriate tool to verify retention and/or document discard in the shore-based whiting fishery. Results of that pilot project indicated that the shore-based fishery was not conducted like a full retention fishery, but instead some discard occurred during approximately 20% of all fishing events. Discard generally occurred when fish were released from the net to enable the net to be brought aboard the vessel, when fish were swept off the deck because the refrigerated seawater tanks were full, and during net cleaning. One of the purposes of the 2005 shore-based whiting EFP was to evaluate the level of operational discard in the shore-based whiting fishery. Is there a difference between "avoidable" and "unavoidable" discard? To reflect this new understanding of how the shore-based fishery operates, all discussions of a full retention fishery have been replaced by discussions of a maximized retention fishery. The second change from previous range of alternatives deals with the sampling of unsorted catch delivered by shore-based whiting vessels at processing plants. 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. 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. Given the previously discussed incentives to under report the catch of salmon and overfished groundfish species, it is important to account for prohibited species and groundfish taken in excess of cumulative trip limits. The quality of monitoring shore-based whiting deliveries to processing plants has declined in recent years. State employees used to sample whiting deliveries, verify fish tickets, collect biological data, and track overage/donation fish. Currently, plant employees sample whiting deliveries in Oregon and state employees do a limited amount of sampling in Washington and California. According to the current terms of the whiting EFP, prohibited species and 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, it is necessary to track the total catch of these fish and ensure that these fish do not enter the stream of commerce.

Currently, catch data for whiting, other groundfish species, and prohibited species harvested by the shore-based whiting fleet comes from commercial landings data and state port sampling programs. Pacific States Marine Fisheries Commission is contracting a review of commercial landings data (fish tickets) in Washington, Oregon, and California. Specifically, this review will document fish ticket data handling processes, fish ticket timing and verification processes, and the statistical validity of the port sampling program. Because of the timing of this review, NMFS removed the processing plant sampling component from this maximized retention and monitoring program. Landed catch data for whiting, other groundfish species, and prohibited species harvested in the shore-based fishery will continue to be generated by fish ticket information. If this review of commercial landings data determines that fish ticket information or port sampling programs have accuracy or statistical validity issues, then NMFS may take further action to develop and implement a processing plant sampling program for the shore-based whiting fishery.

2.4 No Action Alternative

Alternative 1 (No Action Alternative): There would be no provisions for maximized 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. 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.

Vessels would be subject to observer coverage requirements specified at 50 CFR 660.314 (c)(2). These regulations state that if NMFS notifies a vessel of the requirement to carry an observer, the vessel may not take and retain, possess, or land any groundfish without carrying an observer. 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. The groundfish observer coverage under this alternatives would likely be between 10% and 30% of trips made by the shore-based whiting fleet. The Observer Program has only a limited number of observers. Using Observer Program observers to provided random observer coverage for the shore-based fleet during the primary whiting season would reduce the amount of observer coverage in other sectors of the Pacific Coast groundfish fisheries.

2.5 Alternatives

Alternative 2 (Status Quo): The annual process of issuing EFPs to participants in the shore-based whiting fleet would continue as it has for over a decade. The EFPs would specify the maximized retention and monitoring requirements enabling participating vessels to land incidentally taken prohibited species and groundfish taken in excess of cumulative trip limits. However, EFPs for the shore-based whiting fishery were intended to provide for limited testing of a fishing strategy and monitoring program that may eventually be implemented on a larger fleet-wide scale and were not intended to be a permanent solution to the monitoring needs of the shore-based whiting fishery. 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. While monitoring requirements could be revised annually, it is unlikely that there would be at-sea monitoring of the retention and discard aspects of this fishery under this alternative because of the limited resources available to support EFP monitoring. As is the current practice, state agency or processing plant staff would dispose of groundfish taken in excess of cumulative trip limits and prohibited species. [See appendix for a copy of the June 15, 2005 shore-based whiting EFP.]

Alternative 3 (Groundfish Observers): Maximized retention and monitoring requirements for the shore-based whiting fishery would be specified in Federal regulation. The intent of these regulations is to encourage maximized retention while being mindful of operational discard. These regulations would build on the "best practice" techniques already used by the shore-based whiting fleet, may include gear and/or gear sensor requirements, and would discourage selective discard. After documenting discard in their logbooks, shore-based whiting vessels may be permitted to discard marine mammals, seabirds, sea turtles, and individual fish greater than 100 pounds in weight. A formula estimating the amount of annual discard in this fishery would also be specified in Federal regulations. The estimated discard of whiting in a given year could be subtracted from the shore-based sector's whiting allocation the following year. This discard formula could also address the amount of non-target groundfish species, overfished groundfish species, and prohibited species that may be discarded. Discarded catch of salmon and overfished groundfish species could be counted against the whiting fishery's incidental take limit of salmon and bycatch limits. Regulations will be drafted during the winter of 2005/2006 and the allowable discard section of the regulations will be largely based on the results of the 2005 EFP.

The harvesting aspect of the shore-based whiting fishery would be monitored by groundfish observers. Observers would be responsible for documenting retention and/or discard of catch. Observers may be able to approximate the species composition of discard. All discard events would be quantified. Because observers are also trained to collect sighting/interaction data on marine mammals and seabirds, observers would be able to collect this type of data aboard shore-based whiting vessels.

The amount of observer coverage necessary to effectively quantify the amount of discard in the shore-based whiting fishery is still being developed. For discussion purposes, observer coverage amounts of 25% and 100% are analyzed in this EA. The 25% observer coverage option would be similar to the current amount of observer coverage in the Pacific Coast groundfish bottom trawl fleet, while the 100% coverage level would be similar to that of the catcher-processors and motherships in the at-sea whiting fleet. The results of the 2005 EFP should help to assess appropriate observer coverage levels.

Regulations specifying the disposition of groundfish taken in excess of cumulative trip limits and prohibited species at shore-based whiting processing plants would be Federal regulations. The intent of these regulations would be to encourage efficient handling and, if possible, utilization of these fish (e.g., rendered for non-human consumption, fish meal) while ensuring that these fish did not enter the stream of commerce. Like the retention and monitoring requirements, these regulations will be developed during the winter of 2005/2006.

Alternative 4 (Electronic Monitoring): This alternative is identical to Alternative 3 with one exception, the discard monitoring requirements. Electronic monitoring systems would be used to monitor the harvesting aspects of the shore-based whiting fishery to document retention and/or discard of catch. Electronic system requirements would be specified in Federal regulations. Because electronic monitoring systems cannot be used to collect sighting/interaction data on marine mammals and seabirds, this information could not be collected under Alternative 4. Electronic monitoring would be used on 100% of the shore-based whiting trips.

One of the goals of the 2005 EFP is to evaluate how to use electronic monitoring systems to quantify the amount of operational discard in the shore-based whiting fishery. Depending on ability of electronic monitoring systems to quantify discard, supplemental groundfish observer coverage may be used in conjunction with electronic monitoring systems to monitor this fishery.

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.

2.6 Comparison of the Alternatives

Table 2.6.1. A comparison of maximized retention and monitoring options for the shore-based whiting fishery.

Issues	No Action	Status Quo	Groundfish Observer Monitoring	Electronic Monitoring
How to Establish Retention and Monitoring Requirements	Shore-based whiting fishery would operate under cumulative trip limits specified in Federal regulation.	Retention and monitoring requirements would be specified in the terms and conditions of the EFP issued on an annual basis.	Retention and monitoring requirements would be specified in Federal regulation. Estimated discard (whiting, bycatch prohibs) in a given year would be subtracted from the shore-based whiting allocation the following year. Discard would also count against the whiting fishery's incidental take of salmon and bycatch limits for overfished species.	Retention and monitoring requirements would be specified in Federal regulation. Estimated discard (whiting, bycatch prohibs) in a given year would be subtracted from the shore-based whiting allocation the following year. Discard would also count against the whiting fishery's incidental take of salmon and bycatch limits for overfished species.
Retention and Gear Requirements	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.	Either full retention or maximized retention would be specified in the terms and conditions of the EFP.	Maximized retention, best practices, operational discard, discouraging selective discard definition would be specified in Federal regulations. Gear and/or sensor requirements would be specified in Federal regulations.	Maximized retention, best practices, operational discard, discouraging selective discard definition would be specified in Federal regulations. Gear and/or sensor requirements would be specified in Federal regulations.
Discard Monitoring Requirements	Shore-based whiting vessels would be subject to observer coverage requirements specified at 50 CFR 660.314(c)(2). Observer coverage would likely be between 10% and 30% of shore-based whiting trips.	Likely no monitoring to document retention and/or estimate discard.	Groundfish observers would monitor 25% or 100% trips and estimate discard. Coverage requirements would be specified in Federal regulations.	Electronic monitoring systems would monitor 100% of trips and estimate discard. Coverage and system requirements would be specified in Federal regulations. Supplemental groundfish observer coverage may be used to help quantify discard.
Disposition of Overage and Prohibited Species Requirements	Disposition of overages would not be necessary as catch of those species would be discarded at sea.	State and/or plant staff would dispose of overages.	Disposition of overages and prohibited species (e.g., not entering stream of commerce, rendered for non-human consumption, fish meal) would be specified in Federal regulations.	Disposition of overages and prohibited species (e.g., not entering stream of commerce, rendered for non-human consumption, fish meal) would be specified in Federal regulations.

3.0 AFFECTED ENVIRONMENT

3.1 Introduction

This chapter describes the portion of the Pacific Coast groundfish fishery 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. For more complete information on all the groundfish fishery, see the environmental impact statement prepared for the 2005 - 2006 groundfish harvest specifications and management measures titled, "Proposed Acceptable Biological Catch and Optimum Yield Specifications and Management Measures for the 2005 - 2006 Pacific Coast Groundfish Fishery, Final Environmental Impact Statement including Regulatory Impact Review and Initial Regulatory Flexibility Analysis."

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 that 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 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 lb of Pacific whiting per year. Although maximized retention vessels are required to register for a Pacific whiting EFP, 200,000 lb 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

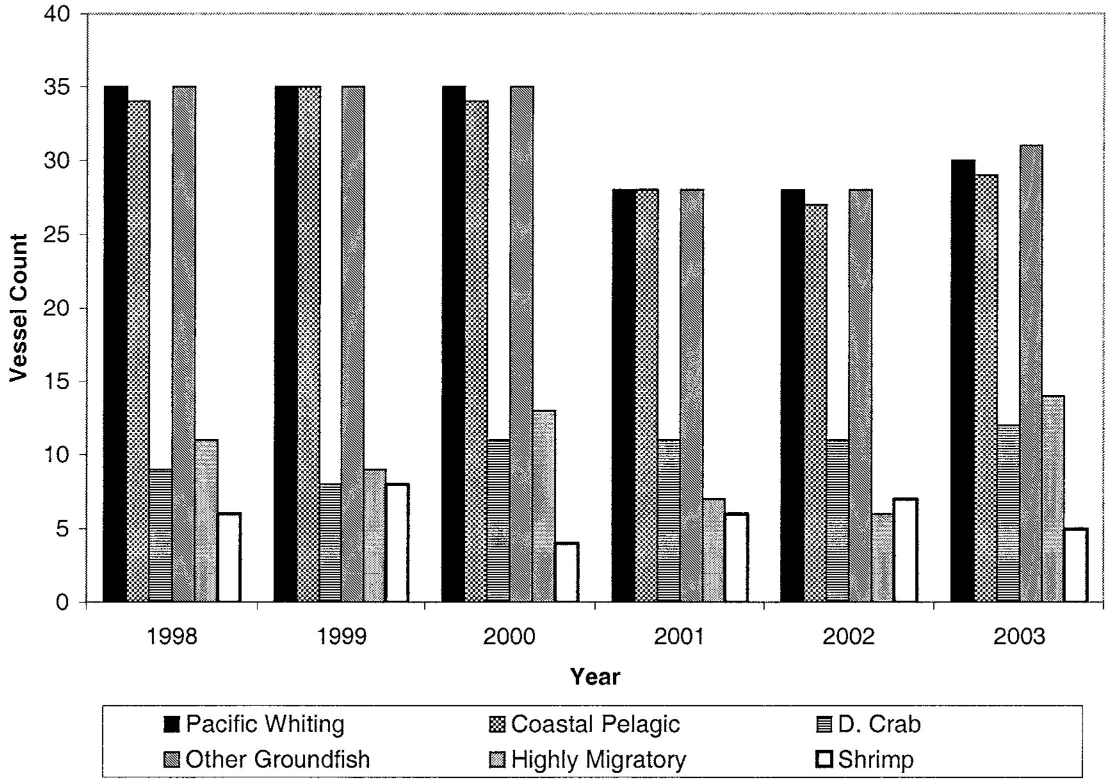

Figure 3.2.2.2. Count of Shore-Based Pacific Whiting Vessels by Year and Management Group. Source: PacFIN 2004

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 target species. 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.

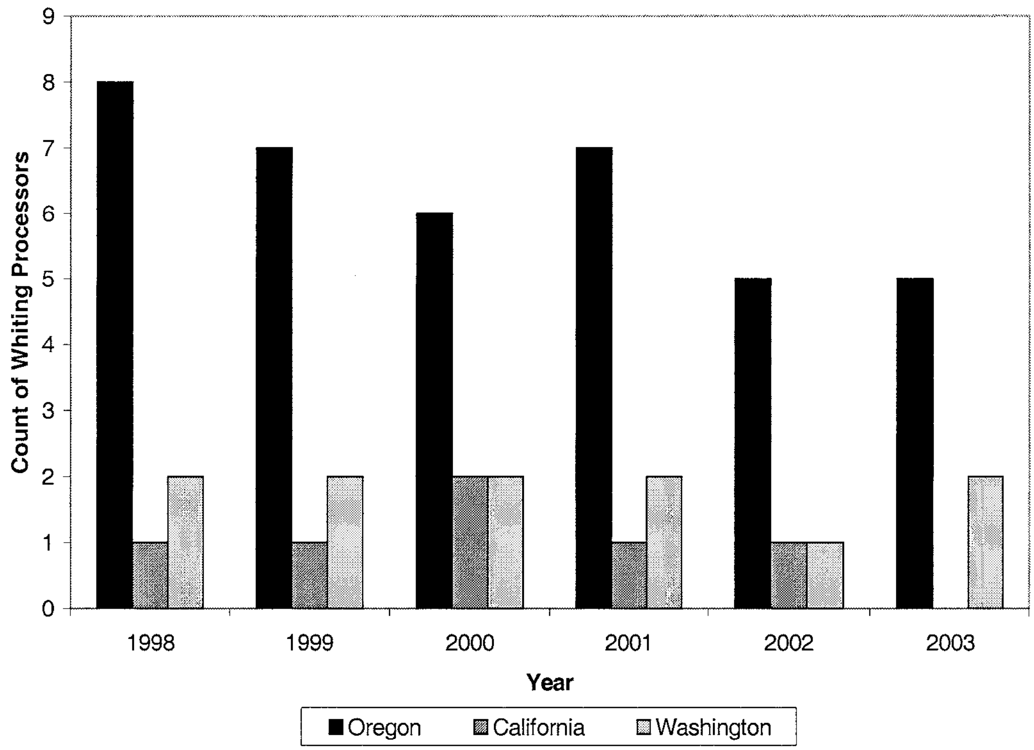

Figure 3.2.2.5. Count of Pacific Whiting Buyers by State 1998 - 2003. Source: PacFIN 2004.

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

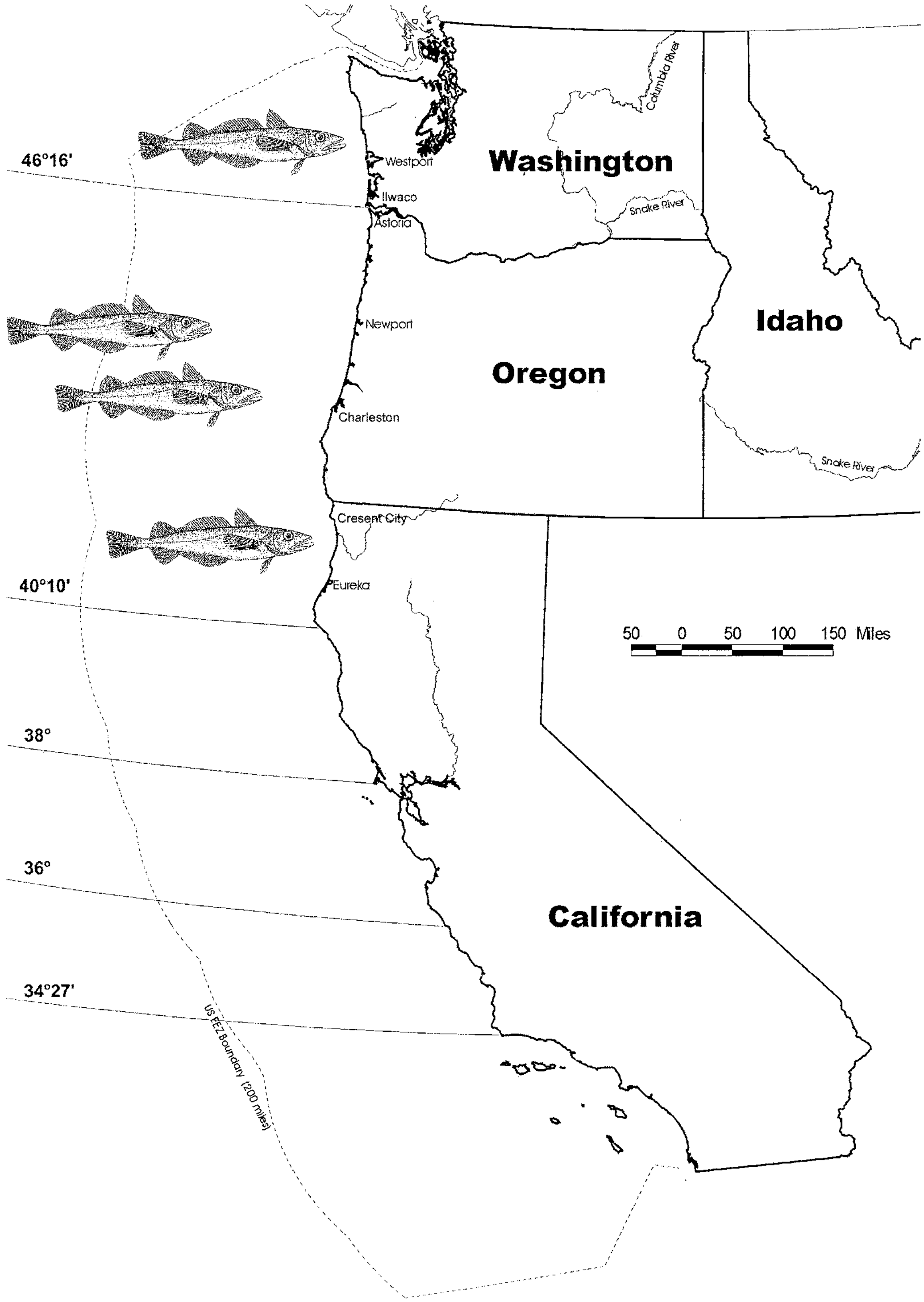

Figure 3.2.3.3. Map of the Pacific Coast showing important ports for the processing of whiting taken by the shore-based whiting fishery.

3.2.4 Shoreside Hake Observation Program

The Shoreside Hake Observation Program (SHOP) 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 SHOP 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 SHOP 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, SHOP's goals were a high target rate of observation (50% of the landings) and a focus on prohibited species. In 1995, the SHOP 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 associated with operating the SHOP 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 samplers) 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 samplers) 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 samplers) (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 samplers 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 SHOP in 2003 (Wiedoff et al. 2003).

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

3.3 Biological Characteristics of the Affected Resource

3.3.1 Salmon Resources

As discussed in Chapter 1, a primary purpose 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 SHOP indicate that some of these species are incidentally taken in the shore-based whiting fishery.

Review of SHOP 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.

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 species 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, 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 90 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 2005/2006 include: lingcod, Pacific cod, Pacific whiting, sablefish, cabezon, Dover sole, English sole, petrale sole, arrowtooth flounder, other flatfish, POP, shortbelly rockfish, widow rockfish, canary rockfish, bocaccio, splitnose rockfish, yellowtail rockfish, shortspine thornyhead, longspine thornyhead, cowcod, darkblotched rockfish, yelloweye rockfish, black rockfish, bank rockfish, blackgill rockfish, chilipepper rockfish, redstripe rockfish, sharpchin rockfish, silvergrey rockfish, splitnose rockfish, yellowmouth rockfish, 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 in length (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.

An age-structured assessment model was used in 2005 to update the 2004 whiting stock assessment. New information in this stock assessment included updated catch data through 2004 and recruitment indices from the 2004 Santa Cruz juvenile index survey. The stock assessment was examined by a joint U.S./Canada Stock Assessment Review (STAR) panel in early February 2005. As in 2004, the amount of whiting that the 2003 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 2005 stock assessment update. The stock was estimated to be at 50 percent of its unfished biomass in 2004 (2.5 million mt of age 3+ fish) if a survey catchability coefficient of 1.0 were applied and at 55 percent (4.0 million mt of age 3+ fish) of its unfished biomass in 2004 if a survey catchability coefficient of 0.6 were applied. However, in the absence of another large year class after 1999, the stock is projected to decline. In 2005, the stock is estimated to be at 38 percent of its unfished biomass when a survey catchability coefficient of 1.0 is applied and at 41 percent when a survey catchability coefficient of 0.6 is applied.

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

Table 3.3.2.1. Catch (mt) of prohibited species and groundfish in the 2004 EFP shore-based whiting fishery.

Species	Catch (mt)	Species	Catch (mt)
Pacific halibut	52 (# of fish)	POP	0.75
Sablefish	113.33	Darkblotched	0.74
Yellowtail	114.64	Bocaccio	0.02
Widow	28.59	Lingcod	3.70
Canary	0.83	Yelloweye	0.01

Data were taken from an ODFW report "Shoreside Hake Observation Program: 2004" (Wiedoff and Parker, 2004).

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 2004, 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 2004 shore-based whiting were yellowtail rockfish, sablefish, and widow rockfish. Table 3.3.2.1 shows the 2004 incidental take of overfished groundfish species as well as those groundfish species most commonly taken in the shore-based fishery during 2004.

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 an 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 Resources

Two species managed under the Coastal Pelagic Species Fishery Management Plan were also incidentally taken in the 2004 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 2004 shore-based whiting fishery was as follows: 107.16 mt of jack mackerel and 0.67 mt of Pacific mackerel (Wiedoff and Parker, 2004).

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.

NMFS is drafting environmental impact statement evaluating the effects of a comprehensive strategy to conserve and enhance essential fish habitat (EFH) for fish managed under the Groundfish FMP. The comprehensive strategy to conserve EFH, including its identification and the implementation of measures to minimize adverse impacts to EFH from fishing, to the extent practicable, must be consistent with provisions in the Magnuson-Stevens Act and implementing regulations. The Magnuson-Stevens Act is the principal legal basis for fishery management within the EEZ. Implementation of the strategy may require that the groundfish FMP be amended to describe any change in the EFH identification and description, among other things. New regulations may also be required to implement minimization measures. For more complete information on EFH, see the environmental impact statement titled, "Essential Fish Habitat Designation and Minimization of Adverse Impacts."

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PACIFIC COAST GROUNDFISH FISHERY EXEMPTED FISHING PERMIT (EFP)
AUTHORITY: Title 50, Code of Federal Regulations
Sections 600.745 and 660.406, and Subpart G of part 660

MONITORING INCIDENTAL CATCH IN THE SHORE-BASED PACIFIC WHITING FISHERY

F/V **Vessel name**

PERMIT # **05-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 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 owner (hereinafter referred to as the "EFP holder"). It expires 24 hours after notification by the Regional Administrator of termination of this permit, or when any of the provisions listed at E.2. are met, or on 11:59 p.m. PST December 31, 2005, 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.

Signature D. Robert Lohn, Regional Administrator Northwest Region National Marine Fisheries Service	Date Signed	Signature **XX**, EFP holder.	Date Signed

By signing this document, the EFP holder agrees that the EFP holder, the vessel owner(s), all vessel operators, and crew members of the vessel will comply with the intent and the terms and conditions of this permit. Further, the EFP holder is responsible for seeing that conditions of this permit are understood by the vessel owner(s), the vessel operator(s) and vessel crew.

Vessel Owner's Name/Address:
name, address, phone, fax XX

EXEMPTED FISHING PERMIT

MONITORING INCIDENTAL CATCH IN THE SHORE-BASED PACIFIC WHITING FISHERY

TERMS AND CONDITIONS

A. PURPOSE.

The purpose of this exempted fishing permit (EFP) is to evaluate a maximized retention and monitoring program in the shore-based Pacific whiting fishery off the coasts of Washington, Oregon, and California.

The objectives of this maximized retention and monitoring program are to allow efficient prosecution of the shore-based whiting fishery, track total catch in the shore-based whiting fishery, and minimize avoidable discard to the extent practicable. If these objectives can be achieved in an efficient and enforceable manner, this maximized retention and monitoring program may be transitioned into Federal regulations. If these objectives cannot be achieved in an efficient and enforceable manner, the shore-based whiting fishery may be required to operate under the Pacific Coast groundfish trip limit management system and sort all catch at sea.

B. BACKGROUND.

A maximized retention program would reduce 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 maximized retention program helps ensure quality whiting products by enabling catch to be placed in refrigerated seawater tanks immediately after capture. Additionally, a maximized retention and monitoring program will improve the ability of fishery management agencies to track the catch of whiting as well as the incidental catch of prohibited species (i.e., Pacific salmon, Pacific halibut, Dungeness crab) and overfished groundfish species (i.e., widow rockfish, darkblotched rockfish, canary rockfish, bocaccio) in the shore-based whiting fishery, thereby, helping to establish a standardized reporting methodology for this fishery.

At this time, this maximized retention and monitoring program is intended for participants in the directed shore-based whiting fishery. If successful, this maximized retention and monitoring program may be used in other Pacific groundfish fisheries in the future. Using this EFP to target any species other than whiting is contrary to the intent of this EFP. Inappropriate use of this EFP may result in early attainment of the 2005 non-tribal whiting fishery bycatch limits for canary rockfish and widow rockfish, as announced in the Federal Register, thus causing a coastwide closure of the non-tribal whiting fishery, and/or the need for the shore-based whiting to sort their catch at sea and operate under groundfish trip limit management.

C. SCOPE.

1. This permit applies to all fishing activities by the permitted vessel targeting on Pacific whiting during the effective dates of the permit. **In addition to all applicable terms and conditions in this document, the EFP holder is responsible for instructing all**

vessel operators and crew members concerning the terms and conditions of this permit.

2. This permit authorizes, for limited purposes as described in this permit, the following activities which would otherwise be prohibited by 50 CFR 660.306 (a)(2) and (6) and 50 CFR 660.405:

   a. Retention, until offloading, of prohibited species (including salmonids, Pacific halibut, and Dungeness crab) incidentally caught in a pelagic trawl;

   b. Retention, until offloading, of groundfish in excess of trip limits.

3. 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.

D. PERMIT CONDITIONS.

1. This permit is valid only for a vessel participating under the States' observation program that is 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, for that trip, the vessel must comply with all applicable trip limits and all fish landed for such a trip will count toward any cumulative trip limits in effect.

5. All groundfish caught in excess of current trip limits, but required to be retained under this EFP, must be abandoned to the State of landing immediately upon offloading. No vessel can receive payment for any fish landed in excess of any cumulative trip limits in effect. [Note: Currently, there are only midwater trawl trip limits for certain species. These are the only species, other than whiting, for which a vessel may be paid.]

6. All prohibited species (including salmonids, Pacific halibut, and Dungeness crab) incidentally caught in a pelagic trawl, and required to be retained under this EFP, must be abandoned to the State of landing immediately upon offloading.

7. When the vessel is targeting Pacific whiting and fishing under this permit as well as participating in the Pacific Coast groundfish fishery and not fishing under this permit during a single cumulative limit period, groundfish caught will count against a vessel's cumulative trip limits for those species.

E. EFFECTIVE DATES.

1. This permit is effective when signed by the NMFS Regional Administrator and the EFP holder. If the permit is signed by the NMFS Regional Administrator and the EFP holder on different dates, the effective date is the date of the EFP holder's signature.

2. This permit is only valid for the primary Pacific whiting season, as announced in the Federal Register and terminates on 11:59 p.m. PST December 31, 2005, unless terminated at an earlier date by one of the following actions:

   a. At the request of the vessel owner, in which case the permit is terminated on the date requested and no further notification from the Regional Administrator or State is required. The vessel owner is responsible for advising the EFP holder of the termination of the permit.

   b. 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 24 hours after delivery of the notification or any later time specified in the notification. The vessel owner is responsible for advising the EFP holder of the termination of the permit.

   c. When the Regional Administrator determines it is necessary to issue amended permits containing additional restrictions, in which case termination occurs 24 hours after delivery of the notice of termination from the Regional Administrator to the vessel owner or any later time specified in the notification. The vessel owner is responsible for advising the EFP holder of the termination of the permit.

   d. 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.

   e. When the Pacific whiting fishery is closed because of achievement of non-tribal whiting fishery bycatch limits, as announced in the Federal Register, in which case further written notification of the vessel owner is not required.

3. A copy of this EFP must be carried on board the vessel while EFP fishing.

F. FISHING RESTRICTIONS.

1. Maximized Retention. All catch, with the exception of unavoidable discards (see paragraph 2.c. below), must be brought onboard the vessel and retained until offloading. This requirement to bring and retain all catch onboard the vessel until offloading includes the catch of whiting, other groundfish species, and prohibited species (i.e., Pacific salmon, Pacific halibut, Dungeness crab).

2. Discard. For the purpose of this EFP, discard is defined as any marine organism, such as any groundfish species (including whiting), prohibited species, marine mammals,

seabirds, and sea turtles, captured as a result of fishing activity and returned to the sea. **When fishing under this EFP, efforts must be made to minimize discard.** Avoidable discard, or discard that results from such events as malfunctioning net sensors and/or catching more fish that is necessary to fill the hold, must be minimize to the extent practicable. Only certain types of discard, as described below, are permitted under this EFP.

a. Size: Large individual marine organisms, such as marine mammals, seabirds, or fish species longer than 6 ft in length, may be discarded. If a large individual marine organism is discarded, the species and reason for discarding shall be recorded and labeled "discard" in the logbook required by the State of landing.

b. Unavoidable Discard: Unavoidable discard, or discard that results from such things as hazardous weather conditions, unusual codend condition, school density, and net cleaning, must be minimized to the extent practicable. If unavoidable discard occurs, an estimate of the total discard amount for each species, to the extent possible, location of the tow, and reason for discarding shall be recorded, and labeled "discard" in the logbook required by the State of landing.

2. Disposition of salmon. Salmon caught under this permit must be retained and abandoned to the State of landing immediately upon offloading.

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 660.306 (a)(6) so long as such overage is surrendered to the State of landing.

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.

4. 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.

1. Only pelagic trawl gear authorized under 50 CFR Part 660, Subpart G may be used.

H. OBSERVER AND OTHER MONITORING REQUIREMENTS.

1. At-sea observers. If requested, a vessel must carry a state-sponsored or federal at-sea observer 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. An observer must be allowed 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, all persons shall abide by groundfish observer regulations at 50 CFR 660.306 and 50 CFR 660.314.

2. NMFS Observer coverage requirements at 50 CFR 660.360 and 50 CFR 660.314 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.

3. Electronic Monitoring (EM) Equipment If requested, a vessel may be required to carry electronic monitoring equipment to monitor for at-sea discarding of catch.

a. When a vessel is notified by NMFS or the state that they will be required to carry EM equipment, they must schedule a time with the NMFS specified EM provider for installation of the system. The installation must be scheduled before the vessel leaves port on the next EFP fishing trip. If an EM system is not installed before the next EFP fishing trip, it will be a 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 installed within 12 hours of the scheduled time.

b. As necessary, the vessel operator must allow for maintenance of EM equipment and data removal by the NMFS specified EM provider by scheduling an appointment. If the vessel operator does not schedule these services it will be a violation of the terms and conditions of this permit.

c. While EM equipment is aboard the vessel, the system must not be interfered with, damaged, or the power source turned off. If the EM system is interfered with, damaged, or the power source turned off, it will be a violation of the terms and conditions of this permit and the permit.

d. Vessel operator must regularly check status lights located on the EM system control box to confirm that the EM system is functioning properly. If status lights indicate an EM system malfunction, the vessel must contact the NMFS specified EM provider immediately. For 2005, the NMFS specified EM provider is Archipelago Marine Research Ltd. Contacts: Project manager - Howard McElderry (1.800.663.7152); Field services - Steve Ward (1.541.272.1775).

e. At the end of the shore-based whiting primary season or termination of the EFP, the EFP holder must schedule removal of the EM system with the NMFS specified EM provider.

I. NOTIFICATION REQUIREMENTS.

1. If requested, the EFP 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 installation and maintenance of electronic video monitoring equipment, and for deployment of at-sea observers, if any.

2. For landings in California, the vessel operator must notify CDFG at least 12 hours before departing port to commence fishing under this permit.

J. REPORTING 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 must be maintained by the vessel operator as required by the applicable state law. "Exempted Fishing Trip" (or "EFP") shall be written in the log for each trip conducted under this permit.

   a. Estimated pounds of all species, including, but not limited to, whiting, other groundfish, salmon, Pacific halibut, and Dungeness crab, observed in each tow must be recorded in the logbook.

   b. If discard occurs, an estimate of the total discard amount for each species, to the extent possible, location of the tow, and reason for discarding shall be recorded and labeled "discard" in the logbook, on the line associated with that tow, as required by the State of landing.

2. Other Reports. This permit does not relieve any person 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 EFP holder agree to the public release of any and all information obtained as a result of activities conducted under this permit, including EM provider access to logbooks to record information during periodic EM maintenance and service.

K. LANDINGS.

1. All landings must be at processing plants that are listed in the Designated Processor List (DPL) in Appendix A to this EFP.

   a. The DPL in Appendix A may be revised, after consultation between NMFS and the State observation program coordinator. The observation program coordinators for each state are as follows:

In California: Mike Fukushima, California Dept. of Fish and Game, 707- 441-5797.
In Oregon: Steve Parker, Oregon Dept. of Fish and Wildlife, 541-867-0300
In Washington: Brian Culver, Washington Dept. of Fish and Wildlife, 360-249-4628

2. 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.

L. SANCTIONS.

Failure of the vessel owner, operator, EFP holder, or any person 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)).

M. WAIVER.

The EFP 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#: 05-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

FEDERAL REGISTER NOTICES

Groundfish and Halibut Notices
September 26, 2005 through October 24, 2005

Documents available at NMFS Sustainable Fisheries Groundfish Web Site
http://www.nwr.noaa.gov/1sustfsh/gdfsh01.htm

70 FR 58066. Pacific Coast Groundfish Fishery; Inseason Adjustments. NMFS announces changes to management measures in the commercial and recreational Pacific Coast Groundfish Fisheries - 10/5/05

70 FR 59296. Pacific Coast Groundfish Fishery; Limited Entry Fixed Gear Sablefish Fishery Permit Stacking Program. NMFS issues this proposed rule to implement portions of Amendment 14 to the Pacific Coast Groundfish Fishery Management Plan for 2007 and beyond - 10/12/05

70 FR 61063. Pacific Coast Groundfish Fishery; Inseason Adjustments; Correction. This document contains corrections to the inseason adjustments that became effective on October 1, 2005 – 10/20/05

70 FR 61393. Pacific Coast Groundfish Fishery. NMFS announces the end of the 2005 Pacific Whiting Primary Season for the Catcher/Processor sector October 18, 2005 – 10/24/05

NATIONAL MARINE FISHERIES SERVICE REPORT ON GROUNDFISH MANAGEMENT

National Marine Fisheries Service (NMFS) Northwest Region will briefly report on recent regulatory developments relevant to groundfish fisheries and issues of interest to the Council.

NMFS Northwest Fisheries Science Center will also briefly report on groundfish-related science and research activities.

Council Task:

Discussion.

Reference Materials:

1. Agenda Item H.1.a, Attachment 1: Proposed Rule to Implement Additional Permit Stacking Regulations for the Limited Entry Fixed Gear Sablefish Fleet (Amendment 14, Second Rule Set).
2. Agenda Item H.1.a, Attachment 2: Letter of October 12, 2005 to Mr. Hansen from Dr. Freese regarding September inseason management recommendations.
3. Agenda Item H.1.a, Supplemental Attachment 3: Informational Report on a Program to Monitor a Maximized Retention Program in the Shore-Based Whiting Fishery (Draft Environmental Assessment Chapters 1-3).

Agenda Order:

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

PFMC
10/13/05

Agenda Item H.2.a
Attachment 2
November 2005

PETRALE SOLE

STAR Panel Report

Alaska Fisheries Science Center
Seattle, Washington
September 26-30, 2005

STAR Panel members:

Steven Berkeley, University of California Santa Cruz, SSC
Martin Dorn (Chair), Alaska Fisheries Science Center, SSC
Ray Conser, Southwest Fisheries Science Center, SSC
Owen Hamel, Northwest Fisheries Science Center, SSC
Robert Mohn, Center for Independent Experts
Kevin Piner (Rapporteur), Southwest Fisheries Science Center
Stephen Ralston, Southwest Fisheries Science Center, SSC

John DeVore, Pacific Fisheries Management Council, GMT representative
Peter Leipzig, Fishermen's Marketing Association, GAP representative

STAT Team Members present:

Han-Lin Lai, Northwest Fisheries Science Center
Jason Cope, University of Washington

Overview

The petrale sole assessment was initially reviewed by the flatfish Stock Assessment Review Panel (STAR) in April 2005. The assessment divided the stock into a northern component in the Vancouver and Columbia INPFC areas, and a southern component in the Eureka, Monterey and Conception areas. The STAR Panel did not approve the northern area assessment for management because new age data were given to the STAT team during the meeting and there was insufficient time during the meeting to evaluate and incorporate the data into the assessment. The STAT team agreed to prepare a revised assessment for the September wrap-up panel.

The southern area assessment was considered suitable for management advice by the April STAR Panel, but subsequent work to finalize the assessment raised questions about the convergence of the base model. The SSC recommended that the southern petrale assessment also be reviewed by the wrap-up panel to address these concerns. The SSC also wanted to be able to request southern model runs if issues raised in the review of the northern model were also relevant to the southern model. During the September wrap-up panel, the STAT team was represented by Han-Lin Lai and Jason Cope.

The STAR Panel and STAT teams agreed on base models and bracketing model runs to quantify uncertainty for both northern and southern components of the stock. Petrale sole in the north was estimated to be at 34% of unfished spawning stock biomass in 2005. In the south, the stock was estimated to be at 29% of unfished spawning stock biomass. Biomass trends were qualitatively similar in both areas, and also showed consistency with petrale sole trends in Canadian waters. Both stocks were estimated to have been below the Pacific Council's overfished threshold of 25% of unfished biomass from the mid-1970s until very recently. Estimated harvest rates were in excess of the target fishing mortality rate of F40% during this period as well. Petrale sole in both areas showed large recent increases in stock size, which is consistent with the strong upward trend in the shelf survey biomass index.

In comparison to previous assessments of petrale sole, this assessment represents a significant change in our perception of petrale sole stock status. For example, in the 1999 assessment, spawning biomass stock biomass in 1998 was estimated to be at 39% of unfished stock biomass. The current assessment now estimates biomass in 1998 to have been at 12% of unfished stock biomass. An extended period of low stock abundance followed by a rapid increase was a consistent feature of model results regardless of geographic area, model configuration, or selection of input data. Nevertheless, this pattern of extreme stock dynamics is difficult to reconcile with the long-term stability of the petrale sole fishery, and the Panel recommends exploration of this issue in future assessments.

The Panel is grateful to the STAT team for their cooperation during the meeting. Furthermore, the Panel agreed that both assessments constituted the best available science and were now acceptable for use in management.

Northern area model

Analyses requested by the STAR Panel

1) Provide a plot of the proportion of positive tows in the data used to generate the fishery CPUE indices

Reason: The CPUE indices in the model did not include the binomial component of the delta GLM due to convergence problems. The CPUE time series was based on only the GLM model for the positive tows.

Outcome: The proportion of positive tows showed an upward trend after 2000. Had it been possible to include the binomial part of the delta GLM, the upward trend in the CPUE index would likely have been magnified, and would be more consistent with the shelf survey biomass trend. The increase in the proportion of positive tows may be a result of changes in fishing practice due to management restrictions. The Panel concluded that it would not be appropriate to use the GLM analysis for positive tows in the model.

2) Develop a simplified model for petrale sole

The Panel requested a simple model with the following characteristics: a) all fisheries should have the same selectivity pattern, b) all selectivity patterns should be asymptotic, c) all length data should correspond to one of the fisheries, d) super years should be removed and year specific composition information should be maintained, e) each length composition should be given an equal effective sample size, f) the age data and the mean size at age data should be removed, g) the model should be a combined sex model, h) the 2004 survey data should be used to estimate growth parameters which should then be subsequently be fixed in the model, i) the original four CPUE time series and the shelf survey should be used in the model, j) the retention component of the model should be removed and zero discard should be assumed and k) recruitment deviations should be estimated over the entire modeled period, and the standard errors of the recruitment deviations should be used to determine which years had information to allow estimation of recruitment. A second model run was requested where recruitment deviations were estimated only for the period for which there is information to inform the model.

Reason: In the draft assessment there were many issues concerning the modeling of multiple fisheries with dome-shaped selectivity patterns using sex-specific age data from different agencies. These issues had not been resolved in the draft document, and were unlikely to be resolved in the time available for review. Model convergence was slow and erratic, suggesting that the model may be overparameterized given the quality and quantity of available data. The complexity of the assessment model was an impediment to understanding the model's basic properties, and the Panel hoped that radical simplification of model structure would help clarify matters.

Outcome: The simple model fit the data nearly as well as the more complex model. Fits to the fishery length composition appeared adequate. The fit to the shelf survey time series was excellent, but the fit the post-2000 fishery CPUE indices was poor. However, the reliability of post-2000 CPUE index is questionable due to changes in fishing practices. Biomass trends were similar to the complex model. It appeared reasonable to begin estimating recruitment deviations in 1940.

3) Do a likelihood profile over the CV of ageing error for the complex model
Reason: The Panel wanted to investigate the effects of the ageing error matrix on model performance. The Panel noted that the current ageing error matrix was based upon a comparison between surface ages and break-and-burn ages, which is an inappropriate measure of ageing precision for ages produced with a single ageing method. There were large and unexplained differences between agencies in the standard deviation of ageing error.
Outcome: The results of the profile indicate that ageing error had little influence on biomass estimates. The current ageing error matrix used in the model resulted in poorer model fits than the runs with a constant CV for ageing error. Based on advice from the STAT team and the results of the likelihood profile, the Panel recommended that an ageing error matrix based on an assumed CV of 10% be used for all data sources.

4) Estimate the growth model using combined male and female data
Reason: The simple model with combined sexes had used the female growth parameters.
Outcome: The combined sex growth model appeared to be nearly linear. The estimates of K (0.09) are smaller and Lmax (57.4 cm) larger than that female growth parameters.

5) Add discard to the total catch rather than attempting to model it separately
Reason: The data on discard of petrale sole are sparse and the historical records are of uncertain quality. The STAT team suggested that a discard rate of 10% in summer and 5% in winter were reasonable assumptions. This approach had been adopted for the southern area model at the previous STAR Panel
Outcome: The Panel and STAT team agreed that this was appropriate but alternative methods should be explored in future assessments.

6) Run both complex and simple models using the CPUE time series from the previous assessment and incorporating the requests 3, 4 and 5.
Reason: The CPUE time series in the previous assessment was derived from a GLM analysis that used all the data including zero tows, and the index ends in 1997 prior to the management restrictions that may have changed fishing practices.
Outcome: Panel and STAT team agreed this was appropriate.

7) Include sex-specific growth and sex-specific length composition data in the simple model.
Reason: This was based upon a recommendation from the STAT team. There is a 10 cm difference in maximum length between males and females and the STAT team wanted to capture this biological difference.
Outcome: The simple split-sex model converges and model fits indicate this is a reasonable base case. Surprisingly, the fits to the length composition were not noticeably better than the combined sex model.

8) Prepare decision table showing the consequences if stock biomass is higher or lower than the base case

Details about how the decision table was developed are described below.

Final base model and quantification of uncertainty

The base model is a split-sex model developed using Stock Synthesis 2. The model begins in 1908, a generation prior to the first substantial catch. Recruitment deviations were estimated starting in 1940. Four fisheries were modeled (Oregon summer and winter and Washington summer and winter) with the fishing year beginning November 1. Data used to fit the model included the fishery CPUE time series from the previous assessment (ending in 1997), and the shelf survey biomass time series (1980-2004) with the fishing year beginning November 1. The fishery CPUE series was taken from the previous assessment and ended in 1997. Length composition data from each fishery (1960-2004) and the shelf survey (1986-2004) were also used.

The model used a single asymptotic selectivity pattern for all fisheries and sexes. Length composition data from the different fisheries were treated as replicate observations with the same fishery selectivity (without super years). The shelf survey was also modeled with an asymptotic selectivity pattern. Discard was treated as a constant fraction of catch (10% summer and 5% winter) and included with the catch. Growth was fixed in the model based on estimates from the 2004 shelf survey length-at-age data. Natural mortality and recruitment variability (σ_R) were fixed, but stock recruit steepness (h) was estimated.

The Panel and STAT team agreed to bracket uncertainty using models with high and low spawning biomass in 2004 that were plus and minus 1.25 standard deviations from the base model spawning biomass. After some experimentation, it was found that the 2004 estimate of the shelf survey could be perturbed to obtain the desired low and high spawning biomass levels. Stock forecasts used catches projected by the GMT for 2005 and 2006 since attaining the OY is considered unlikely.

Southern area model

Analyses requested by the STAR Panel

During the meeting the STAT team noticed that the base model had an inappropriate prior for survey catchability and that recruitment deviations were being estimated at a later phase than is optimal. Changing these model configurations removed the discrepancy in the likelihood profile that was the primary source of unease about the southern area assessment.

1) Estimate recruitments deviations only for the time period when there is information about recruitment strength

Reason: The original assessment estimated recruitment deviations from the start of the model in 1876. There is no information about recruitment strength until the 1950s.

Outcome: The standard deviation of the recruitment residuals indicated that data were informative about recruitment strength during the period 1956-2004. The Panel and the

STAT team agreed that estimating recruitment residuals during this period was appropriate.

2) Examine the 2001 and 2004 shelf survey length data for evidence of strong year classes
Reason: The Panel was looking for support in the data for the model estimate of a strong 1999 year class.
Outcome: The STAT team presented figures of the survey and summer fishery size composition. There is some evidence of a mode corresponding to the 1999 year class, but it is not particularly compelling. The large survey biomass estimate in 2004 is evidently the primary signal that the model is responding to.

3) Provide a table of parameters identifying which parameters were estimated and which were fixed
Reason: The Panel was uncertain about how the model was configured
Outcome: The table was provided to the Panel.

4) Do a sensitivity run with the survey length composition removed
Reason: To determine if this data source is driving the estimated strength of the 1999 year class.
Outcome: Other data in the model tended to support the estimate of a strong 1999 year class, but the support was relatively weak and inconsistent.

5) Provide a model run that does not estimate recruitment deviations after 1998
Reason: To obtain a lower bracketing model to quantify uncertainty in the assessment.
Outcome: As expected this run did give a somewhat more pessimistic assessment result, but an alternative method to bound uncertainty was adopted (see below).

6) Compare predicted growth from the model and the mean length at age by sex from the 2004 survey
Reason: To evaluate whether the model estimates of growth are reasonable.
Outcome: This request could not be done at the meeting because the data were not readily available.

7) Prepare decision table showing the consequences if stock biomass is actually higher or lower than the base case
Details about how the decision table was prepared are described below.

Final base model and quantification of uncertainty

The base model is a split-sex model developed using Stock Synthesis 2. The model begins in 1874, approximately one generation prior to the first substantial catch. Recruitment deviations were estimated in 1956-2004. Two fisheries were modeled (winter and summer) with the fishing year beginning November 1. Data used to fit the model included two fishery CPUE time series (summer and winter), and the shelf survey biomass index (1980-2004). Length composition data from each fishery (1962-2004) and the shelf survey (1980-2004) were also used.

Sex-specific domed-shaped selectivity patterns were used to model both the summer fishery and shelf survey. For the winter fishery, an asymptotic selectivity was assumed for females and domed-shaped selectivity for males. Discard was treated as a constant fraction of catch (2.5% in both summer and winter) and included with the catch. Growth parameters were estimated in the model. Natural mortality and recruitment variability (σ_R) were fixed, but stock recruit steepness (h) was estimated.

The Panel and STAT team agreed to bracket uncertainty using models with high and low spawning biomass in 2004 that were plus and minus 1.25 standard deviations from the base model spawning biomass. After some experimentation, it was found that the 2004 estimate of the shelf survey could be perturbed to obtain the desired low and high spawning biomass levels. Stock forecasts used the pre-specified OYs for 2005 and 2006 since attaining the OY in 2005 was considered likely by the GMT.

Areas of Disagreement

There were no areas of disagreement between the Panel and STAT team.

Technical Merits and Deficiencies

The Panel recognizes that that simple northern assessment model leaves out details that could significantly improve model fits to different data sources. Nevertheless the Panel concluded that the simple base model would provide reliable management advice until the data and modeling issues can be adequately addressed.

Unresolved Problems and Major Uncertainties

The Panel did not have time to consider alternative methods of including discard in the model. A simple assumption of a constant percent discard was agreed to by the Panel and STAT team, primarily because of concerns about the reliability of historical discard estimates. This relatively crude approach assumes that discard and landed catch have the same length distribution, but it is likely that discard is primarily market (i.e., size) based.

The comparability of data collected by different agencies was an issue in this and previous assessments of petrale sole. The initial approach to model Oregon and Washington fisheries separately seemed to accentuate the difficulties rather than to resolve them. Any real difference in the fishery or in the biology of the targeted fish is confounded with differences in sampling and ageing procedures.

Apparent shifts in ageing criteria (break and burn and surface ageing) and poor model fits caused the Panel to question the reliability of the age data. The Panel recommended that all age composition data be removed from the model, however this should be considered an interim solution that needs to be revisited in future assessments.

Recommendations

1) Appropriate comparisons are needed to estimate ageing error. Potential drifts in the ageing criteria over time also should also be examined.

2) Reanalysis of the fishery CPUE data should be attempted using models that can accommodate both zero and positive tows. Although the CPUE indices appeared consistent with shelf survey biomass trends, consideration should be given to the potential impact of management restrictions on fishing practice.

3) Petrale sole stock trends were similar in both northern and southern areas. A single coastwide assessment should be considered.

LINGCOD

STAR Panel Report

Alaska Fisheries Science Center
Seattle, Washington
September 26-30, 2005

STAR Panel members:

Steven Berkeley, University of California Santa Cruz, SSC
Martin Dorn (Chair), Alaska Fisheries Science Center, SSC
Ray Conser, Southwest Fisheries Science Center, SSC
Owen Hamel, Northwest Fisheries Science Center, SSC
Robert Mohn (Rapporteur), Center for Independent Experts
Kevin Piner, Southwest Fisheries Science Center
Stephen Ralston, Southwest Fisheries Science Center, SSC

John Devore, Pacific Fisheries Management Council, GMT representative
Peter Leipzig, Fishermen's Marketing Association, GAP representative

STAT Team Members present:

Thomas Jagielo, Washington Department of Fish and Wildlife
Farron Wallace, Washington Department of Fish and Wildlife

Overview

Lingcod has been designated an overfished stock by the Pacific Fishery Management Council and is currently being managed under a rebuilding plan. The assessment divided the stock into a northern component in the Vancouver and Columbia INPFC areas (LCN), and a southern component in the Eureka, Monterey and Conception areas (LCS). The lingcod assessment was initially reviewed by a STAR panel in August 2005. The STAR Panel did not approve the assessment for management advice because of unresolved questions about the LCN model's estimates of a large increase in stock size in recent years. The Panel had difficulty seeing the foundations in the data for estimates of two strong year classes (1999 and 2000 year classes) that apparently were responsible for the increase in abundance. The STAT team agreed to examine the evidence more carefully and present their findings to the September wrap-up panel. During the panel meeting, the STAT team was represented by Tom Jagielo and Farron Wallace. The STAR panel primarily focused on this issue, and did not conduct a full review of the lingcod assessment.

The data used in the lingcod assessment received extensive scrutiny, and a number of sensitivity runs of the LCN model were performed. The Panel found that the commercial age composition, the survey age composition in 2001 and 2004, and the survey biomass estimates in 2001 and 2004 provided at least some support for stronger than usual 1999 and 2000 year classes. Data from the recreational fishery did not support strong 1999 and 2000 year classes. While these data collectively suggest that these two year classes are above average, their absolute magnitude remains uncertain, and it is not unusual for initial estimates of exceptionally strong year classes to drop down as more data become available.

Sensitivity runs indicated that the LCN stock would rebuild strongly even if the 1999 and 2000 year classes are considered average in size. In this scenario, strong rebuilding occurs because of the relatively high productivity of lingcod and the substantial catch reductions in the northern area in recent years. In contrast, catches have not been reduced to the same extent in the southern area, and rebuilding has been much slower. Based on these analyses and sensitivity runs, the Panel accepted the both LCN and LCS models. The models were unchanged from the earlier STAR Panel and are considered to be adequate for management advice. Spawning stock biomass was estimated to be 87% of unfished biomass in 2005 for the northern component, and 24% of unfished biomass for the southern component. The coastwide spawning stock biomass was estimated to be 64% of unfished biomass in 2005.

The Panel is grateful to the STAT team for their cooperation during the meeting. Furthermore, the Panel agreed that both LCN and LCS assessments constituted the best available science and were now acceptable use in management.

Analyses requested by the STAR Panel

1) Provide a sensitivity run with at least one asymptotic selectivity pattern

The Panel was concerned that the model was estimating high proportion of cryptic biomass (i.e., unseen in catch or surveys). The female selectivity pattern for the commercial fishery was considered a good candidate since it was already nearly asymptotic. Sensitivity runs were produced for both LCN and LCS models by assuming an asymptotic selectivity pattern for females in the commercial fishery. In LCN model, the starting biomass fell about 30%, which is consistent with the reported proportion of cryptic biomass presented at the pervious STAR Panel. In LCS model, the run with asymptotic selectivity reduced biomass by about 10%. The Panel did not consider the proportion of cryptic biomass to be excessive.

2) Provide two retrospective analyses. First, remove the shelf survey data for 2004, and then remove both 2004 and 2001 (remove both age composition data and biomass indices). Second, step back through the commercial composition data removing data in 2004 to 2001, sequentially and cumulatively.

It was unclear which data sets were contributing to the estimates of the strong 1999 and 2000 year classes. The retrospective analyses indicated that data from both the 2001 and 2004 shelf survey provide support for the estimates of strong recruitment of the 1999 and 2000 year classes. The commercial age composition data also support estimates of strong recruitment. Somewhat unexpectedly, the LCN stock shows strong rebuilding even with the 2001 and 2004 survey data removed and the 1999 and 2000 year classes assumed to be average. The stock will still rebuild in this scenario because of the relatively high productivity of lingcod and the substantial catch reductions in recent years.

3) Plot average age compositions for the survey and commercial fishery and then superimpose recent age composition

The results showed the 1999 and 2000 year classes were more prominent in comparison to the average age distributions in these data sets. There appeared to be some smearing of year classes in the commercial data, presumably due to ageing error.

4) As a sensitivity test, increase the CV's on the 1986 and 1995 shelf survey biomass estimates

The CV's on the 1986 and 1995 shelf surveys biomass estimates are very small and the panel thought that this may be affecting estimates of recruitment in subsequent years. This was not done due to time constraints.

5) Iteratively balance the model so that input and output sample sizes and standard deviations are similar

The Panel recommended that the abundance indices be balanced first and then the size and age composition data. The STAT team argued that further balancing was not needed since this had been done in the previous assessment model by dividing the input sample sizes by 10. Because the STAT team chose not to rebalance the model, the panel requested a diagnostic plot of effective sample sizes vs input sample sizes. These were presented and the practice of dividing by 10 looked roughly appropriate.

6) Prepare decision table showing the consequences if stock biomass is different than base case
Details about how decision tables were developed for the LCN and LCS models are described below.

Final base-cases models and quantification of uncertainty

The models for the two areas had the following fixed parameters in common:

Natural mortality: Females 0.18, Males 0.32
Recruitment variability: $\sigma_R = 1$
Stock-recruit steepness: $h = 0.90$
Von Bertalanffy growth curves were fitted outside the model. Separate curves were estimated for males and females and for northern and southern areas.

LCN model input data and selectivity patterns

Catch: 1956-2004

Abundance indices:
Trawl CPUE 1976-1997
Shelf survey 1977 – 2004

Length frequencies:
Recreational 1981-1983
Commercial 1975-1978
Shelf survey 1986, 1989

Age frequencies:
Recreational 1980, 1986-2004
Commercial 1979-2004
Shelf survey 1992 – 2004

Selectivity
Commercial fishery – domed or asymptotic
Recreational fishery - domed
Shelf survey - domed

LCS input data and selectivity patterns
Catch1956-2004

Abundance indices:
Trawl CPUE 1978 -1997
Shelf survey 1977 – 2004

Age frequencies:
- Recreational 1992-1998, 2000-2004
- Commercial 1992-1998, 2000-2004
- Shelf survey 1995-2004

Selectivity
- Commercial fishery – domed
- Recreational fishery - domed
- Shelf survey - domed

For the LCN model, the Panel and STAT team agreed to bracket uncertainty with a single low biomass run obtained by removing the 2001 and 2004 survey data and fishery size and age composition data from 2001 onward. Removal of these data produce estimates of the 1999 and 2000 years classes equal to the long-term average.

For the LCS model, the Panel and STAT team agreed to bracket uncertainty using models with high and low spawning biomass in 2005 that were plus and minus 1.25 standard deviations from the base model. After some experimentation, it was found that catches could be perturbed to obtain the desired low and high spawning biomass levels. Stock forecasts used catches projected by the GMT for 2005 and 2006.

Technical merits and/or deficiencies in assessments

The STAT Team is commended for their effort in producing the large number of analyses before and during the STAR Panel review.

This Panel did not conduct a full review of the lingcod assessment. Examination of model diagnostics (sensitivities, retrospective analyses, residual patterns, etc…) was limited, especially for the LCS model.

Areas of disagreement

There were no significant areas of disagreement within the Panel nor between the Panel and the STAT team.

Unresolved problems and major uncertainties

Due to lingcod's preference for rocky reef habitat, the Panel considered dome-shaped selectivity patterns to be reasonable from a conceptual perspective. However, some of the estimated selectivity patterns were quite angular in appearance with very steep descending slopes. The Panel had concerns both about the biological plausibility of these curves and whether the selectivity parameters had been defined and estimated appropriately. Further evaluation of survey and fishery selectivity patterns was warranted, but the Panel was unable to do so in the time available for review.

Recommendations for future research

1) Considering the independent recruitment trends in recent years between LCN and LCS, an investigation into stock structure should be considered.

2) Generic recommendation: At modeling workshop prior to this year's assessment cycle, there was a general recommendation to use iterative reweighting of input sample sizes and index variances. As a result, there was much more extensive use of these procedures in the assessments conducted this year. Prior experience of West Coast assessment scientists with these procedures was limited, and in some cases reweighting procedures may have been applied uncritically. For example, reducing weights on a survey index and increasing the weight on fishery data seems difficult to justify on first principles. A workshop is needed to assimilate the experience gained from this year's assessments and to develop recommendations for future assessments. Other methodological issues, such as the use of priors in this year's assessments, could also be addressed in the workshop, or a separate workshop.

Assessment of Lingcod (*Ophiodon elongatus*)

for the

Pacific Fishery Management Council

in 2005

by

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Executive Summary

Stock

This assessment applies to lingcod (*Ophiodon elongatus*) in the full Pacific Fishery Management Council (PFMC) management zone (the US-Vancouver, Columbia, Eureka, Monterey, and Conception INPFC areas). Separate assessment models were constructed to describe population trends in the northern (LCN: US-Vancouver, Columbia) and southern (LCS: Eureka, Monterey, Conception) areas.

Catches

Commercial Landings

Commercial lingcod catch history in California waters is available beginning 1916 (personal communication Brenda Erwin, PSMFC) and averaged 428 mt between 1916 and 1955 (Table 4). Commercial lingcod landings in Oregon were first reported in 1950 (Mark Freeman, personal communication) and averaged 264 mt between 1950 and 1953. Washington commercial lingcod landings were first reported in 1937 (anonymous, 1956, WDFW report) and averaged 106 mt until 1955.

Catch data were compiled from agency reports and personal communication for all years preceding 1981 (Table 5). The PacFIN database was queried for catch information in subsequent years and catch detail is presented by gear and INPFC area in Table 6.

Commercial landings peaked in 1985 at 3,129 mt in northern waters (Columbia and Vancouver INPFC areas) and in 1974 at 1,735 mt in southern waters (Eureka, Monterey and Conception INPFC Areas)(Table 5). Average catch between 1990-1997 declined 40 % and 35% since the 1980's in northern and southern waters, respectively. Under rebuilding management, commercial fishery restrictions in recent years (1998-present) reduced coastwide catches to an annual average of less than 225 mt (Figure 3).

From 1981-1997, trawl gear has made up the majority of commercial landings for the northern (83%) and southern (63%) coast. In recent years (1998-2004), commercial fishery restrictions constrained the trawl portion of the commercial catch to 65% and 40% for the northern and southern coast, respectively. In 2004, coastwide commercial landings totaled 174 mt and were distributed as follows by INPFC area: U.S.-Vancouver (41.7 mt), Columbia (44.6 mt) , Eureka 39.5 mt), Monterey (33.2 mt), Conception (14.8 mt).

Recreational Landings

Recreational fishers in California have targeted lingcod since the early 1940's. Catch averaged 65.3 mt annually between 1947-1954 (Leet et al., 1992). Recreational lingcod catch information is not available until 1977 for Oregon waters and averaged 52.3 mt annually between 1977 and 1979. Recreational lingcod catch in Washington was first estimated in 1967 to be 25.3 mt and annual catch estimates have been provided since 1975.

Recreational catch estimates were extracted from the RecFIN database for years 1980–1989 and 1993 to present for California waters. California recreational catch estimates for all other years were previously compiled in the 2000 lingcod assessment (Jagielo et al., 2000). Oregon recreational catch data were provided by ODFW (Don Bodenmiller personal communication). The recreational catch in Washington was provided by the WDFW Ocean Sampling Program.

Recreational catch in southern waters has declined since catch peaked in 1980 at 2,226 mt (Table 5, Figure 4). In contrast, recreational catch in northern waters peaked at 236 mt in 1994. Estimated coastwide recreational landings averaged 500 mt. from 1998-2004 and were 1175 mt. and 316 mt. in 2003 and 2004, respectively.

Historically, recreational landings have comprised a larger proportion of the total landings for the southern area, compared to the northern area. In recent years, the recreational portion of the total landings has increased substantially in both the southern and northern areas. In 2004 recreational fisheries harvested 65% of the total lingcod catch coastwide (Figure 5).

Data and Assessment

Present Modeling Approach and Assessment Program

The present assessment updates the previous coastwide assessment (Jagielo et al. 2003) and is implemented in Stock Synthesis II using the executable code SS2 version 1.19d (Methot 2005).

As in the previous assessment, separate age structured models were constructed to analyze stock dynamics for the northern (LCN: US-Vancouver, Columbia) and southern (LCS: Eureka, Monterey, Conception) areas.

The LCN model incorporated the following likelihood components, which are described mathematically in Methot 2005). Input data sources are specified by Table number in the body of the 2003 assessment document which follows:

1) Commercial Catch-At-Age: 1979-2004 (Table 9, Table 15).
2) Recreational Catch-At-Age: 1980, 1986-2004 (Table 10, Table 15).
3) Commercial Catch-At-Length: 1975-1978 (Table 13).
4) Recreational Catch-At-Length: 1981-1983 (Table 13).
5) NMFS Trawl Survey Catch-At-Age: 1992, 1995, 1998, 2001, and 2004 (Table 11).
6) NMFS Trawl Survey Catch-At-Length: 1986 and 1989 (Table 12).
7) WDFW Tag Survey Catch-At-Age: 1994-1997 (Table 11).
8) WDFW Tag Survey Catch-At-Length: 1986-1993 (Table 12).
9) NMFS Trawl Survey Biomass (mt): 1977, 1980, 1983, 1986, 1989, 1992, 1995, 1998, 2001 (Table20) and 2004 (Table 21).
10) WDFW Tag Survey Abundance (Numbers of Fish): 1986-1992 (Table 22).

NOTE: THIS DATASET WAS OMITTED IN FINAL BASE MODEL AT THE REQUEST OF THE STAR PANEL CONDUCTED AUGUST 15-19, 2005.

11) Trawl Fishery Logbook CPUE Index: Washington and Oregon lingcod CPUE estimates (lbs/hr) derived from a Delta GLM analysis of trawl logbook information, 1976-1997 (Table 24).

The LCS model incorporated the following likelihood components:

1) Commercial Catch-At-Age: 1992-1998, 2000-2004 (Table 14, Table 15).
2) Recreational Catch-At-Age: 1992-1998, 2000-2004 (Table 14, Table 15).
3) NMFS Trawl Survey Catch-At-Age: 1995, 1998, 2001, and 2004 (Table 14, Table 15).
4) NMFS Trawl Survey Biomass (mt): 1977, 1980, 1983, 1986, 1989, 1992, 1995, 1998, 2001 (Table20) and 2004 (Table 20, Table 21).
5) Trawl Fishery Logbook CPUE Index: Oregon and California lingcod CPUE estimates (lbs/hr) derived from a Delta GLM analysis of trawl logbook information, 1978-1997 (Table 25).

Unresolved Problems and Major Uncertainties

At the STAR Panel review (August 15-19, 2005) concern was raised regarding the apparent lack of evidence in the data for the northern (LCN) model estimates of high 1999 and 2000 year class strength. In particular, doubts were raised concerning the reliability of the 2001 and 2004 NMFS triennial survey estimates, in which these two year classes were abundant. Furthermore, the STAR Panel did not find compelling evidence from the fishery age composition data to corroborate the high year classes seen in those two surveys. As a result of these uncertainties, the lingcod assessment was recommended for further review at the follow-up STAR Panel meeting (September 26-30, 2005).

At the follow-up STAR Panel meeting, additional analyses and information were provided to document the LCN model estimates of high 1999 and 2000 year class strength. Additional model runs with sequential removal of the 2001 and 2004 NMFS trawl surveys, and age compositions from the commercial and recreational fisheries from 2000-2004 indicted that both survey and commercial data supported the two strong year classes. As a result, the STAT Team recommended and the STAR Panel approved the base LCN model for management.

The STAT team very much appreciated the constructive August 15-19, 2005 and September 26-30 STAR Panel reviews, which resulted in improved LCN and LCS models for fisheries management.

The STAT team additionally notes that:

1) Uncertainty regarding stock status is higher for the southern area relative to the northern area, primarily because historical data from the southern area were sparse relative to the northern area. The time series of fishery age data available for the southern (LCS) model is short and samples sizes are small, resulting in greater uncertainty in the estimation of assessment parameters and stock productivity for the southern area. Age data for the NMFS trawl survey were sparse for both regions in early years, but particularly for the southern region. Recreational fishery catch at age data were not available for the southern region in 2003.

2) Management-implemented minimum size limits have resulted in limiting the utility of fishery information for estimation of recent stock recruitment in both regions, and fishery trip limits have compromised the utility of recent fishery CPUE data as viable indices of abundance.

Management Reference Points

Management reference points derived from the 2005 lingcod stock assessment are summarized in Table ES-1. The estimates of unfished spawning biomass (Bzero) were determined as the product of mean recruitment from 1956-2005 and the estimated Spawners Per Recruit. On a coastwide basis the lingcod population is fully rebuilt; estimated spawning biomass was 34,017 mt in 2005, which is 0.60 of the unfished spawning biomass estimate (52,850 mt). The estimated ratio of 2005 spawning biomass to unfished spawning biomass is higher in the north (0.87) compared to the south (0.24).

Spawning Stock Biomass

SS2 estimates of the coastwide female spawning stock biomass declined from 60,106 mt in 1956 to 6,004 mt in 1994, and subsequently increased to 34017 mt in 2005 (Table ES-2, Figure ES1-Top). Female spawning biomass depletion (B_0/B_t) fell to 0.11 in 1994 and subsequently increased to 0.64 in 2005 (Table ES-2, Figure ES1-Bottom).

Recruitment

The model estimate of virgin recruitment was higher for the northern area (3750 thousand age 0 fish) compared to the southern area (2503 thousand age 0 fish). Recruitments were generally similar in magnitude in both the north and south from 1972-1992, averaging 2008 in the north, and 2071 in the south (Table ES-2. Figure ES-1, bottom). Subsequently, from 1993-2005, recruitments tended to be higher in the north, and averaged 4503 compared to 1309 for the same period in the south. Recent, historically strong, 1999 and 2000 year classes were estimated in the north.

Exploitation Status

In the northern area, the exploitation rate (catch/available biomass) peaked at 0.20 in 1991 and averaged 0.03 from 1956-1980, 0.12 from 1981-1997, and 0.02 from 1998-2005 (Table ES-3). Exploitation rates were generally higher in the southern area, peaking at 0.26 in 1989 and averaging 0.05 from 1956-1980, 0.20 from 1981-1997, and 0.10 from 1998-2005.

Management Performance

The first lingcod ABC's based on a quantitative assessment were implemented in 1995. A comparison of reported landings and ABC values shows good correspondence through 2001, when landings were typically at or below the target ABC values (Figure ES2). In 2002, landings exceeded the coastwide ABC by 17% and the coastwide OY was exceeded by 51%.

Forecasts and Decision Table

Projected yield was forecasted using the SS2 software for the northern (LCN) and southern (LCS) base models (Table ES-4). Coastwide yield forecasts (sum of LCN and LCS) are summarized in Table ES-5. Forecasts were run with and without the 40:10 adjustment option. These forecasts assumed that fishery removals in 2005 and 2006 were taken at the level projected by the Groundfish Management Team for 2005 (970mt) (John Devore, Personal Communication).

Additional model forecast runs were made for a set of alternative conditions to establish decision tables. For LCN, the decision table was constructed with the base model and one alternate model in which both: 1) the NMFS 2001 and 2004 shelf triennial trawl survey data were omitted, and 2) the age composition data for the recreational and commercial fishery were omitted for the years 2000 through 2004 (Table ES-6). For LCS, the decision table was constructed with the base model and two alternate models (Table ES-7). The first "low" alternate model assumed that spawning biomass in 2005 was approximately 1.25 standard deviations below the base model estimate of spawning biomass in 2005 (3375 mt); the second "high" alternate model assumed that spawning biomass in 2005 was approximately 1.25 standard deviations above the base model estimate of spawning biomass in 2005 (5827 mt).

In both decision tables (Table ES-6 and Table ES-7), the base case model using the base case catch projection is highlighted with a bold outline. The additional cells in the decision tables contrast the results obtained when the models are run with catch projections from the alternate (State of Nature) models. For instance, in the northern area, when base model projected catches are used with the alternate State of Nature model, a depletion level of 0.27 is predicted in the year 2016 (Table ES-6). In the southern area, the predicted depletion level of 0.39 in the year 2016 results when the "high" ending biomass model catches are applied to the "low" ending biomass State of Nature model (Table ES-7).

Recommendations: Research and Data Collection Needs

Emphasis should be placed on improving fishery age structure sampling size and geographical coverage in both regions. More frequent and synoptic fishery independent surveys should be conducted in both regions to aid in determination of stock status and recent recruitment.

Table ES1. Management reference points derived from the 2005 lingcod stock assessment.

Northern (LCN)	Base model
B2005 (mt)	29416
Rinit (Thousands)	3750
Spawners Per Recruit	10.52
Rmean56-05 (Thousands)	3207
Bzero (mt)	33749
Depletion	0.87
Southern (LCS)	**Base model**
B2005 (mt)	4601
Rinit (Thousands)	2503
Spawners Per Recruit	9.43
Rmean56-05 (Thousands)	2025
Bzero (mt)	19101
Depletion	0.24
Coastwide	**Base models-Pooled**
B2005 (mt)	34017
Bzero (Thousands)	52850
Depletion	0.64

Table ES2. Estimates of lingcod spawning biomass, depletion, and recruitment (1956-2005), derived from the 2005 lingcod stock assessment.

	Spawning Biomass (mt)			Depletion			Recruitment-Age 0 (Thousands)		
Bzero:	33749	19101	52850						
Year	LCN	LCS	Coastwide	LCN	LCS	Coastwide	LCN	LCS	Coastwide
1956	38357	21749	60106	1.14	1.14	1.14	3747	2497	6244
1957	37696	21500	59196	1.12	1.13	1.12	3745	2496	6241
1958	36979	20998	57977	1.10	1.10	1.10	3743	2494	6237
1959	36181	20480	56660	1.07	1.07	1.07	3740	2493	6233
1960	34816	20046	54862	1.03	1.05	1.04	3736	2491	6227
1961	33381	19675	53057	0.99	1.03	1.00	3731	2489	6220
1962	32166	19304	51470	0.95	1.01	0.97	3726	2488	6214
1963	31513	19065	50578	0.93	1.00	0.96	3724	2487	6210
1964	31280	18854	50134	0.93	0.99	0.95	3723	2486	6208
1965	30866	18781	49647	0.91	0.98	0.94	3721	2485	6206
1966	30281	18737	49018	0.90	0.98	0.93	3719	2485	6204
1967	29522	18700	48221	0.87	0.98	0.91	3715	2485	6200
1968	29283	18639	47922	0.87	0.98	0.91	3714	2485	6199
1969	28785	18539	47324	0.85	0.97	0.90	3712	2484	6196
1970	28723	18458	47181	0.85	0.97	0.89	3711	2484	6195
1971	28946	18228	47174	0.86	0.95	0.89	3712	2483	6195
1972	29065	17758	46823	0.86	0.93	0.89	3375	2480	5855
1973	29236	16829	46065	0.87	0.88	0.87	1176	2475	3652
1974	29073	15671	44744	0.86	0.82	0.85	2706	2468	5174
1975	28628	14435	43063	0.85	0.76	0.81	1515	2460	3975
1976	27545	13407	40952	0.82	0.70	0.77	1326	3967	5293
1977	26402	12480	38882	0.78	0.65	0.74	2318	1099	3417
1978	24918	12195	37113	0.74	0.64	0.70	2477	1227	3704
1979	23504	11994	35498	0.70	0.63	0.67	6619	5522	12141
1980	21260	11539	32800	0.63	0.60	0.62	1539	1403	2942
1981	19384	9664	29049	0.57	0.51	0.55	955	586	1541
1982	18112	8393	26505	0.54	0.44	0.50	1442	483	1925
1983	17140	7626	24766	0.51	0.40	0.47	1244	928	2172
1984	15700	7063	22763	0.47	0.37	0.43	1972	5487	7459
1985	13790	6212	20002	0.41	0.33	0.38	1298	1124	2422
1986	11454	5108	16562	0.34	0.27	0.31	2576	4621	7198
1987	10562	4512	15074	0.31	0.24	0.29	282	514	796
1988	9524	4384	13908	0.28	0.23	0.26	986	578	1563
1989	8615	4270	12885	0.26	0.22	0.24	1610	1581	3191
1990	7296	3934	11230	0.22	0.21	0.21	1357	1664	3021
1991	6328	3397	9725	0.19	0.18	0.18	2589	2015	4604
1992	4796	2720	7515	0.14	0.14	0.14	2806	800	3605
1993	4266	2255	6522	0.13	0.12	0.12	1120	1500	2620
1994	3864	2141	6004	0.11	0.11	0.11	3841	1067	4908
1995	3924	2226	6150	0.12	0.12	0.12	3607	985	4592
1996	4449	2215	6664	0.13	0.12	0.13	1694	2606	4300
1997	5034	2145	7179	0.15	0.11	0.14	1666	314	1979
1998	5886	2075	7961	0.17	0.11	0.15	4601	860	5462
1999	7245	2331	9576	0.21	0.12	0.18	11733	2016	13750
2000	8675	2630	11306	0.26	0.14	0.21	12945	1587	14532
2001	10702	3099	13801	0.32	0.16	0.26	3320	1750	5070
2002	13758	3558	17316	0.41	0.19	0.33	3552	1106	4658
2003	18370	3859	22229	0.54	0.20	0.42	3434	788	4221
2004	24077	3919	27996	0.71	0.21	0.53	3318	1075	4393
2005	29416	4601	34017	0.87	0.24	0.64	3715	1362	5076

Table ES3. Estimates of exploitation rate derived from the 2005 lingcod stock assessment.

Year	LCN Exploitation Rate	LCS Exploitation Rate
1956	0.016	0.018
1957	0.018	0.029
1958	0.021	0.029
1959	0.035	0.026
1960	0.039	0.024
1961	0.037	0.026
1962	0.027	0.021
1963	0.020	0.022
1964	0.027	0.017
1965	0.033	0.018
1966	0.039	0.019
1967	0.028	0.021
1968	0.036	0.023
1969	0.026	0.023
1970	0.020	0.031
1971	0.023	0.043
1972	0.022	0.068
1973	0.031	0.083
1974	0.037	0.093
1975	0.050	0.088
1976	0.043	0.090
1977	0.046	0.055
1978	0.040	0.066
1979	0.065	0.092
1980	0.063	0.193
1981	0.064	0.164
1982	0.079	0.178
1983	0.115	0.151
1984	0.128	0.139
1985	0.149	0.171
1986	0.074	0.152
1987	0.098	0.195
1988	0.109	0.226
1989	0.161	0.262
1990	0.146	0.261
1991	0.204	0.252
1992	0.130	0.256
1993	0.156	0.233
1994	0.131	0.191
1995	0.092	0.198
1996	0.097	0.198
1997	0.085	0.206
1998	0.049	0.125
1999	0.037	0.131
2000	0.011	0.062
2001	0.009	0.057
2002	0.009	0.103
2003	0.006	0.158
2004	0.008	0.039

Table ES4. Projected yield for the LCN Base Model (Top) and LCS Base Model (Bottom).

LCN Base Model

FORECAST:_Without_40:10

year	4010	bio-all	SpawnBio	recruit-0	Yield	ABC
2007	1	56321	36250	3741	5830	5830
2008	1	52212	34135	3734	5025	5025
2009	1	48734	31802	3725	4473	4473
2010	1	45743	29533	3715	4058	4058
2011	1	43170	27454	3705	3741	3741
2012	1	40976	25614	3694	3484	3484
2013	1	39145	24046	3684	3259	3259
2014	1	37670	22768	3675	3059	3059
2015	1	36525	21776	3667	2903	2903
2016	1	35653	21023	3661	2810	2810

FORECAST:__with_40:10

year	4010	bio-all	SpawnBio	recruit-0	Yield	ABC
2007	1	56321	36250	3741	5830	5830
2008	1	52212	34135	3734	5025	5025
2009	1	48734	31802	3725	4473	4473
2010	1	45743	29533	3715	4058	4058
2011	1	43170	27454	3705	3741	3741
2012	1	40976	25614	3694	3484	3484
2013	1	39145	24046	3684	3259	3259
2014	1	37670	22768	3675	3059	3059
2015	1	36525	21776	3667	2903	2903
2016	1	35653	21023	3661	2810	2810

LCS Base Model

FORECAST:_Without_40:10

year	4010	bio-all	SpawnBio	recruit-0	Yield	ABC
2007	1	9123	5451	1390	876	876
2008	1	9260	5398	2289	828	828
2009	1	9524	5374	2287	805	805
2010	1	10013	5419	2290	771	771
2011	1	10715	5609	2298	794	794
2012	1	11519	5973	2313	907	907
2013	1	12279	6429	2330	1025	1025
2014	1	12945	6884	2345	1134	1134
2015	1	13503	7291	2357	1218	1218
2016	1	13966	7643	2366	1275	1275

FORECAST:__with_40:10

year	4010	bio-all	SpawnBio	recruit-0	Yield	ABC
2007	0.756	9123	5451	1390	662	876
2008	0.767	9475	5558	2296	658	857
2009	0.778	9906	5667	2301	664	853
2010	0.792	10529	5819	2307	656	828
2011	0.817	11332	6091	2318	698	855
2012	0.85	12214	6517	2333	824	969
2013	0.885	13035	7022	2349	965	1090
2014	0.914	13736	7509	2362	1097	1200
2015	0.936	14299	7928	2373	1200	1282
2016	0.953	14743	8273	2381	1269	1332

Table ES-5. Projected coastwide yield (Sum of LCN and LCS).

Coastwide-Pooled (Sum of LCN and LCS)					
FORECAST:_Without_40:10					
year	**bio-all**	**SpawnBio**	**recruit-0**	**Yield**	**ABC**
2007	65445	41701	5130	6706	6706
2008	61471	39533	6022	5853	5853
2009	58257	37175	6012	5278	5278
2010	55756	34952	6005	4829	4829
2011	53885	33062	6003	4535	4535
2012	52495	31587	6008	4390	4390
2013	51424	30474	6014	4284	4284
2014	50615	29652	6020	4193	4193
2015	50028	29067	6024	4121	4121
2016	49619	28665	6026	4085	4085
FORECAST:__with_40:10					
year	**bio-all**	**SpawnBio**	**recruit-0**	**Yield**	**ABC**
2007	65445	41701	5130	6493	6706
2008	61686	39693	6030	5683	5883
2009	58640	37468	6026	5136	5326
2010	56271	35352	6022	4714	4886
2011	54502	33544	6023	4440	4597
2012	53190	32131	6027	4308	4453
2013	52181	31067	6033	4224	4349
2014	51405	30277	6037	4156	4259
2015	50824	29704	6040	4103	4184
2016	50396	29295	6041	4080	4142

Table ES6. Decision table for the northern (LCN) area.

LCN			State of Nature			
B0: 33749			Base Case		Alternate Case	
	Year	Catch	SSB	Depletion	SSB	Depletion
Management Decision						
			RUN BB		RUN AB	
Base Case Catch (With 40:10)	2007	5830	36250	1.07	20327	0.60
Full Model	2008	5025	34135	1.01	17713	0.52
	2009	4473	31802	0.94	15461	0.46
	2010	4058	29533	0.88	13614	0.40
	2011	3741	27454	0.81	12167	0.36
	2012	3484	25614	0.76	11067	0.33
	2013	3259	24046	0.71	10257	0.30
	2014	3059	22768	0.67	9695	0.29
	2015	2903	21776	0.65	9346	0.28
	2016	2810	21023	0.62	9159	0.27
			RUN BA		RUN AA	
Alternate Case Catch (With 40:10)	2007	3267	36250	1.07	20327	0.60
Delete:	2008	3042	36057	1.07	19584	0.58
2001, 2004 Survey	2009	2869	35277	1.05	18845	0.56
2000-2004 Fishery Age Comps.	2010	2729	34157	1.01	18170	0.54
	2011	2625	32927	0.98	17594	0.52
	2012	2555	31650	0.94	17116	0.51
	2013	2500	30396	0.90	16720	0.50
	2014	2456	29224	0.87	16396	0.49
	2015	2424	28171	0.83	16139	0.48
	2016	2402	27238	0.81	15933	0.47

Table ES7. Decision table for the southern (LCS) area.

LCS								
B0: 19101			Base Case		Alternate Case-Low		Alternate Case-High	
	Year	Catch	SSB	Depletion	SSB	Depletion	SSB	Depletion
Management Decision								
			RUN BB		**RUN LB**		**RUN HB**	
Base Case Catch (With 40:10)	2007	662	5451	0.29	4251	0.22	6568	0.34
Full Model	2008	658	5558	0.29	4420	0.23	6653	0.35
	2009	664	5667	0.30	4607	0.24	6713	0.35
	2010	656	5819	0.30	4839	0.25	6796	0.36
	2011	698	6091	0.32	5189	0.27	6988	0.37
	2012	824	6517	0.34	5694	0.30	7325	0.38
	2013	965	7022	0.37	6280	0.33	7739	0.41
	2014	1097	7509	0.39	6850	0.36	8135	0.43
	2015	1200	7928	0.42	7354	0.38	8464	0.44
	2016	1269	8273	0.43	7784	0.41	8722	0.46
			RUN BL		**RUN LL**		**RUN HL**	
Alternate Case Catch (With 40:10)	2007	414	5451	0.29	4251	0.22	6568	0.34
Ending Biomass-Low	2008	491	5745	0.30	4600	0.24	6840	0.36
	2009	557	5984	0.31	4920	0.26	7031	0.37
	2010	602	6218	0.33	5237	0.27	7195	0.38
	2011	672	6525	0.34	5627	0.29	7421	0.39
	2012	808	6959	0.36	6144	0.32	7764	0.41
	2013	956	7459	0.39	6732	0.35	8171	0.43
	2014	1096	7936	0.42	7297	0.38	8554	0.45
	2015	1203	8337	0.44	7788	0.41	8862	0.46
	2016	1280	8660	0.45	8201	0.43	9095	0.48
			RUN BH		**RUN LH**		**RUN HH**	
Alternate Case Catch (With 40:10)	2007	853	5451	0.29	4251	0.22	6568	0.34
Ending Biomass-High	2008	799	5415	0.28	4280	0.22	6509	0.34
	2009	761	5412	0.28	4357	0.23	6458	0.34
	2010	706	5490	0.29	4512	0.24	6467	0.34
	2011	740	5727	0.30	4823	0.25	6626	0.35
	2012	849	6131	0.32	5302	0.28	6943	0.36
	2013	979	6628	0.35	5874	0.31	7351	0.38
	2014	1101	7116	0.37	6441	0.34	7752	0.41
	2015	1195	7545	0.39	6949	0.36	8094	0.42
	2016	1258	7908	0.41	7393	0.39	8374	0.44

Figure ES1. Female spawning biomass (top) depletion (middle), and recruitment (bottom) 1956-2005.

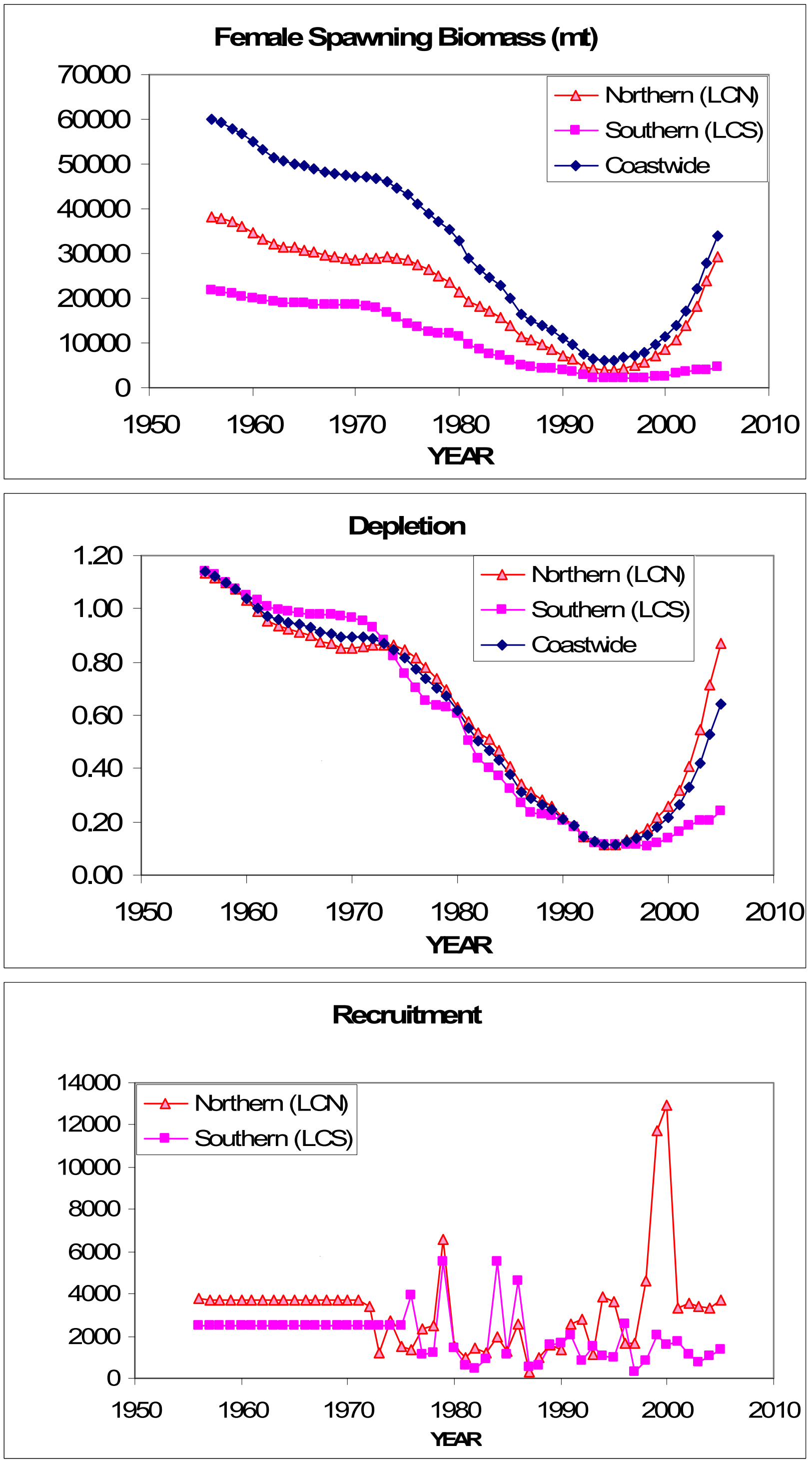
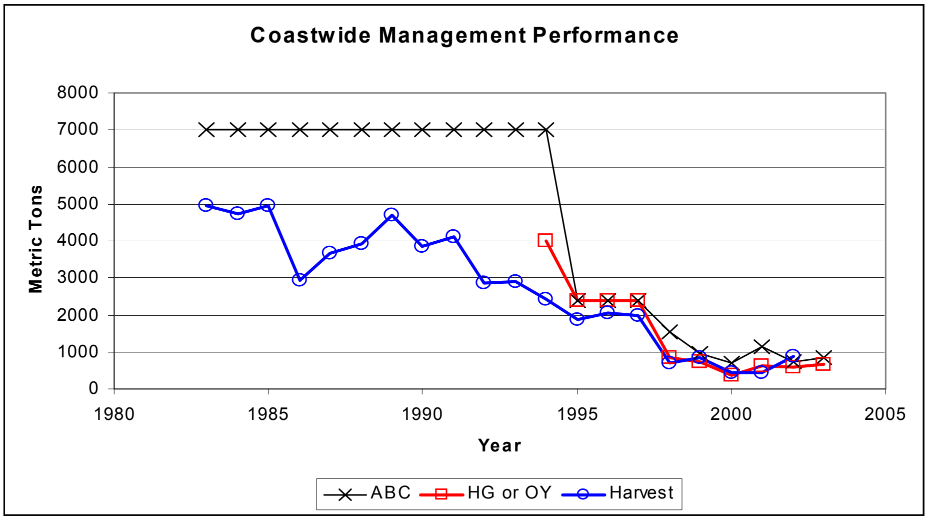


Figure ES2 Comparison of lingcod ABC, OY and landings (mt) between 1983 and 2003.



Agenda Item H.2.a
Attachment 8
November 2005

Rebuilding Analyses for Overfished Groundfish Stocks

STAR Panel Meeting Report
September 26-30, 2005
NOAA Fisheries
Alaska Fisheries Science Center
Seattle, Washington

STAR Panel:
Martin Dorn – NOAA Fisheries, AFSC (Chair)
Steve Ralston – NOAA Fisheries, SWFSC
Owen Hamel – NOAA Fisheries, NWFSC
Tom Jagielo – WDFW, Olympia, WA
Kevin Piner – NOAA Fisheries, SWFSC
Ray Conser – NOAA Fisheries, SWFSC
Steve Berkeley – Long Marine Laboratory, UCSC, Santa Cruz, CA
Bob Mohn – Center for Independent Experts (outside reviewer)

PFMC:
John DeVore – Groundfish Management Team (GMT), PFMC
Pete Leipzig – Groundfish Advisory Panel (GAP), PFMC

STAT Teams:
Jean Rogers – NOAA Fisheries, NWFSC
Alec MacCall – NOAA Fisheries, SWFSC
Xi He – NOAA Fisheries, SWFSC
Owen Hamel – NOAA Fisheries, NWFSC
Kevin Piner – NOAA Fisheries, SWFSC
Rick Methot – NOAA Fisheries, S&T, Seattle
Farron Wallace – WDFW, Montesano, WA
Tien-Shui Tsou – WDFW, Olympia, WA

Introduction

At the September 2005 PFMC meeting in Portland, the Council took action on agenda item F.7, which dealt with developing procedures for evaluating progress towards attaining rebuilding targets when overfished stocks have been re-assessed. This year 23 stock assessments have been completed, of which eight pertained to overfished species, including lingcod, widow, canary, yelloweye, bocaccio, POP, cowcod, and darkblotched rockfish. Prior to the September meeting authors of these assessments were provided instructions and guidance that requested them to complete a series of rebuilding "runs" as outlined in Agenda Item F.7a, Attachment 1, September 2005). The six runs were:

Run #	Prob(recovery)	By	Based on
#1 (default)	Estimated	Current T_{TARGET}	Current SPR
#2 (T_{TARGET} with 50% prob)	0.5	Current T_{TARGET}	Estimated SPR
#3 (#1 based on T_{MAX})	Estimated	Current T_{MAX}	Current SPR
#4 (#2 based on T_{MAX})	P_0	Current T_{MAX}	Estimated SPR
#5 (#3 with re-estimated T_{MAX})	Estimated	T_{MAX} (re-estimated)	Current SPR
#6 (#4 with re-estimated T_{MAX})	P_0	T_{MAX} (re-estimated)	Estimated SPR

In addition, the Council adopted a policy (see Agenda Item F.7.c, Supplemental GMT Report, September 2005, *Alternative 5*) for revising harvest rates when progress was deemed to be inadequate. The essence of the adopted policy is to maintain the current rebuilding harvest rate (SPR) when: (1) the probability of recovery by the existing T_{target} is greater than 45% and (2) the probability of recovery by the existing T_{target} is less than 55% ***or*** the probability of recovery by T_{max} is less than 80%[1]. In situations where the first condition is not met, rebuilding is deemed inadequate and the harvest rate would be lowered, if possible within the constraints imposed by the existing T_{target}. If, however, rebuilding was determined to be impossible by T_{target}, even if all fishing was eliminated, the plan could be revised. Conversely, if the second of these conditions is false (i.e., P_{target} > 55% and P_{max} > 80%) then the Council retained the option to increase the rebuilding harvest rate, as long as P_{max} did not fall below 80%.

Assuming the runs were completed, the first condition can be evaluated by examining the results of Run #1. Specifically, if the estimated probability of recovery by the existing T_{target} is greater than 0.45 then progress is considered adequate. If progress is inadequate, results from run #2 can be used to determine the harvest rate that will allow recovery by

[1] At the time this report was prepared there was uncertainty regarding whether the T_{max} referred to in *Alternative 5* pertained to the old (current) T_{max} or the new (re-estimated) value. Pending clarification of this issue by the Council and the GMT, results from Runs #3 and #5 should be used to evaluate whether or not rebuilding progress is sufficiently ahead of schedule such that the harvest rate could be increased.

T_{target}. Furthermore, the second condition can be evaluated by examining results of Runs #1, #3, and #5 to determine the estimated probability of recovery by T_{max} if fishing continues at the current rate (see footnote 1).

The SSC groundfish sub-committee met the week of September 26-30, 2005 at the Alaska Fisheries Science Center, Sand Point Facility and reviewed rebuilding analyses for 6 of the overfished stocks (bocaccio, cowcod, darkblotched rockfish, Pacific Ocean perch, widow rockfish, and yelloweye rockfish) . A rebuilding analysis for lingcod was not conducted because results from this year's stock assessment indicate that the stock has recovered to the $B_{40\%}$ target level, at least on a coastwide basis, which is how the stock is managed by the PFMC. In addition, the rebuilding analysis for canary rockfish was completed in the week that followed the meeting and it was reviewed by panelists by email. What follows are stock-specific summaries and rebuilding projections pertaining to the seven remaining overfished groundfish stocks (including canary rockfish but excluding lingcod), which the review panel collectively endorses as being the best available scientific information.

Bocaccio

A new rebuilding analysis for bocaccio was presented to the review panel by Dr. Alec MacCall. Using the Council's *Alternative 5* as a criterion for assessing adequacy of progress, results from the bocaccio analysis indicate that rebuilding is barely adequate based upon the T_{target} calculated from the previous rebuilding analysis (see Run #1a where the probability of rebuilding by T_{target} = 2027 is 46%), but is actually behind schedule relative to the T_{target} that was ultimately adopted in Amendment 16-3 to the groundfish FMP (see Run #1b where the probability of rebuilding by T_{target} = 2023 is 24%). This discrepancy was revealed during the latest rebuilding analysis and is apparently due to mis-specification of the start year to which the 23 year rebuilding target was added (2000 instead of 2004). Rebuilding is slightly behind schedule according to Run #1a due to small changes in estimates of recruitments. Rebuilding is significantly behind schedule based upon Run #1b, but would be behind schedule based upon the previous rebuilding analysis as well, which leads to a paradoxical situation. If the intent of the Council was to adopt a 70% probability of rebuilding by T_{max}, which is linked directly to T_{target} = 2027, then results from Runs #1a and #2a should take precedence and T_{target} in the rebuilding plan should be revised.

The updated estimate of T_{max} is unchanged from the last analysis (2032). In all rebuilding runs, both 2005 and 2006 were given projected catch of 150 mt instead of the OY values based upon the advice of the GMT representative on the panel. Future recruitments were projected using recruits-per-spawner, which method is supported by the modeled steepness of 0.211 in the 2005 assessment.

There have been many changes in the management of bocaccio and management performance has recently been very good. Given the highly variable nature of this stock there could be changes in management based upon future rebuilding analyses. For example, there are preliminary indications that the 2003 year-class is relatively strong.

	Bocaccio			10 Year Projections				
Year	Run #1a	Run #1b	Run #2a	Run #2b	Run #3	Run #4	Run #5	Run #6
P	0.458	0.24	0.50	0.50	0.678	0.70	0.678	0.70
SPR	0.692	0.692	0.717	0.883	0.692	0.705	0.692	0.705
F	0.0498	0.0498	0.045	0.0166	0.0498	0.0475	0.0498	0.0475
T	T_{target}=2027	T_{target}=2023	T_{target}=2027	T_{target}=2023	T_{max}=2032	T_{max}=2032	T_{max}=2032	T_{max}=2032
2007	314	314	284	106	314	300	314	300
2008	316	316	287	109	316	302	316	302
2009	334	334	304	118	334	319	334	319
2010	359	359	328	129	359	344	359	344
2011	388	388	356	142	388	373	388	373
2012	425	425	390	158	425	408	425	408
2013	462	462	426	175	462	444	462	444
2014	498	498	460	192	498	479	498	479
2015	535	535	495	211	535	516	535	516
2016	567	567	526	228	567	547	567	547

footnote: case "a" is for T_{target}=2027 based on P_0=0.70; case "b" is for FMP T_{target}=2023

Cowcod

Based on the new stock assessment parameters, the rebuilding analysis indicates that the stock is rebuilding ahead of schedule (see Run #1 where the probability of rebuilding by T_{target} = 0.81). Moreover, at the current SPR the stock has a 82% probability of rebuilding to the target by the current (old) T_{max} (Run #3) and a 75% probability of rebuilding by the new, re-estimated T_{max} (Run #5). Hence, there is ambiguity as to whether or not rebuilding is sufficiently ahead of schedule so as to allow for an increase of the harvest rate as specified under *Alternative 5* (see footnote 1). However, because: (1) the rebuilding "surplus" is very small (i.e., 82% is not much greater than 80%), (2) the specified OYs are quite small in magnitude, and (3) results from Runs #3 and #5 are identical, in practice the discrepancy is unlikely to affect cowcod management to any appreciable degree. The STAR panel also notes that the increase in the probability of rebuilding is not due to a change in stock condition, but is a result of structural changes in the model, primarily the use of a spawner-recruit model to estimate recruitments.

The rebuilding analysis for cowcod was presented to the STAR panel by Dr. Kevin Piner. The stock assessment that forms the basis for this rebuilding plan is much simpler than most of the other stock assessments that have been conducted recently, and thus contains very few input parameters on which to model uncertainty. The previous rebuilding analysis was based on the 1999 stock assessment (Butler *et al*., 1999), which used a delay-difference model. The new rebuilding analysis is based on a new assessment conducted in 2005 (Piner *et al*., 2005), wherein recruitment is described by a Beverton and Holt spawner-recruit model. To incorporate uncertainty into the rebuilding projections, a range of steepness values were entered into the model, centered on the base case value (h=0.5) with a symmetrical range bounded by h=0.25 and h=0.75 and standard deviation = 0.1. Recruitments are re-sampled from this synthetic posterior with the frequency determined by this probability distribution.

	Cowcod		10 Year Projections			
Year	Run #1	Run #2	Run #3	Run #4	Run #5	Run #6
P	0.81	0.50	**0.82**	0.60	**0.75**	0.60
SPR	0.78	0.601	0.78	0.63	0.78	0.69
F	0.009	0.021	0.009	0.019	0.009	0.015
T	T_{target}=2090	T_{target}=2090	T_{max}=2099	T_{max}=2099	T_{max}=2074	T_{max}=2074
2007	6	12	**6**	11	**6**	9
2008	6	13	**6**	11	**6**	9
2009	6	13	**6**	11	**6**	9
2010	6	13	**6**	12	**6**	9
2011	6	13	**6**	12	**6**	9
2012	6	13	**6**	12	**6**	10
2013	6	13	**6**	12	**6**	10
2014	7	13	**7**	12	**7**	10
2015	7	14	**7**	12	**7**	10
2016	7	14	**7**	13	**7**	10

Darkblotched Rockfish

The 2005 assessment of darkblotched rockfish resulted in a number of major changes to the model. In particular, the natural mortality rate was increased from 0.05 to 0.07 yr^{-1}, which had a strong influence on rebuilding projections. For example, the $F_{50\%}$ harvest rate rose from 0.0319 to 0.0463, representing a 45% increase. In addition, the new estimate of T_{min} is now 8 years and the generation time has dropped from 33 to 24 years, resulting in a decline of T_{max} from 2044 to 2033. In the rebuilding analysis a variety of projections were completed, including all four scenarios outlined in the SSC Terms of Reference for Rebuilding Analysis. In the 2003 analysis the preferred alternative was to invoke the environmental hypothesis and to project population growth by re-sampling recruits. The same approach was taken this year (model labeled A1).

Results of the darkblotched rockfish rebuilding analysis were presented by Dr. Jean Rogers via conference call and are summarized in the table below. The projections show that the stock is rebuilding substantially ahead of schedule (see Run #1, probability of rebuilding before the current T_{target} = 0.962). Note that the existing rebuilding SPR is 0.50 because the ABC (calculated at $F_{50\%}$) was actually lower than the rebuilding yield. Thus, the ABC set a cap on harvest during rebuilding.

Another peculiarity with darkblotched rockfish is that the revised assessment now indicates that rebuilding could occur within 10 years (by 2011). If required to do so, results from Run #7 provide the Council with the needed information. This scenario is presented for completeness, although it should be emphasized that for the last few years the Council has been operating under a policy wherein T_{target} = 2030. Imposing a new estimate of T_{min} at this point effectively moves the finish line midway through rebuilding.

	Darkblotched Rockfish		10 Year Projections				
Year	Run #1	Run #2	Run #3	Run #4	Run #5	Run #6	Run #7
P	0.962	0.50	0.986	0.90	0.972	0.90	0.50
SPR	0.500	0.381	0.500	0.434	0.500	0.461	missing
F	0.0463	0.0701	0.0463	0.0583	0.0463	0.0531	0.032
T	T_{target}=2030	T_{target}=2030	T_{max}=2044	T_{max}=2044	T_{max}=2033	T_{max}=2033	T_{max}=2011
2007	456	> ABC	456	> ABC	**456**	> ABC	**317**
2008	487	> ABC	487	> ABC	**487**	> ABC	**343**
2009	500	> ABC	500	> ABC	**500**	> ABC	**355**
2010	519	> ABC	519	> ABC	**519**	> ABC	**373**
2011	530	> ABC	530	> ABC	**530**	> ABC	**385**
2012	538	> ABC	538	> ABC	**538**	> ABC	**395**
2013	546	> ABC	546	> ABC	**546**	> ABC	**403**
2014	553	> ABC	553	> ABC	**553**	> ABC	**412**
2015	558	> ABC	558	> ABC	**558**	> ABC	**418**
2016	560	> ABC	560	> ABC	**560**	> ABC	**422**

Pacific Ocean Perch (POP)

The new POP rebuilding analysis completed and presented by Dr. Owen Hamel indicates that the stock is rebuilding ahead of schedule, despite being slightly more depleted. At the current rate of rebuilding, there is nearly a 60% probability of rebuilding to the old T_{target} at the old SPR (Run #1). Moreover, there is a 78% probability of rebuilding by the old T_{max} (Run #3) and there is a 79% probability of rebuilding by the new T_{max}. Thus, there is no rebuilding "surplus" as defined under *Alternative 5*, regardless of which T_{max} is used (see footnote 1). Accelerated rebuilding of the POP stock is due primarily to recent above average year-classes entering the fishery. The new rebuilding analysis is based on a stock assessment update. As in the previous assessment, the new analysis is based on re-sampling from historical recruitments (1965-2003) using the MCMC algorithm (Punt, 2002). The principal differences between the previous assessment and the new one is the inclusion of updated fishery age and length composition data, new survey age data, and the removal of water hauls from the triennial survey data. The new rebuilding analysis indicates that the stock is slightly more depleted than estimated in the 2003 assessment (2005 depletion = 27.6% of B_0, whereas 2003 depletion = 27.7%). Other revisions include a slightly lower estimated value for B_0 and an increase in T_{max} from 2042 to 2043 in the new rebuilding projections.

Depending on the interpretation of T_{max}, Runs #3 and #5 in the table below conform to the GMT's recommendations and Council adopted policy (*Alternative 5*). Note, however, that the time series of catch from each of these two runs is identical.

	Pacific Ocean Perch		10 Year Projections			
Year	Run #1	Run #2	Run #3	Run #4	Run #5	Run #6
P	0.597	0.50	0.782	0.70	0.789	0.70
SPR	0.696	0.633	0.696	0.644	0.696	0.640
F	0.0231	0.0304	0.0231	0.0290	0.0231	0.0295
T	T_{target}=2021	T_{target}=2021	T_{max}=2042	T_{max}=2042	T_{max}=2043	T_{max}=2043
2007	397	522	**397**	498	**397**	506
2008	412	538	**412**	514	**412**	522
2009	431	561	**431**	536	**431**	544
2010	455	588	**455**	564	**455**	572
2011	473	609	**473**	583	**473**	591
2012	482	617	**482**	592	**482**	600
2013	488	621	**488**	597	**488**	605
2014	498	633	**498**	608	**498**	616
2015	508	643	**508**	618	**508**	626
2016	519	655	**519**	630	**519**	638

Widow Rockfish

The new widow rockfish rebuilding analysis indicates that rebuilding is much ahead of schedule (Run #1 probability of rebuilding by current T_{target} = 96%). The probability of rebuilding by the old T_{max} is also substantially greater than 80% (P = 98%), as is the probability of rebuilding by the new T_{max} (P = 94%). Thus, both indicate there is a rebuilding "surplus" that could be considered under *Alternative 5* by determining the harvest that would rebuild with 80% probability (see footnote 1). However, results from that type of analysis are presently only available for the new T_{max} scenario (see Run #7).

Accelerated rebuilding is due to changes in the 2005 model that affect estimates of steepness and depletion, both of which are greater than in the 2003 assessment. For example, the previous rebuilding analysis estimated a rebuilding fishing mortality rate of 0.0093, equivalent to an SPR of 0.936, whereas the new SPR estimate is 0.834. The panel also requested that 40:10 OY projections be included in the table. However, due to the low estimated productivity of widow rockfish, this harvest control rule may be overly aggressive, as the proxy harvest rate ($F_{50\%}$) is apparently too high to maintain the stock near the $B_{40\%}$ target level.

Dr. Xi He presented results of four different assessment models, including the base model (Model T2), which was characterized by natural mortality of 0.125 and steepness of 0.28. Depletion rate in this base model is 31.1%, versus 22.4% in 2003 assessment. It is noteworthy that the new assessment indicates that the stock never fell below the $B_{25\%}$ minimum stock size threshold and may therefore never have been overfished. Three methods of generating future recruitments were considered including: (1) a Beverton-Holt spawner-recruit curve (as the base case), (2) recruits-per-spawner, and (3) recruits-per-spawner with pre-specified 2005-2007 (3-year old) recruitments based on estimates from the Santa Cruz survey (2002-2004). The panel accepted the STAT team's use of the spawner-recruit curve (method 1) for generating future recruitments and that the base model (T2) be used for all analyses.

	Widow Rockfish		10 Year Projections					
Year	Run #1	Run #2	Run #3	Run #4	Run #5	Run #6	Run #7	40:10
P	0.9625	0.50	0.9765	0.60	0.9395	0.60	0.80	<0.001
SPR	0.936	0.798	0.936	0.81	0.936	0.834	0.886	N/A
F	0.0093	0.0354	0.0093	0.0329	0.0093	0.0283	0.0188	N/A
T	T_{target}=2038	T_{target}=2038	T_{max}=2042	T_{max}=2042	T_{max}=2033	T_{max}=2033	T_{max}=2033	N/A
2007	447	1683	**447**	1568	**447**	1352	**903**	4249
2008	464	1716	**464**	1601	**464**	1385	**931**	4161
2009	466	1696	**466**	1586	**466**	1375	**930**	3899
2010	460	1650	**460**	1544	**460**	1343	**913**	3583
2011	453	1606	**453**	1505	**453**	1311	**895**	3305
2012	447	1575	**447**	1476	**447**	1287	**881**	3102
2013	448	1564	**448**	1468	**448**	1282	**880**	2980
2014	448	1556	**448**	1460	**448**	1277	**878**	2875
2015	452	1561	**452**	1467	**452**	1283	**884**	2805
2016	454	1557	**454**	1463	**454**	1282	**885**	2729

Yelloweye Rockfish

A yelloweye rockfish presentation was made to the panel by Mr. Farron Wallace and Dr. Tien-Shui Tsou. They reported that the existing estimate of SPR from the rebuilding analysis conducted in 2002 was based on an improperly specified length at 50% maturity (40 cm rather than 42 cm). Moreover, the STAT team was unable to recover the final 2002 rebuilding files that would be needed to recreate the exact SPR used in the 2002 rebuilding plan. Nonetheless, an effort was made to estimate the 2002 rebuilding SPR using the existing rebuilding fishing mortality rate ($F=0.0153\ yr^{-1}$), which yielded a value of 0.591. The 2005 stock assessment update of yelloweye rockfish largely resulted in changes to life history parameters, including growth, aging error, maturity, fecundity, and selectivity. Collectively, these changes would be expected to have a significant effect on the rebuilding SPR rate, all other things being equal. As a result, the review panel concluded that rebuilding runs #1, #3, and #5, which utilize the old estimate of SPR, were not essential and that efforts to improve estimation of this statistic should be abandoned.

Rebuilding projections for yelloweye rockfish were based on parametric sampling from the spawner-recruit curve, as was the 2002 analysis. Results of the analyses are presented in the following table. Note that run #1, which measures the probability of rebuilding by the current T_{target} using the existing SPR rate, indicates that rebuilding is impossible. In order to maintain the current T_{target} stipulated in Amendment 16-3 to the groundfish FMP, the SPR must be increased from 0.591 to 0.754 (see Run #2). Run #6 describes a rebuilding scenario consistent with the new stock assessment and the Council's original intent (i.e., P_0 = 0.8).

	Yelloweye Rockfish		10 Year Projections			
Year	Run #1	Run #2	Run #3	Run #4	Run #5	Run #6
P	0.00	0.50	0.001	0.80	0.003	0.80
SPR	0.591	0.764	0.591	0.744	0.591	0.717
F	0.0233	0.0118	0.0233	0.0129	0.0233	0.0143
T	T_{target}=2058	T_{target}=2058	T_{max}=2071	T_{max}=2071	T_{max}=2080	T_{max}=2080
2007	34.6	**16.8**	34.6	18.5	34.6	**21.0**
2008	34.7	**17.0**	34.7	18.8	34.7	**21.3**
2009	34.9	**17.3**	34.9	19.0	34.9	**21.5**
2010	35.0	**17.5**	35.0	19.2	35.0	**21.7**
2011	35.1	**17.7**	35.1	19.4	35.1	**22.0**
2012	35.2	**17.9**	35.2	19.6	35.2	**22.2**
2013	35.4	**18.1**	35.4	19.9	35.4	**22.4**
2014	35.5	**18.3**	35.5	20.1	35.5	**22.6**
2015	35.7	**18.6**	35.7	20.3	35.7	**22.9**
2016	35.9	**18.8**	35.9	20.6	35.9	**23.1**

Canary Rockfish

The canary rockfish stock assessment was reviewed initially at a STAR panel held at the NWFSC Montlake Laboratory August 15-19th and was subsequently considered by the SSC at its meeting in Portland from September 19-21st. At that time, several concerns were raised and the assessment was referred to the "mop-up" STAR panel for further consideration. At that meeting Dr. Richard Methot presented results from the canary rockfish assessment and interacted with members of the panel to address their concerns. Ultimately, two models were presented that were considered equally plausible by the SSC and both were carried into an integrated rebuilding analysis, although that analysis was not completed until after the meeting adjourned. Thus, what is summarized here is drawn from a document prepared by Dr. Methot titled "Updated Rebuilding Analysis for Canary Rockfish Based on Stock Assessment in 2005" that is dated October 2005.

The rebuilding analysis for canary rockfish integrates over a great deal of uncertainty, including that associated with two distinct models, i.e., the *NoDiff* and *Diff* scenarios. Both of these treat selectivity as a function of length, but in the former the selectivity curves of males and females are the same, whereas the latter allows for sex-specific differences in selectivity at the cost of additional parameters. The analysis combined the two models by drawing equally from the model-specific probability distributions of the steepness parameter. Aside from steepness, other sources of uncertainty that were integrated in the analysis were numbers at age in the base year (2004), selectivity patterns, and residual variance in recruitment (σ_r). The blended analysis was endorsed by the panel and estimated that B_0 is 34,155 mt, B_{2005} is 3,176 mt, and that current depletion is 9.4%. Results presented below show that rebuilding is currently ahead of schedule according to the current T_{target} (P = 57%), but not greatly so (Run #3 probability of rebuilding by the old T_{max} is 58.5%, whereas Run #5 probability of rebuilding by the new T_{max} is 55.4%). Following the revision rule adopted by the Council, the current harvest rate would therefore be maintained (Run #5). It is worth noting however, that the new re-estimated T_{max} (at a 60% probability of rebuilding) is now earlier than the existing T_{target}.

	Canary Rockfish		10 Year Projections			
Year	Run #1	Run #2	Run #3	Run #4	Run #5	Run #6
P	0.574	0.50	0.585	0.60	0.554	0.60
SPR	0.887	0.816	0.887	0.903	0.887	0.935
F	missing	missing	missing	missing	missing	missing
T	T_{target}=2074	T_{target}=2074	T_{max}=2076	T_{max}=2076	T_{max}=2071	T_{max}=2071
2007	43.2	73.4	43.2	37.0	**43.2**	24.1
2008	44.5	75.0	44.5	38.1	**44.5**	24.8
2009	45.1	75.8	45.1	38.6	**45.1**	25.3
2010	46.4	77.6	46.4	39.8	**46.4**	26.0
2011	48.6	81.0	48.6	41.7	**48.6**	27.3
2012	51.1	85.0	51.1	43.9	**51.1**	28.8
2013	54.1	89.7	54.1	46.5	**54.1**	30.6
2014	56.5	93.3	56.5	48.6	**56.5**	32.0
2015	58.7	96.7	58.7	50.6	**58.7**	33.3
2016	61.0	100.1	61.0	52.5	**61.0**	34.7

Bocaccio Rebuilding Analysis for 2005

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Introduction

In 1998, the PFMC adopted Amendment 11 of the Groundfish Management Plan, which established a minimum stock size threshold of 25% of unfished biomass. Based on the stock assessment by Ralston et al. (1996), bocaccio was declared formally to be overfished, thereby requiring development of a rebuilding plan for consideration by the Council in the fall of 1999. Rebuilding was initiated by catch restrictions beginning in 2000.

A number of bocaccio stock assessments (MacCall et al. 1999, MacCall 2002, MacCall 2003a, MacCall 2005) and rebuilding analyses (MacCall 1999, MacCall and He 2002, MacCall 2003b) have now been conducted since the stock was declared overfished. In 2004, a formal rebuilding plan for bocaccio was enacted by the Pacific Fishery Management Council (PFMC) as part of Amendment 16-3 to the Pacific Coast Groundfish Fishery Management Plan (PFMC 2004).

The 2003 stock assessment examined three models of bocaccio. One of those, the STATc model, was used as the basis for subsequent fishery management and as the basis of FMP Amendment 16-3. The 2005 bocaccio stock assessment updated the 2003 STATc model, and is the basis of this rebuilding analysis. Also, the 2005 assessment is the first new assessment since the formal Rebuilding Plan (FMP Amendment 16-3) was established.

IMPORTANT NOTE: In preparing this rebuilding analysis, an error was discovered in the Rebuilding Plan, Amendment 16-3. Although the PFMC clearly selected a bocaccio rebuilding plan with $\mathbf{P_0}$ (probability of reaching rebuilding target by $\mathbf{T_{max}}$) of 70%, the corresponding value of $\mathbf{T_{targ}}$ (year with a 50% probability of reaching the target) was incorrectly specified as 2023. The 2003 rebuilding analysis indicated that a 50% probability rebuilding would require 23 years, but this assumed a beginning date of 2004 (the first simulated year). Accordingly, the correct value of $\mathbf{T_{targ}}$ was 2027. Both values of $\mathbf{T_{targ}}$ are examined in the present analysis.

Management Performance

Details of management performance are provided in Table 1. The rebuilding OY was set at 100 MT for 2000-2002 as a transition to a constant fishing mortality rate policy beginning in 2003. This was a learning period for fishery management, which required unprecedented restrictions on both commercial and recrerationa fishing opportunities. Actual harvest exceeded management targets in the first three years, but with a smaller excess by the third year. In response to the 2002 bocaccio assessment, which indicated very low productivity, the 2003 OY was set at 20MT, and the retained catch was about 12MT. Including mortality of estimated discards, estimated 2003 total kill was 22MT. Based on the 2003 assessment, which showed a much more productive stock, the 2004 OY was set at 250MT, but management used an operational target of 199MT; the final catch was 78MT. Discards brought the estimated 2004 kill to 83MT. Thus, recent management has shown substantial improvement in performance, and has been achieving total removals at (2003) or well below (2004) maximum target levels. The anticipated bocaccio mortality in 2005 also is expected to fall well below the maximum level set by the OY.

Table 1. Recent history of bocaccio management performance.

	Commercial			Recreational			Total			ABC	OY
Year	Catch	Discard	Total	Catch	Discard	Total	Catch	Discard	Total		
1995	730	*	730	31	2	33	761	2	763	1700	1700
1996	480	*	480	89	4	93	569	4	573	1700	1700
1997	324	*	324	146	11	157	470	11	481	265	265
1998	157	*	157	51	0	51	208	0	208	230	230
1999	73	*	73	120	4	124	193	4	197	230	230
2000	25	49	74	103	9	112	128	58	186	164	100
2001	22	76	98	103	6	109	125	82	207	122	100
2002	21	30	51	82	2	84	103	32	135	122	100
2003	1	10	11	9	2	11	10	12	22	244	<20
2004	12	10	22	54	8	62	66	18	84	400	199
2005									150**	566	307

* Discarded commercial catch was not estimated and is assumed to be negligible.
** Anticipated 2005 bocaccio mortality given in June 2005 GMT document dated "6/16/06 17:45" [actual year 2005]

Simulation Model

This analysis uses the SSC Default Rebuilding Analysis (version 2.8a). All data and parameters use as input to this analysis were taken from the STATc model in the 2005 assessment. An example input file is given in Appendix A. Future recruitments were simulated by re-sampling estimated historical recruits/spawning output (**R/B**) ratios from years 1970 to 2005. Re-sampling **R/B** values is justified by the estimated Mace-Doonan steepness value of $\boldsymbol{h}$ = 0.211 in the 2005 stock assessment. This value of steepness indicates negligible curvature in the estimated stock-recruitment relationship. Probability distributions are based on 2000 simulations.

As a comparability check, the input data from the 2003 rebuilding analysis were run in this most recent version of the SSC simulation model, and results were identical to those in the original 2003 analysis. Note that due to differences in model structure, the projections made by the SSC model may differ from projections made by the Stock Synthesis model used in the 2005 stock assessment (MacCall 2005).

Rebuilding Parameters/Management Reference Points

$B_{unfished}$: Unfished biomass (measures as spawning output) is estimated by multiplying average recruitment (**R**) by the spawning output per recruit achieved when the fishing mortality rate is zero (**$SPR_{F=0}$** = 2.499, spawning output in billion eggs, recruitment in thousand fish at age 1). Based on the 2005 bocaccio assessment, the estimated unfished spawning output (**$B_{unfished}$**) is 13325 billion eggs (compared with 13387 billion eggs estimated in the 2003 rebuilding analysis), based on the average recruitment from spawning years between 1950 and 1985. This time period was chosen as representing a presumably "natural" range of stock abundance. Because recruitment is highly variable, this calculation of unfished abundance is imprecise (CV $ 10%; variability is underestimated because estimated recruitment in the first ten years is held constant).

B_{msy}: The rebuilding target is the spawning abundance level that produces MSY. This value cannot be determined directly for bocaccio, so this analysis uses the PFMC proxy value of 40% of estimated unfished spawning output. Estimated **B_{msy}** is 5330 billion eggs (compared with 5355 billion eggs in the 2003 rebuilding analysis).

Current status: According to the 2005 stock assessment as modified for input to the SSC Rebuilding Analysis model, current (2005) spawning output is 1419 billion eggs, which is 27% of the estimated **B_{msy}**. This is a substantial increase over the 2003 values. Historical abundance relative to the rebuilding target is shown in Figure 1.

Mean generation time: Mean generation time of bocaccio is estimated from the net maternity function, and is 14 years.

The following table summarizes results of the 2003 and 2005 rebuilding analyses. Reference years are unchanged by the 2005 update.

Table 2. Parameters and reference points for rebuilding

Date of Analysis	2003	2005
Assessment model used as basis	STATc	STATc update
First year of rebuilding	2000	2000
Present year (Final year of assessment)	2003	2005
First simulated year	2004	2006
Tmin	2018	2018
Mean Generation Time	14	14
Tmax	2032	2032
Prob rebuild by Tmax	0.7	
Rebuild SPR	0.693	
Exploitation Rate	0.0498	
Ttarg from 2003 Rebuilding Analysis	2027	
Ttarg from Amendment 16-3 (wrong)	2023	

Results of Simulations

Table 3 is a suite of projections requested by the GMT. Because of the alternative interpretations of $\mathbf{T_{targ}}$ for bocaccio, two versions of run #2 are presented: Version "a" uses $\mathbf{T_{targ}}$ = 2027 and version "b" uses $\mathbf{T_{targ}}$ = 2023. Both values of $\mathbf{T_{targ}}$ are also considered in run #1.

Table 3. Rebuilding projections requested by the GMT.

Run #	Prob (recovery)	By	Based on
#1 (default)	Estimated	Current T_{TARGET}	Current SPR
#2 (T_{TARGET} with 50% prob)	0.5	Current T_{TARGET}	Estimated SPR
#3 (#1 based on T_{MAX})	Estimated	Current T_{MAX}	Current SPR
#4 (#2 based on T_{MAX})	P_0	Current T_{MAX}	Estimated SPR
#5 (#3 with re-estimated T_{MAX})	Estimated	T_{MAX} (re-estimated)	Current SPR
#6 (#4 with re-estimated T_{MAX})	P_0	T_{MAX} (re-estimated)	Estimated SPR

Projection results, including time series of median catch and median spawning output relative to the rebuilding target are shown in Table 4. Because the value of $\mathbf{T_{max}}$ did not change from the 2003 value, some of the GMT-requested runs are identical (3 and 5, 4 and 6), and Table 4 is condensed accordingly. Results for four additional runs are also shown: cases of **F**=0, catches under ABC ($\mathbf{F_{50\%}}$) and the 40-10 rules, an 80% probability of achieving the rebuilding target by $\mathbf{T_{max}}$, and a "scorecard F projection" requested by the GMT (John Field, Pers. Comm.). The latter projection is based on a constant harvest rate equivalent to a 2005 catch of 148.9 mtons. Catches and biomasses projected under an ABC (i.e., $\mathbf{F_{msy}}$ proxy = $\mathbf{F_{50\%}}$) harvest policy do not correspond to the ABC for individual years under other policies, but rather represent projections under the maximum allowable harvest rate. Also note that the **F**=0 projection now has a median rebuilding date of 2022 because of actual catches taken during 2000-2006 (i.e., this scenario represents no harvest beginning in 2007) as opposed to the original $\mathbf{T_{min}}$ of 2018 which assumed no harvest beginning in 2000.

Simulated individual rebuilding trajectories are erratic due to rare large recruitments (Figure 1). The time series of percentiles and medians of simulated catch and abundance trajectories (Figures 2, 3, 4) provide a more informative overview of likely rebuilding performance and uncertainty.

Table 4. Results of rebuilding projections. Bold numbers are specifications for runs (see Table 3). Shaded cells indicate median abundance exceeds rebuilding target. Where applicable, rebuilding policy reverts to 40-10 policy upon achieving target abundance.

Run	re-do 2003	1a, 1b, 3, 5	2a	2b	4, 6	F=0	F50%(ABC)	40-10 Policy	P=0.8 by Tmax	Scorecard F
SPR	0.693	0.692	0.717	0.883	0.705	1.000	**0.5**	**variable**	0.777	0.844
F	0.0498	**0.0498**	0.0450	0.0166	0.0475	**0**	0.0971	**variable**	0.034	**0.023**
P(by 2023)	0.316	0.240	0.270	**0.5**	0.254	0.638	0.0445	0.284	0.37	0.448
P(by 2027)	0.517	0.458	**0.5**	0.726	0.48	0.8365	0.1145	0.5	0.726	0.688
P(by 2032)	**0.7**	0.678	0.720	0.9	**0.7**	0.958	0.228	0.706	**0.8**	0.868
T(P=0.5)	2027	2028	2027	2023	**2028**	2022	2044	2027	2026	2024
Median Catch										
2004	306									
2005	308	*150*	*150*	*150*	*150*	*150*	*150*	*150*	*150*	*148.9*
2006	309	*150*	*150*	*150*	*150*	*150*	*150*	*150*	*150*	147
2007	316	314	284	106	300	0	602	38	216	147
2008	337	316	287	109	302	0	585	53	219	150
2009	368	334	304	118	319	0	601	73	234	161
2010	400	359	328	129	344	0	627	101	254	176
2011	429	388	356	142	373	0	664	137	277	194
2012	457	425	390	158	408	0	707	187	306	215
2013	483	462	426	175	444	0	753	252	336	237
2014	520	498	460	192	479	0	785	327	365	259
2015	555	535	495	211	516	0	825	424	395	283
2016	594	567	526	228	547	0	848	532	423	305
Median Spawning Output Relative to Target										
2005	0.25	0.27	0.27	0.27	0.27	0.27	0.27	0.27	0.27	0.27
2006	0.26	0.28	0.28	0.28	0.28	0.28	0.28	0.28	0.28	0.28
2007	0.28	0.30	0.30	0.30	0.30	0.30	0.30	0.30	0.30	0.30
2008	0.29	0.31	0.31	0.31	0.31	0.31	0.30	0.31	0.31	0.31
2009	0.31	0.31	0.32	0.33	0.31	0.33	0.30	0.33	0.32	0.32
2010	0.33	0.32	0.33	0.34	0.33	0.35	0.30	0.35	0.33	0.34
2011	0.36	0.34	0.35	0.37	0.34	0.38	0.31	0.38	0.35	0.36
2012	0.38	0.36	0.37	0.40	0.36	0.42	0.31	0.40	0.38	0.39
2013	0.41	0.38	0.39	0.43	0.39	0.46	0.33	0.44	0.41	0.42
2014	0.44	0.41	0.42	0.47	0.42	0.51	0.34	0.48	0.44	0.46
2015	0.47	0.44	0.45	0.52	0.45	0.56	0.35	0.52	0.48	0.50
2016	0.50	0.48	0.49	0.57	0.48	0.62	0.37	0.56	0.52	0.55
2017	0.53	0.51	0.53	0.62	0.52	0.69	0.39	0.61	0.56	0.60
2018	0.57	0.55	0.56	0.68	0.55	0.76	0.40	0.64	0.61	0.65
2019	0.61	0.58	0.60	0.73	0.59	0.82	0.42	0.68	0.65	0.70
2020	0.65	0.61	0.64	0.79	0.63	0.90	0.43	0.72	0.69	0.75
2021	0.69	0.65	0.68	0.85	0.66	0.98	0.45	0.76	0.74	0.81
2022	0.73	0.69	0.72	0.92	0.71	1.07	0.46	0.79	0.79	0.87
2023	0.78	0.73	0.77	0.97	0.75	1.16	0.48	0.83	0.85	0.94
2024	0.84	0.78	0.82	1.01	0.80	1.28	0.50	0.87	0.91	1.02
2025	0.90	0.84	0.88	1.05	0.86	1.40	0.51	0.90	0.95	1.11
2026	0.95	0.89	0.93	1.08	0.91	1.53	0.53	0.94	1.00	1.19
2027	0.98	0.94	0.97	1.12	0.95	1.67	0.55	0.97	1.03	1.28
2028	1.02	1.00	1.00	1.16	0.99	1.82	0.56	1.01	1.07	1.38
2029	1.06	1.06	1.04	1.21	1.02	2.00	0.58	1.05	1.10	1.49
2030	1.10	1.13	1.07	1.25	1.06	2.18	0.60	1.08	1.14	1.61
2031	1.14	1.20	1.11	1.31	1.10	2.38	0.63	1.13	1.19	1.73
2032	1.19	1.28	1.16	1.37	1.14	2.61	0.65	1.18	1.24	1.87
2033	1.24	1.37	1.22	1.43	1.19	2.88	0.68	1.24	1.30	2.04

Analysis of Sustainability

Under the fishing rates given by this rebuilding analysis, the probability of further long-term decline in bocaccio abundance is negligibly small (less than one percent over the next 100 years).

Acceptable Biological Catch (ABC) in 2007 and 2008

The value of ABC for 2007 is 602mtons, as given by the median catch for the ABC scenario in Table 4, which is conditional on actual catches of 150 mtons in 2005 and 2006. Table 5 shows that ABC for 2008 depends weakly on the actual catch in 2007, which in turn is influenced by the choice of rebuilding policies.

Table 5. Median estimated values of ABC in 2008.

Assumed catch in 2005	150	150	150	150
Assumed catch in 2006	150	150	150	150
Assumed catch in 2007	100	150	200	300
2008 ABC (median)	621	618	614	607

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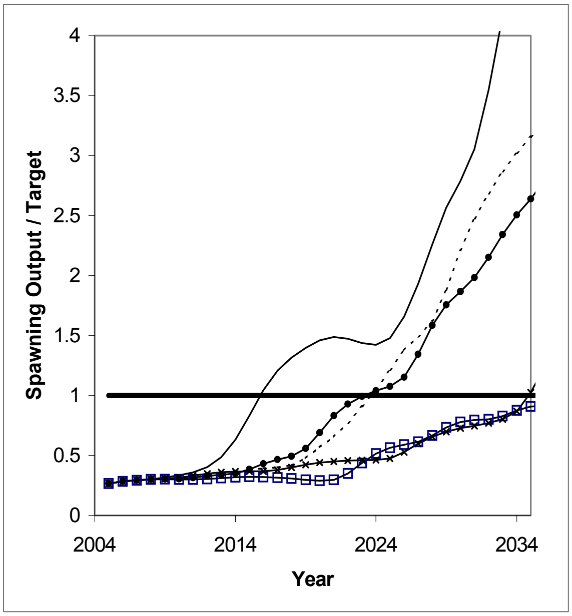

Figure 1. Example individual rebuilding trajectories for bocaccio.

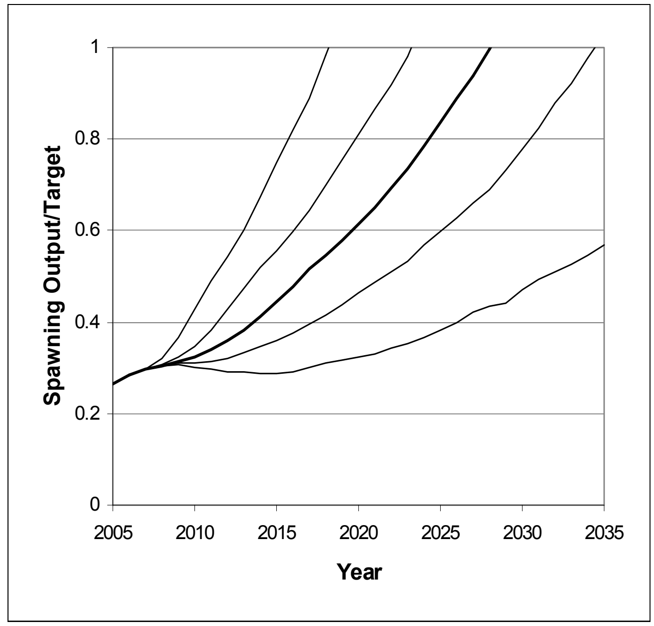

Figure 2. Envelope of rebuilding trajectories for GMT run 1 (current F = 0.0498). Lines are 5, 25, 50, 75 and 95 percentiles of 2000 simulations.

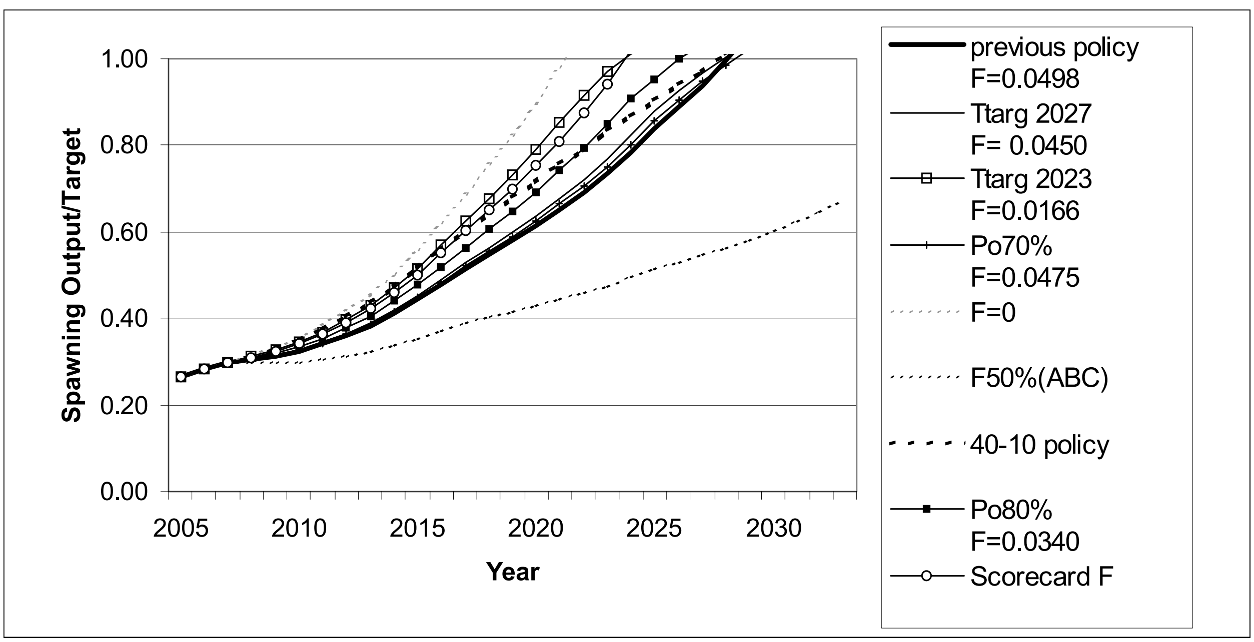

Figure 3. Median trajectories of abundance (relative to rebuilding target) for various cases in Table 4.

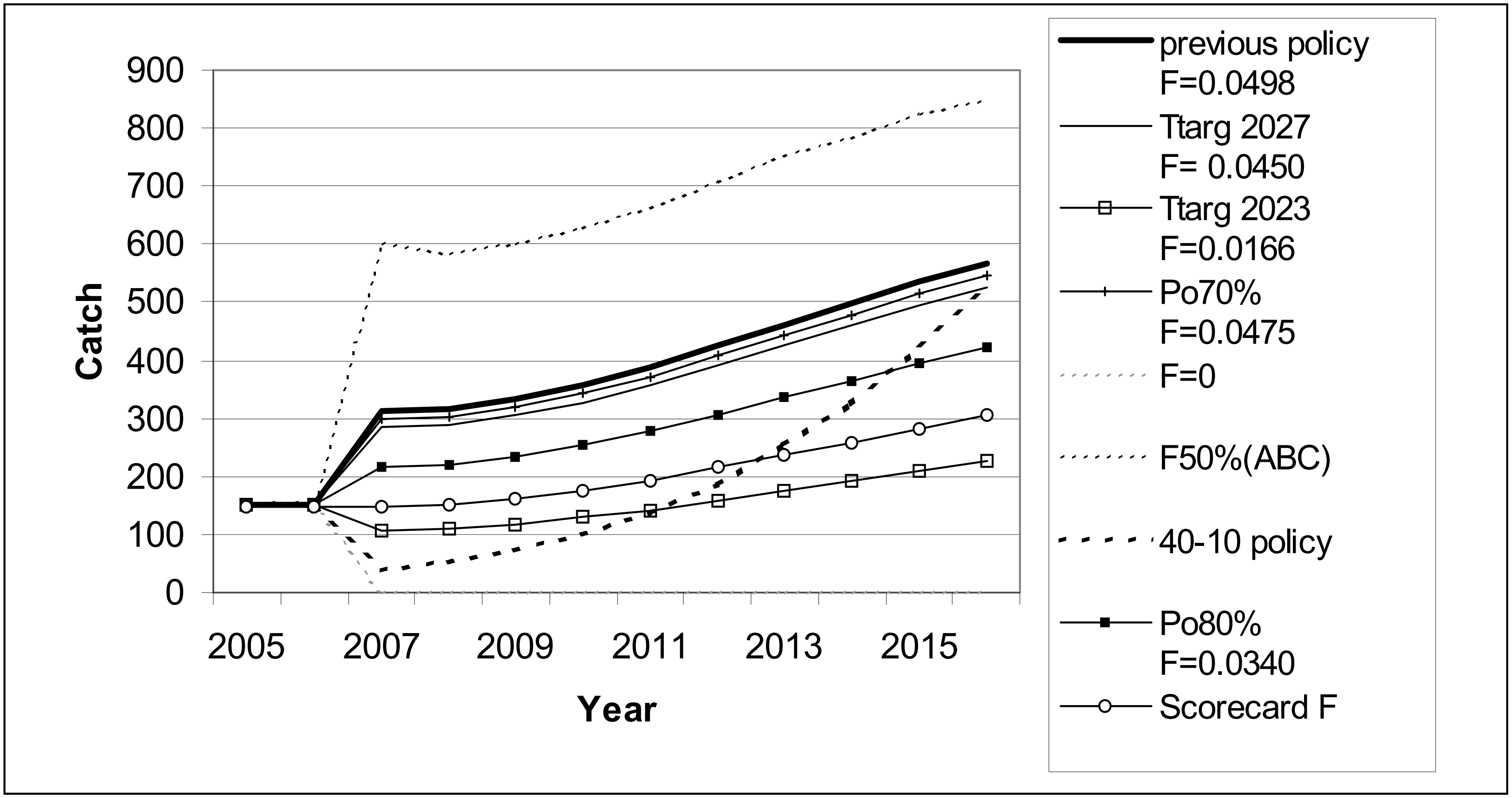

Figure 4. Median trajectories of catch for various cases in Table 4.

Appendix A. Projection data file for Run 1a.

```
# Title
bocaccio 2005 model STATC2005 resample to 2005 use current SPR=0.693 F=0.0498
# Number of sexes
2
# Age range to consider (minimum age; maximum age)
1 21
# Number of fleets to consider
1
# First year of the projection
2005
# Year declared overfished
2000
# Is the maximum age a plus-group (1=Yes;2=No)
1
# Generate future recruitments using historical recruitments (1), historical recruits/spawner (2), or a stock-recruitment
(3)
2
# Constant fishing mortality (1) or constant Catch (2) projections
1
# Fishing mortality based on SPR (1) or actual rate (2)
2
# Pre-specify the year of recovery (or -1) to ignore
21
# Fecundity-at-age
#  1  2  3  4  5  6  7  8  9 ...  21+
 0.000   0.002   0.026   0.131   0.325   0.547   0.762   0.965   1.160   1.345   1.513   1.659   1.781
         1.882   1.965   2.032   2.086   2.129   2.163   2.191   2.265
# Age specific information (Females then males) weight and selectivit
# Females
 0.223   0.499   0.878   1.313   1.771   2.227   2.663   3.071   3.446   3.783   4.074   4.319   4.522
         4.690   4.828   4.939   5.028   5.100   5.157   5.203   5.328
 0.166   0.501   0.792   0.965   0.987   0.903   0.775   0.647   0.545   0.477   0.436   0.411   0.396
         0.386   0.379   0.373   0.369   0.366   0.364   0.362   0.357
# Males
 0.223   0.463   0.770   1.101   1.430   1.742   2.025   2.276   2.495   2.681   2.839   2.972   3.082
         3.174   3.250   3.313   3.365   3.408   3.442   3.471   3.560
 0.167   0.466   0.725   0.906   0.995   1.000   0.958   0.898   0.833   0.772   0.717   0.671   0.633
         0.602   0.578   0.559   0.545   0.533   0.524   0.517   0.501
# Age specific information (Females then males), natural mortality and numbers at age
# Females
 0.15    0.15    0.15    0.15    0.15    0.15    0.15    0.15    0.15    0.15    0.15    0.15    0.15
         0.15    0.15    0.15    0.15    0.15    0.15    0.15    0.15
 442     575     151     91      13      1147    65      34      115     40      57      47      15
         40      32      2       40      7       4       3       24
# Males
 0.15    0.15    0.15    0.15    0.15    0.15    0.15    0.15    0.15    0.15    0.15    0.15    0.15
         0.15    0.15    0.15    0.15    0.15    0.15    0.15    0.15
 442     575     151     91      13      1150    65      35      115     40      57      47      15
         41      32      2       36      6       3       2       11
# Initial age-structure (for Tmin)
 2618    154     83      279     96      134     109     34      92      73      4       89      16
         9       6       29      1       0       1       1       21
 2618    154     83      280     98      138     113     36      96      76      4       83      13
         7       4       18      1       0       0       0       6
# Year for Tmin Age-structure
 2000
# Number of simulations
```

2000
Recruitment and Spanwer biomasses
Number of historical assessment years
55
Historical data: Year, Recruitment, Spawner biomass, Used to compute B0, Used to project based
on R, Used to project based on R/S

1951	3523	3659	1	0	0
1952	3523	3640	1	0	0
1953	3523	3626	1	0	0
1954	3523	3564	1	0	0
1955	3523	3474	1	0	0
1956	3523	3362	1	0	0
1957	3523	3164	1	0	0
1958	3523	2933	1	0	0
1959	3523	2638	1	0	0
1960	2278	2432	1	0	0
1961	1268	2292	1	0	0
1962	1698	2247	1	0	0
1963	53828	2225	1	0	0
1964	767	2073	1	0	0
1965	602	2509	1	0	0
1966	802	4092	1	0	0
1967	1247	6054	1	0	0
1968	1860	7092	1	0	0
1969	2041	7610	1	0	0
1970	3091	7785	1	0	1
1971	15118	7626	1	0	1
1972	1732	7319	1	0	1
1973	2039	6841	1	0	1
1974	15668	5910	1	0	1
1975	5451	4821	1	0	1
1976	1258	4139	1	0	1
1977	511	3783	1	0	1
1978	23029	3860	1	0	1
1979	2367	3714	1	0	1
1980	8090	3499	1	0	1
1981	1395	3470	1	0	1
1982	1520	3488	1	0	1
1983	151	3144	1	0	1
1984	586	2610	1	0	1
1985	10474	2087	1	0	1
1986	1413	1723	1	0	1
1987	1332	1337	0	0	1
1988	1550	1212	0	0	1
1989	5564	1214	0	0	1
1990	167	1035	0	0	1
1991	1822	863	0	0	1
1992	1485	873	0	0	1
1993	374	844	0	0	1
1994	830	789	0	0	1
1995	755	751	0	0	1
1996	413	737	0	0	1
1997	953	731	0	0	1
1998	234	728	0	0	1
1999	362	760	0	0	1
2000	5235	795	0	0	1
2001	50	825	0	0	1
2002	291	878	0	0	1
2003	413	1038	0	0	1

```
2004    1342    1261    0    0    1
2005    885     1430    0    0    1
# Number of years with pre-specified catches
2
# Catches for years with pre-specified catches
2005 150
2006 150
# Number of future recruitments to override
0
# Process for overiding (-1 for average otherwise index in data list)
# Which probability to product detailed results for (1=0.5,2=0.6,etc.)
2
# Steepness and sigma-R  and auto-correlations
  0.211  1.000000 0.0
# Target SPR rate (FMSY Proxy)
0.5
# Target SPR information: Use (1=Yes) and power
0 20
# Discount rate (for cumulative catch)
0.100000
# Truncate the series when 0.4B0 is reached (1=Yes)
0
# Set F to FMSY once 0.4B0 is reached (1=Yes; 2=Apply 40:10 rule after recovery)
2
# Percentage of FMSY which defines Ftarget
0.900000
# Maximum possible F for projection (-1 to set to FMSY)
2
# Conduct MacCall transition policy (1=Yes)
0
# Defintion of recovery (1=now only;2=now or before)
2
# Results for rec probs by Tmax (1) or 0.5 prob for various Ttargets
1
# Definition of the "40-10" rule
10 40
# Produce the risk-reward plots (1=Yes)
0
# Calculate coefficients of variation (1=Yes)
0
# Number of replicates to use
20
# First Random number seed
-89102
# Conduct projections for multiple starting values (0=No;else yes)
0
# File with multiple parameter vectors
MCMC.PRJ
# Number of parameter vectors
100
# User-specific projection (1=Yes); Output replaced (1->6)
1 2 0 0.5
# Catches and Fs (Year; 1/2 (F or C); value); Final row is -1
2007 1 0.0498
-1 -1 -1
# Split of Fs
2005 1
2006 1
-1 1
```

Time varying weight-at-age (1=Yes;0=No)
0
File with time series of weight-at-age data
HakWght.Csv

Cowcod Rebuilding Analysis 2005
Analysis of the Progress towards rebuilding in the Southern California Bight

October 3, 2005

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Introduction

Cowcod (*Sebastes levis*) population status was initially assessed by Butler et al (1999) and declared overfished in 2000. The original stock assessment was conducted using a Delay-Difference model that estimated recruitments as a random walk function. The model estimated that the spawning stock abundance was 7% of an unfished stock in 1999 and that resilience of the stock was low. The original cowcod rebuilding analysis was completed using a surplus production model because of the density dependent population growth inherent in the logistic equation. The surplus production rebuilding analysis was modeled using a log-normal distribution fitted to recruitment (1951-1998) estimated in the original delay difference model (Butler et al. 1999). A subsequent rebuilding analysis (Butler and Barnes 2000) estimated the following rebuilding parameters and quantities that were adopted by the PFMC in 2004 (PFMC 2004):

Current Adopted Rebuilding Parameters

Year declared overfished	2000
Year rebuilding plan adopted	2004
B_0	3367 t
B_{msy}	1350 t
$B_{current}$	7% (of B0)
T_{min}	2062
T_{max}	2099
P_{max}	60%
T_{target}	2090
Harvest control rule	F=0.0093 (78% SPR)

A new assessment was conducted in 2005 (Piner et al. 2005). The new assessment differed from the previous assessment in that the recruitment process was described by a Stock/Recruit (S/R) relationship. This was a departure from the previous assessment and represents much of the difference in results between the two assessments. Only the level of unexploited recruitment (*R*0) was estimated, and the level of steepness (*h*) in the S/R relationship was fixed. This fixing of *h* greatly reduced the uncertainty in the model because it was the parameter that the STAR panel believed expressed the most uncertainty in the stock assessment (STAR Panel Report 2005). The review of the assessment considered a value of *h*=0.5 to be the most appropriate choice, but that actual steepness may be somewhat higher or lower. The assessment estimated that 2005 spawning biomass was 18% of unfished (*h*=0.5), but reached as low as 9% of unfished spawning biomass in 1990.

Methods

To evaluate the progress of rebuilding, the Science and Statistical Committee of the Pacific Fishery Management Council suggested that the analytical team use a Synthetic posterior approach. The Synthetic posterior was created from the output of individual model runs bounding a credible range of stock steepness (*h*=0.25-0.75, increment 0.025). The posterior was symmetrical around a mean *h* = 0.5 with a S.D. of 0.1, with the frequency of the output from each run reflecting the probability of that steepness (Figure 1). We acknowledge that the Synthetic posterior approach is subjective, but the advantage of this approach is that it incorporates some uncertainty surrounding a fixed but unknown estimate of *h*. The rebuilding trajectories were calculated using the 'Puntalizer' software (version 2.8 April, 2005) developed by Andre Punt. A total of 1000 iteration were used in each rebuilding run. We chose to use 1000 because the results of a 10,000 iterations run (run#1) were nearly identical to same run using only 1000 iterations. The probability of rebuilding in this analysis is the probability of being at or above $B_{40\%}$ by T_{target}. Biological and fishery parameters-at-age are given in Table 1. Appendix I is the rebuild.data file used for run 1. Rebuilding projections are based upon the following calculations and assumptions:

A) the old F in the adopted rebuilding plan = SPR of 0.78. The calculation of the SPR rate that corresponded to F=0.009 was done in a spreadsheet using the weight at age, maturity at age, selectivity at age and natural mortality used in the assessment. Identical (or nearly so) assumptions about these parameters were made in the current and preceding assessment.
B) Unfished spawning biomass (SB0) is calculated the same as the assessment.
C) Recruitment is generated from the S/R curve taken from the assessment and uncertainty generated using the synthetic posterior and Sigma-R=0.5.
D) A single selectivity pattern is used to describe the removals.

Six rebuilding projections were done following guidelines developed by the NW Region, NW Center, Council Staff and the SSC. The results of the six runs are given in Table 1 and are defined as the following (the same as in the Hastie memo):

Run #1- probability of recovery estimated, T_{target} is the adopted target, harvest rate is adopted SPR.
Run #2- probability of recovery 0.5, T_{target} is the adopted target, harvest rate is estimated SPR.
Run #3- probability of recovery estimated, T_{target} is the adopted T_{max}, harvest rate is adopted SPR.
Run #4- probability of recovery adopted P_0, T_{target} is the adopted T_{max}, harvest rate is estimated SPR.
Run #5- probability of recovery estimated, T_{target} is the estimated T_{max}, harvest rate is adopted SPR.
Run #6- probability of recovery adopted P_0, T_{target} is the estimated T_{max}, harvest rate is estimated SPR.

Results

The results of the analysis of the progress towards rebuilding indicate that cowcod are more likely to rebuild by the old T_{target} than indicated in the first rebuilding analysis (Table 2). A new estimated T_{max} of 2074 was estimated, which is 25 years earlier than the

2099 estimated previously (Butler and Barnes 2000). The estimated catches of cowcod across all 6 SSC scenarios were 6-12 t, and this is projected to increase slowly over time (Table 3). Although this is higher than the 2-3 t in the current rebuilding plan, it is likely that it will be difficult to measure the difference using the historical data sources. At the request of the GMT, Table 4 gives the projected catch for run#6 over all probabilities (0.5-0.9).

A sensitivity analysis was done to the shape of the normal distribution used to construct the Synthetic posterior. Rebuilding parameterization corresponding to run 1 was used in the exploration of the affects of the shape of the Synthetic posterior on the rebuilding results. Results of using a more narrowly defined posterior defined as *h* mean=0.5, sd=0.059, range 0.35-0.65 and more diffuse distribution defined as *h* mean=0.5, sd=0.12, range 0.25-0.75 are given in Table 2. These results suggest that the more narrowly defined the posterior distribution (and smaller range of *h*) the more likely the stock is to rebuild by the current T_{target} and the more diffuse the distribution the less likely the stock is to rebuild.

Conclusions:

The results of this analysis indicate that if the stock of cowcod in the SCB has a population resilience as described in the current stock assessment (Piner et al. 2005) and this synthetic posterior rebuilding analysis, it is 20% more likely to rebuild by the old T_{target} (2090) than previously thought. However, the probability of recovery using the old harvest rate and a new T_{max} is not greater than 80%.

This rebuilding plan is based upon many assumptions. We have no information if the assumption of the Stock/Recruitment relationship and corresponding Synthetic posterior is appropriate. The results of this rebuilding analysis suggest that the previous analysis was not incorrect to suggest that rebuilding of cowcod may take several decades. The true state of nature of the cowcod resilience is quite uncertain and unlikely to become significantly clearer in the near future.

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Table 1. The biological and fishery parameters used in the 2005 rebuilding analysis of Cowcod.

					Fleet 1								
Age	Fec	M	Init N	Init N Tmin	Wt	Sel	Age	Fec	M	Init N	Init N Tmin	Wt	Sel
0	0.000	0.055	27.658	23.489	0.017	0.000	41	8.518	0.055	0.075	0.014	8.600	1.000
1	0.000	0.055	25.462	21.419	0.017	0.000	42	8.680	0.055	0.051	0.009	8.758	1.000
2	0.000	0.055	23.379	19.287	0.022	0.000	43	8.834	0.055	0.034	0.006	8.909	1.000
3	0.000	0.055	21.402	17.376	0.057	0.000	44	8.982	0.055	0.023	0.004	9.054	1.000
4	0.000	0.055	19.519	16.208	0.114	0.000	45	9.124	0.055	0.015	0.003	9.192	1.000
5	0.000	0.055	17.841	14.885	0.196	0.000	46	9.259	0.055	0.010	0.002	9.324	1.000
6	0.000	0.055	16.269	14.031	0.302	0.000	47	9.388	0.055	0.007	0.001	9.450	1.000
7	0.000	0.055	14.650	12.754	0.433	0.000	48	9.511	0.055	0.004	0.001	9.570	1.000
8	0.002	0.055	13.198	11.937	0.589	0.010	49	9.628	0.055	0.003	0.000	9.685	1.000
9	0.021	0.055	12.311	10.879	0.767	0.090	50	9.740	0.055	0.002	0.000	9.794	1.000
10	0.136	0.055	11.306	9.988	0.965	0.310	51	9.846	0.055	0.001	0.000	9.898	1.000
11	0.464	0.055	10.657	9.297	1.183	0.650	52	9.948	0.055	0.001	0.000	9.997	1.000
12	0.939	0.055	9.686	10.042	1.418	0.900	53	10.044	0.055	0.001	0.000	10.091	1.000
13	1.380	0.055	9.062	10.603	1.666	1.000	54	10.136	0.055	0.000	0.000	10.181	1.000
14	1.735	0.055	8.255	12.225	1.927	1.000	55	10.224	0.055	0.000	0.000	10.266	1.000
15	2.041	0.055	7.571	13.006	2.198	1.000	56	10.307	0.055	0.000	0.000	10.347	1.000
16	2.330	0.055	7.035	13.041	2.477	1.000	57	10.386	0.055	0.000	0.000	10.423	1.000
17	2.616	0.055	7.585	11.996	2.762	1.000	58	10.460	0.055	0.000	0.000	10.496	1.000
18	2.905	0.055	7.997	11.306	3.051	1.000	59	10.532	0.055	0.000	0.000	10.566	1.000
19	3.196	0.055	9.208	10.166	3.342	1.000	60	10.599	0.055	0.000	0.000	10.632	1.000
20	3.488	0.055	9.785	9.277	3.634	1.000	61	10.663	0.055	0.000	0.000	10.694	1.000
21	3.780	0.055	9.800	8.288	3.926	1.000	62	10.724	0.055	0.000	0.000	10.753	1.000
22	4.072	0.055	9.005	7.103	4.216	1.000	63	10.782	0.055	0.000	0.000	10.810	1.000
23	4.361	0.055	8.477	5.922	4.504	1.000	64	10.837	0.055	0.000	0.000	10.863	1.000
24	4.646	0.055	7.613	4.812	4.788	1.000	65	10.889	0.055	0.000	0.000	10.913	1.000
25	4.928	0.055	6.939	3.739	5.067	1.000	66	10.938	0.055	0.000	0.000	10.961	1.000
26	5.204	0.055	6.192	2.851	5.341	1.000	67	10.984	0.055	0.000	0.000	11.007	1.000
27	5.475	0.055	5.301	2.138	5.609	1.000	68	11.029	0.055	0.000	0.000	11.050	1.000
28	5.740	0.055	4.414	1.591	5.870	1.000	69	11.070	0.055	0.000	0.000	11.091	1.000
29	5.999	0.055	3.583	1.168	6.125	1.000	70	11.110	0.055	0.000	0.000	11.129	1.000
30	6.250	0.055	2.780	0.853	6.373	1.000	71	11.148	0.055	0.000	0.000	11.166	1.000
31	6.494	0.055	2.118	0.613	6.614	1.000	72	11.183	0.055	0.000	0.000	11.200	1.000
32	6.731	0.055	1.587	0.438	6.847	1.000	73	11.217	0.055	0.000	0.000	11.233	1.000
33	6.960	0.055	1.179	0.311	7.072	1.000	74	11.249	0.055	0.000	0.000	11.264	1.000
34	7.182	0.055	0.865	0.217	7.290	1.000	75	11.279	0.055	0.000	0.000	11.294	1.000
35	7.395	0.055	0.631	0.150	7.499	1.000	76	11.308	0.055	0.000	0.000	11.321	1.000
36	7.601	0.055	0.453	0.102	7.702	1.000	77	11.335	0.055	0.000	0.000	11.348	1.000
37	7.800	0.055	0.323	0.069	7.896	1.000	78	11.360	0.055	0.000	0.000	11.373	1.000
38	7.991	0.055	0.229	0.046	8.083	1.000	79	11.385	0.055	0.000	0.000	11.396	1.000
39	8.174	0.055	0.160	0.031	8.263	1.000	80	11.408	0.055	0.000	0.000	11.419	1.000
40	8.350	0.055	0.110	0.021	8.435	1.000							

Table 2. Results of the six model runs requested by the SSC for whan evaluating a currently existing rebuilding plan and two sensitivity runs to the shape of the pseudo-posterior.

Run description	F (SPR) Rate	T_{max} year	T_{target} year	P_{0-} (prob of rec by T_{target})	T_{min}	Generation time (yrs)	Virgin spawn (target spawn) (t)
			Requested Runs				
Run 1	0.009 (0.78)	2099	2090	81%	2036	39	3045 (1218)
Run 2	0.021 (0.601)	2099	2090	50%	2035	39	3045 (1218)
Run 3	0.009 (0.78)	2099	2099	83%	2035	39	3045 (1218)
Run 4	0.019 (0.63)	2099	2099	60%	2035	39	3045 (1218)
Run 5	0.009 (0.78)	2074	2074	75%	2035	39	3045 (1218)
Run 6	0.015 (0.69)	2074	2074	60%	2035	39	3045 (1218)
			Sensitivity Runs				
Reduced	0.009 (0.78)		2090	90%			
Diffuse	0.009 (0.78)		2090	78%			

n/a indicates this rebuilding parameter does not apply to the run

Table 3. Ten year projected catches and ABC levels under the six rebuilding scenarios requested by the SSC. Projected catches for Runs #1, 3 and 5 are the same because the runs used the same exploitation rate.

year	Run #1 (t)		Run #2		Run #3		Run #4		Run #5		Run #6	
	OY	ABC	OY	ABC	OY	ABC	OY	ABC	OY	ABC	OY	ABC
2007	6	17	12	17	6	17	11	17	6	17	9	17
2008	6	17	13	17	6	17	11	17	6	17	9	17
2009	6	18	13	17	6	18	11	17	6	18	9	18
2010	6	18	13	18	6	18	12	18	6	18	9	18
2011	6	19	13	18	6	19	12	18	6	19	9	18
2012	6	19	13	18	6	19	12	18	6	19	10	19
2013	6	19	13	18	6	19	12	18	6	19	10	19
2014	7	20	13	18	7	20	12	19	7	20	10	19
2015	7	20	14	19	7	20	12	19	7	20	10	20
2016	7	21	14	19	7	21	13	19	7	21	10	20

Table 4. Projected catches in metric tons under rebuilding run #6 request by the GMT. The probability of recovery by Tmax is given across the top of column and predicted catch across rows.

Prob. year	50% (t)	60%	70%	80%	90%
2007	11	9	7	3	0
2008	11	9	7	4	0
2009	11	9	7	4	0
2010	11	9	7	4	0
2011	11	9	7	4	0
2012	11	10	7	4	0
2013	12	10	8	4	0
2014	12	10	8	4	0
2015	12	10	8	4	0
2016	12	10	8	4	0

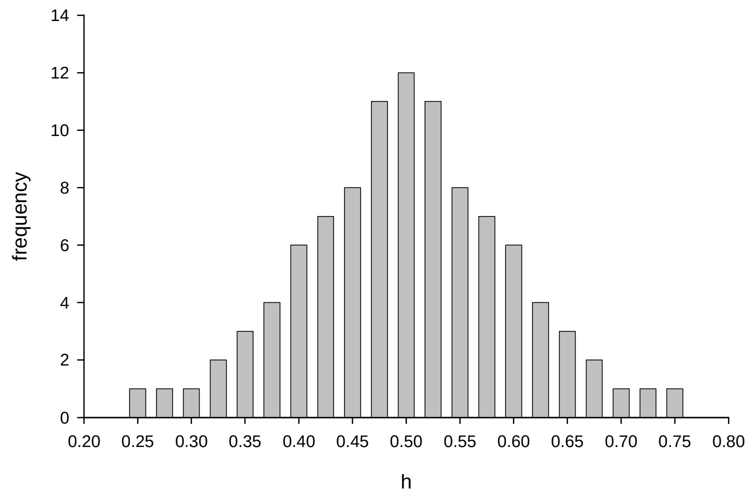

Figure1. Distribution of *h* from the model runs used to create the synthetic posterior used in the rebuilding analysis (*h* mean=0.5, sd=0.1).

Appendix I.
Rebuild.dat file corresponding to run1 in table 2.

#Title
COW - STAR panel model
Number of sexes
1
Age range to consider (minimum age; maximum age)
0 80
Number of fleets
1
First year of projection
2005
Year declared overfished
2000
Is the maximum age a plus-group (1=Yes;2=No)
1
Generate future recruitments using historical recruitments (1) historical recruits/spawner (2) or a stock-recruitment (3)
3
Constant fishing mortality (1) or constant Catch (2) projections
1
Fishing mortality based on SPR (1) or actual rate (2)
1
Pre-specify the year of recovery (or -1) to ignore
83
Fecundity-at-age need to change to weight*maturity
0 to 80

2.14288E-11	2.14288E-11	2.14335E-11	5.04419E-10	1.78424E-08	4.62721E-07	9.30794E-06	0.000151707	0.00203723	0.0211324	0.13572	0.464185
	0.93892	1.37984	1.73516	2.04064	2.32951	2.61622	2.9049	3.19583	3.48808	3.78042	4.07164
	4.3606	4.64629	4.92782	5.20442	5.47546	5.74037	5.99871	6.2501	6.49428	6.73102	6.96018
	7.18165	7.39541	7.60145	7.79981	7.99056	8.1738	8.34966	8.51828	8.67982	8.83445	8.98237
	9.12376	9.25883	9.38777	9.5108	9.62812	9.73993	9.84645	9.94787	10.0444	10.1362	10.2236
	10.3066	10.3855	10.4604	10.5316	10.5992	10.6633	10.7241	10.7819	10.8366	10.8885	10.9377
	10.9843	11.0285	11.0704	11.1101	11.1477	11.1833	11.217	11.2489	11.2791	11.3077	11.3347
	11.3604	11.3846	11.4076								

Age specific information (Females then males) weight selectivity
#

0.0168015	0.0168015	0.0222434	0.0574434	0.114456	0.195677	0.30197	0.43322	0.588562	0.766579	0.96547	1.18319
	1.41754	1.6663	1.92722	2.19814	2.47697	2.76176	3.0507	3.34209	3.63441	3.92629	4.21649
	4.50392	4.78763	5.06678	5.34068	5.60871	5.87038	6.12529	6.37311	6.61359	6.84655	7.07188
	7.2895	7.4994	7.70159	7.89613	8.08311	8.26264	8.43486	8.59992	8.75799	8.90924	9.05387
	9.19207	9.32405	9.45001	9.57016	9.6847	9.79384	9.89778	9.99673	10.0909	10.1805	10.2656
	10.3465	10.4234	10.4965	10.5658	10.6316	10.6941	10.7534	10.8096	10.8629	10.9134	10.9613
	11.0067	11.0498	11.0905	11.1291	11.1657	11.2003	11.2331	11.2642	11.2936	11.3214	11.3477
	11.3727	11.3962	11.4186								
0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.01	0.09	0.31	0.65
	0.90	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00
	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00
	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00
	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00
	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00
	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00
	1.00	1.00	1.00								

M and initial age-structure
#

0.055	0.055	0.055	0.055	0.055	0.055	0.055	0.055	0.055	0.055	0.055	0.055
	0.055	0.055	0.055	0.055	0.055	0.055	0.055	0.055	0.055	0.055	0.055
	0.055	0.055	0.055	0.055	0.055	0.055	0.055	0.055	0.055	0.055	0.055
	0.055	0.055	0.055	0.055	0.055	0.055	0.055	0.055	0.055	0.055	0.055
	0.055	0.055	0.055	0.055	0.055	0.055	0.055	0.055	0.055	0.055	0.055
	0.055	0.055	0.055	0.055	0.055	0.055	0.055	0.055	0.055	0.055	0.055
	0.055	0.055	0.055	0.055	0.055	0.055	0.055	0.055	0.055	0.055	0.055
	0.055	0.055	0.055								
27.6581	25.4615	23.3788	21.4015	19.5187	17.8413	16.2692	14.6499	13.1979	12.3113	11.3061	10.6566
	9.68567	9.06191	8.25489	7.57081	7.03514	7.58531	7.99687	9.20847	9.78546	9.80023	9.00456
	8.47665	7.61305	6.93917	6.19182	5.30059	4.41363	3.58279	2.7803	2.11816	1.58659	1.17905
	0.865047	0.631135	0.453183	0.323102	0.229102	0.160158	0.11014	0.0749628	0.0506906	0.034094	0.0228424
	0.015273	0.0101753	0.00676334	0.00448062	0.00296042	0.0019501	0.00128113	0.000840131	0.000550735	0.000360606	0.000235928
	0.000154213	0.000100741	6.58E-05	4.29E-05	2.80E-05	1.83E-05	1.19E-05	7.72E-06	5.01E-06	3.25E-06	2.10E-06
	1.35E-06	8.62E-07	5.47E-07	3.44E-07	2.13E-07	1.30E-07	7.75E-08	4.48E-08	2.48E-08	1.29E-08	6.09E-09
	2.42E-09	6.68E-10	4.00E-11								

Initial age-structure

23.4886	21.4188	19.287	17.3755	16.2083	14.885	14.0307	12.7544	11.9365	10.8791	9.98805	9.29686
	10.0417	10.6025	12.2245	13.0059	13.0408	11.996	11.306	10.1662	9.27731	8.28793	7.10331
	5.92156	4.81237	3.73868	2.85143	2.13815	1.59061	1.16819	0.85316	0.6132	0.437596	0.310568
	0.217299	0.149561	0.101876	0.0689435	0.0464055	0.0311133	0.0208176	0.0138784	0.00923061	0.00611886	0.00404518
	0.00266614	0.00175247	0.0011498	0.000754099	0.00049399	0.000323337	0.000211436	0.000138177	9.03E-05	5.89E-05	3.85E-05
	2.51E-05	1.63E-05	1.06E-05	6.89E-06	4.46E-06	2.88E-06	1.85E-06	1.19E-06	7.53E-07	4.73E-07	2.93E-07
	1.79E-07	1.07E-07	6.17E-08	3.42E-08	1.78E-08	8.39E-09	3.34E-09	9.21E-10	5.44E-11	1.13E-13	9.01E-14
	7.57E-14	6.43E-14	5.12E-13								

Year for Tmin Age-structure
2000
Number of simulations
10000
recruitment and biomass
Number of historical assessment years
91
Historical data
year recruitment spawner in B0 in R project in R/S project

1915	59.5551	2998.44	1	0	0

1916	59.3267	2998.44	0	0	0
1917	59.294	2991.91	0	0	0
1918	59.2367	2980.52	0	0	0
1919	59.1766	2968.65	0	0	0
1920	59.1434	2962.13	0	0	0
1921	59.1089	2955.36	0	0	0
1922	59.0832	2950.34	0	0	0
1923	59.0624	2946.29	0	0	0
1924	59.0354	2941.04	0	0	0
1925	59.0124	2936.58	0	0	0
1926	58.9836	2931.01	0	0	0
1927	58.937	2922.02	0	0	0
1928	58.9018	2915.27	0	0	0
1929	58.8672	2908.66	0	0	0
1930	58.837	2902.88	0	0	0
1931	58.7966	2895.21	0	0	0
1932	58.7568	2887.66	0	0	0
1933	58.7331	2883.19	0	0	0
1934	58.7179	2880.33	0	0	0
1935	58.7049	2877.89	0	0	0
1936	58.6902	2875.13	0	0	0
1937	58.6781	2872.85	0	0	0
1938	58.6691	2871.17	0	0	0
1939	58.6664	2870.67	0	0	0
1940	58.6666	2870.7	0	0	0
1941	58.6645	2870.3	0	0	0
1942	58.6638	2870.17	0	0	0
1943	58.6814	2873.47	0	0	0
1944	58.6859	2874.32	0	0	0
1945	58.6562	2868.75	0	0	0
1946	58.563	2851.38	0	0	0
1947	58.4914	2838.16	0	0	0
1948	58.4396	2828.64	0	0	0
1949	58.3965	2820.76	0	0	0
1950	58.3483	2811.97	0	0	0
1951	58.2766	2798.99	0	0	0
1952	58.1889	2783.21	0	0	0
1953	58.0594	2760.18	0	0	0
1954	57.9264	2736.8	0	0	0
1955	57.7025	2698.11	0	0	0
1956	57.3729	2642.57	0	0	0
1957	56.9993	2581.59	0	0	0
1958	56.6673	2529.08	0	0	0
1959	56.3446	2479.48	0	0	0
1960	56.0677	2438.03	0	0	0
1961	55.7611	2393.25	0	0	0
1962	55.5216	2359.08	0	0	0
1963	55.2895	2326.62	0	0	0
1964	55.0614	2295.3	0	0	0
1965	54.8674	2269.13	0	0	0
1966	54.5938	2232.92	0	0	0
1967	53.9872	2155.42	0	0	0
1968	53.1728	2057	0	0	0
1969	52.6124	1992.75	0	0	0
1970	52.2639	1954.14	0	0	0
1971	51.6485	1888.32	0	0	0
1972	51.1752	1839.64	0	0	0
1973	50.2998	1753.79	0	0	0
1974	49.1778	1651.03	0	0	0
1975	47.628	1521.02	0	0	0
1976	46.1513	1408.41	0	0	0
1977	44.0725	1265.85	0	0	0
1978	42.5715	1172.91	0	0	0
1979	41.4415	1107.79	0	0	0
1980	39.6995	1014.67	0	0	0
1981	37.8253	923.191	0	0	0
1982	37.027	886.685	0	0	0
1983	34.9855	799.296	0	0	0
1984	34.2606	770.164	0	0	0
1985	31.166	655.655	0	0	0
1986	27.0606	524.64	0	0	0
1987	21.9187	386.943	0	0	0
1988	19.52	330.794	0	0	0
1989	17.0506	277.504	0	0	0
1990	17.3169	283.048	0	0	0
1991	17.8478	294.24	0	0	0
1992	18.5339	308.996	0	0	0
1993	18.7441	313.583	0	0	0
1994	19.5163	330.711	0	0	0
1995	19.5965	332.517	0	0	0
1996	20.1968	346.175	0	0	0
1997	20.4925	353.009	0	0	0
1998	21.5297	377.52	0	0	0
1999	22.6299	404.501	0	0	0
2000	23.4886	426.298	0	0	0
2001	24.3218	448.097	0	0	0
2002	25.2408	472.919	0	0	0
2003	26.0972	496.82	0	0	0
2004	26.9011	519.964	0	0	0
2005	27.6581	542.417	0	0	0

Number of years with pre-specified catches
2
catches for years with pre-specified catches

```
2005 0.5
2006 2
# Number of future recruitments to override
0
# Process for overiding (-1 for average otherwise index in data list)
# Which probability to product detailed results for (1=0.5; 2=0.6; etc.)
3
# Steepness sigma-R Auto-correlation
0.5 0.5 0.5
# Target SPR rate (FMSY Proxy)
0.78
# Target SPR information: Use (1=Yes) and power
0 20
# Discount rate (for cumulative catch)
0.1
# Truncate the series when 0.4B0 is reached (1=Yes)
0
# Set F to FMSY once 0.4B0 is reached (1=Yes)
0
# Percentage of FMSY which defines Ftarget
0.9
# Maximum possible F for projection (-1 to set to FMSY)
-1
# Conduct MacCall transition policy (1=Yes)
0
# Defintion of recovery (1=now only;2=now or before)
2
# Results for rec probs by Tmax (1) or 0.5 prob for various Ttargets (2)
1
# Definition of the "40-10" rule
10 40
# Produce the risk-reward plots (1=Yes)
0
# Calculate coefficients of variation (1=Yes)
0
# Number of replicates to use
20
# Random number seed
-89102
# Conduct projections for multiple starting values (0=No;else yes)
3
# File with multiple parameter vectors
MCMC.PRJ
# Number of parameter vectors
100
# User-specific projection (1=Yes); Output replaced (1->6)
0 6 0 0.5
# Catches and Fs (Year; 1/2 (F or C); value); Final row is -1
2007 1 0.01025
-1 -1 -1
# Split of Fs
2005 1
-1 1
# Time varying weight-at-age (1=Yes;0=No)
0
# File with time series of weight-at-age data
Elvis_lives.CSV
```

Agenda Item H.2.a
Attachment 12
November 2005

Update of Darkbotched Rockfish (*Sebastes crameri*) Rebuilding Analyses

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Introduction

Darkblotched rockfish was declared overfished in January 2001 (John DeVore, PFMC, pers.comm.). The declaration was based on the 2000 stock assessment (Rogers et al. 2000).

Rebuilding analyses were first conducted in mid-year 2001 (Methot and Rogers 2001). Those analyses included a partial update of the 2000 stock assessment, which added data through 2002 and re-estimated recruitments (Methot and Rogers 2001). The authors presented a range of rebuilding models with varying assumptions regarding recruitment (Table 1). The Pacific fisheries management council (PFMC) selected a model (A1) which assumed that recruitment was based primarily on environmental conditions. Spawning output in the absence of fishing was calculated by assuming recruitment was the average of the entire time series of recruitments, but future recruitments were randomly selected only from recruitments in more recent years (after 1982).

The PFMC used the 2001 rebuilding model A1 to set the 2002 and 2003 Optimum Yields (OYs) and to create a rebuilding plan, which was adopted in June 2003 (PFMC 2004). The model estimated that darkblotched rockfish could not be rebuilt within 10 years, so the maximum year to rebuild the spawning stock (T_{MAX}) was the minimum year to rebuild the stock in the absence of fishing (T_{MIN}) (11.5 years beginning in 2002) plus one mean generation time (33 years) or 2047 (Table 2). The 2002 OY was based on a 70% probability of rebuilding by T_{MAX} (P_{MAX}), while the 2003 OY was based on an 80% P_{MAX}. This 80% probability was the value chosen as policy (Po) in the rebuilding plan (PFMC 2004). The target year to rebuild (T_{TARGET}) was set at 2030, which was the median year to rebuild the stock given Po (T_{MED}). (A glossary of rebuilding terms and abbreviations is provided at the end of this document).

In mid-year 2003, the 2000 assessment and 2001 rebuilding analyses were fully updated (Rogers 2003). In the assessment update, data were added through 2002 and all fitted parameters (selectivities and recruitments) were re-estimated. The 2000 and 2001 age-one recruitments (1999 and 2000 year classes) were estimated to be very high in the assessment update (Figure 1). The rebuilding analyses updated only the model selected by the PFMC (Model A1). Virgin recruitment was set equal to the mean of the entire recruitment time series, but the projected recruitments were randomly selected only from recruitments after 1982. The SSC requested progressively including the high 2000 and 2001 age-one recruitment estimates into the rebuilding analyses (Rogers 2003). Risk of error progressively increased from including those recruitments because they were based on increasingly limited data. The PFMC chose the rebuilding model which included age-one recruitment estimates only through 2000 (Table 2). Recruitments after 2000 were randomly selected from the 1982-2000 estimates.

The PFMC used the 2003 rebuilding model to set the 2004-2006 OYs and produce a 2004 amendment to the rebuilding plan (PFMC 2004). The rebuilding plan addendum reduced T_{MAX} from 2047 to 2044. T_{MAX} was modified because T_{MIN} was reduced from 2014 to 2011 (Table 2). T_{MIN} was reduced for two reasons. The time to rebuild in the absence of fishing was lowered from 11.5 to 10 years, and a 2002 change in the rebuilding software (Punt 2005) caused that 10 years to begin with the year overfishing was declared (2001) rather than the first year of projection (2002). The addendum also increased Po. The Allowable Biological Catch (ABC) was lower than the 2004 OY given the Po of 0.8. Since the OY cannot be greater than the ABC, the ABC was adopted as the OY. Po in the amendment was therefore the probability of rebuilding by 2044 given the ABC catch. That probability was slightly more than 90%.

The 2004 ABC was lower than the 2004 OY given a Po of 0.8 because of a difference in time frames. The ABC was based only on the 2004 biomass available to the fishermen. In 2004, the strong 2000 age-one recruitment was only age 5, so each fish had a relatively small biomass and that age was not yet fully selected by the fishery gear. The rebuilding analyses considered the biomass available during 2004-2044. During that time period, the strong 2000 recruitment would not only affect the biomass available to the fishermen, but could be randomly selected in the prediction of other recruitments.

Although the 2004 addendum reduced T_{MAX} and increased Po, the target year to rebuild (T_{TARGET}) was unchanged from 2030 (PFMC 2004). T_{TARGET} is essentially inviolate according to the FMP, only to be changed if absolutely needed (i.e., its falls outside the range of Tmin to Tmax) (John DeVore, PFMC, pers.comm.). T_{TARGET} was therefore no longer the median year to rebuild given the selected probability of rebuilding by T_{MAX}. T_{MED} given the ABC catches and the new T_{MAX} was 2019 (Table 2).

A full stock assessment for darkblotched rockfish was conducted in 2005, with substantial changes to the 2000-2003 model structure and data (Rogers 2005). The model was extended back to 1928 and data were added through 2004. Data included a new survey index of relative abundance. Growth and discard were estimated within the 2005 model rather than externally, as was done previously. Growth and the fishery selectivity and retention curves in the new model were allowed to change over time in order to better fit the data and reflect known changes. Changes were also made to the fixed life history parameters. Natural morality in the selected model was increased from 0.05 to 0.07 and the fecundity-at-weight and weight-at-length relationships were changed slightly.

This document revises the 2003 rebuilding analyses using the new information from the 2005 assessment. It also provides an assessment of rebuilding progress given the parameters in the current rebuilding plan.

Update of Rebuilding Plan and Addendum

Rebuilding Program and Files

The 2005 rebuilding analyses were primarily conducted in June 2005 using version 2.8a (April 2005) of the SSC default rebuilding analysis software (Punt 2005).

The input file for Model A1 is at the end of this document. That model is a full update of the initial rebuilding analyses using the standard environmental hypothesis (A1), which is the basis of the rebuilding plan (PFMC 2004).

Inputs to the Rebuilding Model

Recruitments

Recruitments estimates input to the 2005 rebuilding model were the number of age 0 fish in 1968-2003 (Table 2). Although the 2005 assessment model was extended back to 1928, recruitments were fit stochastically only after 1967. Fitting recruitments earlier than that led to wide fluctuations due to lack of data, so recruitments in 1928-1967 were taken from the Beverton-Holt stock-recruitment curve. In the new stock recruitment model (SS2) recruitments are always specified as age 0.

The strength of recruitments before and after 1982 was similar in the 2005 stock assessment estimates (Figure 1, Table 3). The 1982 change in recruitments was most evident in the 2001 update (Methot and Rogers 2001). That update indicated that age-one recruitment in 1983-1996 was only 67% of the level in 1963-1982. In the 2000 assessment and the 2003 full update of that assessment, recruitments before and after 1982 were more similar.

Life History

Life history-at-age inputs to the rebuilding program included spawning output (fecundity times proportion mature), body weight in the fishery, and natural mortality (Table 4). This update increased natural mortality from 0.05 to 0.07. It also slightly changed the spawning output and weight at age from the values input in the 2001 and 2003 rebuilding analyses. There were slight changes to the fecundity and weight-at-length relationships fixed in the 2005 assessment model.

Since the 2005 assessment model fit growth within the model, there was slightly slower growth in 1998 than in other years. Given that slower growth, estimates for ages greater than age 6 in 2004 were based on a smaller weight-at-age than estimated for the population before 1998. Although the rebuilding program allows for the life history inputs to change with each year, only the 2004 relationships for spawning output and weight were used in the rebuilding models. Yearly outputs were not available from the stock synthesis assessment model, and the author of the rebuilding model stated that his yearly-change option was not appropriate in this circumstance (Andre Punt, U. of W., pers.comm.).

Age Compositions

Both the 2001 and 2004 age composition data from the assessment model were supplied to the rebuilding model (Table 5). The age composition in 2001, the year the stock was declared overfished, was needed to determine $T_{MIN,}$ which assumed no fishing mortality after that year. Using the 2004 age composition from the assessment model required including the 2004 age-0 recruitment, which was based on the stock-recruitment curve rather than estimated using available data (Table 2). The 2004 age composition was chosen because it was compatible with the available fecundity-at-age and weight-at-age in the fishery, which were output by the stock synthesis model only for the ending year of the assessment model. The 2004 age composition included the high recruitment estimates for both 1999 and 2000 (Figure 1). The STAR panel for the 2005 assessment specified that those recruitments should not be down-weighted in the projections (Rogers 2005).

In the past rebuilding analyses, the age composition input was for a year prior to 2001, so only one age composition was necessary. The 2001 analyses used the 1998 age 1+ population age composition, and the 2003 analyses (as selected by the PFMC) used the 2000 age composition (Table 2). Although the stock assessment ending year age compositions were not used in the previous rebuilding analyses (1999 was not used in the 2001 analyses and 2001 was not used in the 2003 analyses), this was not a problem because growth was constant over time in those models.

Fishery Selectivity

The 2004 fishery selectivity-at-age for males and females was input to the rebuilding model. Those selectivities were higher for the younger ages and had more difference between sexes than the selectivities used in the previous rebuilding analyses (Table 6). Selectivity in the assessment models was based on length and then converted to selectivity-at-age, and the age-length relationship was different in 2004. As mentioned under the above life history section, slower growth in 1998 affected the growth in 2004. The 2004 selectivities were also fit to the fishery data after 2002, when the fishery was shifted out of the depth range of the medium-sized darkblotched rockfish.

Catch

Catch was supplied to the model for 2004-2006. The 2004 catch was based on the known landings and an assumed discard rate of 15%. The 2005-2006 catches were assumed equal to their previously-set OYs, which were the ABCs forecast using the 2003 rebuilding model. Catches were forecast beginning with 2007, the first year these rebuilding analyses could affect the OY (Table 2).

In the previous analyses, catch was also supplied for the last three years. For the 2001 analyses, catch in 1999-2001 was assumed equal to the known landings in 1999-2000 and the OY in 2001. Catches were forecast beginning with 2002 (Table 2). For the 2003 analyses, catch in 2000-2003 were supplied to the rebuilding model. In 2000, the catch was equal to the known landings. In 2001-2002, discard was added to the known landings using limited entry rates assumed by the PFMC (16% in 2001 and 20% in 2002). Catch in 2003 was assumed equal to that estimated for 2002. Catches were forecast beginning in 2004 (Table 2).

Rebuilding Outputs

The new life history inputs to the rebuilding model (primarily the increase in natural mortality) changed the rebuilding program estimates for mean generation time, unfished level of spawning output per recruit, and F50% (Table 2). The mean generation time was reduced from 33 to 24 years and the unfished level of spawning output per recruit was reduced from 18.42 to 10.16. F50%, which was approximately 0.03 in the prior analyses, was increased to 0.046.

Model A1

Model A1 was a standard environmental scenario, similar to the models selected in the initial rebuilding plan (2001 model) and addendum (2003 model). Virgin recruitment was set equal to the 1968-2003 mean recruitment and projected recruitments were randomly sampled from1982-2003 recruitments (Tables 2).

As in the 2003 model, T_{MAX} was re-calculated. Based on the revised generation time (24 years) plus a modified T_{MIN} (8 years), it was now 32 years. The maximum allowable year to rebuild the stock was therefore 2033: 2001 (the year overfishing was declared) plus 32 years. Since T_{MIN} is less than 10 years, given the new information T_{MAX} could be equal to the year the stock was declared overfished plus 10 years, which would occur in 2011. The rebuilding software, however, determined that T_{MAX} was 2033 and the 10 year rule is presently being revised.

Given the T_{MAX} of 2033, the catch based on the ABC at F50% was once again less than the catch given P_{MAX} = 0.80, the Po in the initial rebuilding plan (Tables 7,8 and Figure 2). The P_{MAX} associated with the ABC catches and the new T_{MAX} was 0.97 (Tables 2,7,8). The median year to rebuild given the ABC catches and the new T_{MAX} was 2012. The new T_{MAX} (2033) is close to the previous T_{TARGET} (2030). The probability of rebuilding by that T_{TARGET} is very high (0.96) given the ABC catches (Table 8). Even given the lower 95% confidence interval, the probability of rebuilding by T_{TARGET} is greater than 80% (Figure 3).

The ABC catch was based on a proxy of F50%, which was increased from 0.032 in 2003 to 0.046 in 2005 (Tables 2,6). The 2007 ABC catch projected in 2005 was also greater than that catch projected in 2003. As would be expected, if F was set at the old value for F50% (the current harvest control rule) in the 2005 model projections, the catches were smaller than the ABC based on the new value for F50% (Tables 7,8, Figure 2).

If the 10 year rule is used and T_{MAX} is set equal to 2011, the OY at Po of 0.80 would be intermediate between the current F OY and the F50% OY (Table 9). The probability of rebuilding the stock by 2011 is 100% for the current F OY and 0% given the F50% OY. Use of the 40-10 rule would result in around 40% change of rebuilding by T_{MAX}.

Model A1-b

Because changing the values for T_{MAX} and P_{MAX}, and the harvest control rule (F) might require another amendment to the rebuilding plan, a second model was developed to assess rebuilding progress using the T_{MAX} and Po currently in effect (Table 2). Rebuilding was therefore required by 2044. The current Po is not an exact value, only slightly greater than 0.9, so 0.9 was used as a proxy. This was also compared to the results given the Po of 0.8, from the original rebuilding plan. There was 67% chance of rebuilding by T_{TARGET} given the catches at P0.8, and 79% chance given the catches at P0.9 (Table 10).

Progress Towards Rebuilding

In July 2005, the SSC requested six comparisons which would help determine progress towards rebuilding (Table 11). The fifth comparison was Model A1 and the fourth comparison was Model A1-b. The first comparison (default) is consistent with the results shown in Table 8: that given the ABC catches, the stock has a 96% chance of rebuilding by the current T_{TARGET} of 2030.

Sensitivity Analyses

Model 2

Model 2 used the stock assessment option in the rebuilding model to forecast recruitments. The SSC was requested this comparison for darkblotched rockfish. As in the 2005 assessment model, a Beverton-Holt relationship with a steepness parameter of 0.95 was assumed. The standard deviation of the log-recruitment was set at 0.8, the value that was iteratively fit in the 2005 assessment model. Auto-correlation was set at zero. Although there was some correlation in recruitments with a one-year lag, this could be attributed to slightly miss-specified aging error or coefficient of variation in length-at-age in the assessment model, rather than actual recruitment correlation. Virgin recruitment from the 2005 assessment model was used to estimate B_0 in the rebuilding model. This model could be considered comparable to scenario B2 (optimistic stock-recruitment) in the 2001 analyses (Table 1). ABC catches for Model 2 were also lower than catch given PMAX of 0.9, so the OY was assumed equal to the ABC. The Model 2 OYcatches were slightly higher than the Model A1 catches in the later years of ten year projection (Table 12).

Conclusions

Given the parameters in the current rebuilding plan, rebuilding is ahead of schedule. There is a 96% chance of rebuilding by the 2030 target year. If the OY catch continues to be based on the current F, the stock has 100% chance of rebuilding by 2011, which is ten years after the stock was declared overfished.

References

Methot, R. and J.B. Rogers. 2001. Rebuilding analysis for darkblotched rockfish. Pacific Fishery Management Council, 7700 NE Ambassador Place, Suite 200, Portland, OR 97201.

PFMC. 2004. Darkblotched rockfish (*Sebastes crameri*) rebuilding plan pursuant to the Pacific coast groundfish management plan adopted June 2003 and 2004 addendum to the darkblotched rockfish rebuilding plan *in* Status of the Pacific Coast Groundfish Fishery through 2003 and Recommended Acceptable Biological Catches for 2004. Pacific Fishery Management Council, 7700 NE Ambassador Place, Suite 200, Portland, OR 97201.

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Rogers, J.B., R.D. Methot, T.L. Builder, K. Piner, and M. Wilkins. 2000. Status of the Darkblotched Rockfish (*Sebastes crameri*) Resource in 2000, appendix to Status of the Pacific coast groundfish fishery through 2000 and recommended acceptable biological catches for 2001. Pacific Fishery Management Council, 7700 NE Ambassador Place, Suite 200, Portland, OR 97201.

Table 1. Rebuilding models compared in 2001 analyses.

Hypothesis			Recruitment		2002 OY (mt)
Label	**Recruitment**	**Type**	**Virgin**	**Forecast**	**P_{MAX} = 0.7**
A1	Environmental	Standard	1963-1996 average	1983-1996	168
A2	Environmental	Optimistic	1963-1996 average	1963-1996	260
B1	Stock-Recruitment	Pessimistic	initial conditions	1983-1996	115
B2	Stock-Recruitment	Standard	initial conditions	1963-1996	196

Table 2. Comparison of scenario A1 models from the 2001 analyses, which were the basis of the rebuilding plan, the 2003 analyses, which were the basis of the plan amendment, and the 2005 analyses presented in this document. Outputs from the assessment models were used as inputs to the rebuilding models.

		Year of Analysis		
Model		**2001**	**2003**	**2005**
Assessment				
	Type	partial update	full update	full
	Ending Year of Model	2001	2002	2004
	Age of Recruits	1	1	0
	Last Year Recruits were Estimated	1999	2001	2003
Rebuilding				
	Utilization	Plan	Amendment	Amendment?
	First Year with Zero Catch (to calculate T_{MIN})	2002	2001	2001
	First Year Catch was Forecast	2002	2004	2007
	Year Declared Overfished - Age Comp	na	na	2001
	Year of Current Age Comp, Life History, Selectivity	1998	2000	2004
	Generation Time	33	33	24
	F_{MSY} proxy (F50%)	0.0321	0.0319	0.0463
	SPR unfiished population	18.42	18.42	10.16
	Age 0 Recruitments used to estimate B_0 (mean)	1962-1995	1962-1999	1968-2003
	Resample for Future Age 0 Recruits (from within range)	1982-1995	1982-1999	1982-2003
	B_0	29,044 mt	30,775 mt	25,361 mt
	B_{MSY}	11,618 mt	12,310 mt	10,144 mt
	T_{MIN} (years)	11.5	10	8
	T_{MIN}	2014	2011	2009
	T_{MAX}	2047	2044	2033
	T_{MED}	2030	2019	2012
	T_{TARGET}	2030	2030	2030
	P_{MAX}	80%	>90% (ABC)	97% (ABC)
	Harvest Control Rule (F)	0.027	0.032	0.046
	2007 OY		314 mt	456 mt

Table 3. Comparison of the mean age-0 recruitments (numbers of fish x 1000) in various time periods, as estimated in the last four stock assessments for darkblotched rockfish. Age-0 recruitments in the 2000-2003 assessments were calculated using age-1 recruitments with natural mortality of 0.05.

		Mean Age 0 Recruitment x 1000			
Time Period	**Years**	**Assessment Year**			
		2000	**2001**	**2003**	**2005**
Last Year Estimated in Model		**1997**	**1998**	**2000**	**2003**
Last Year Used in Rebuilding			**1995**	**1999**	**2003**
virgin	Initial		1961	1757	2623
entire	1962-1995	2001	1658	1663	2402
	1962-1999			1902	2439
	1968-2003				2475
early	up to 1981	2073	1916	1919	2685
late	1982-1995	1898	1288	1297	2023
	1982-1999			1883	2184
	1982-2003				2338

Table 4. Comparison of life history inputs into earlier rebuilding analyses versus those input into the 2005 rebuilding model. The 2005 model had inputs up to age 75, but the values were similar to those at age 40.

	Year of Analysis							
	2001 and 2003				2005			
Age	M	Fecundity	Weight (kg)		M	Fecundity	Weight (kg)	
		10^7 eggs	Females	Males		10^7 eggs	Females	Males
0					0.07	0.00	0.01	0.01
1	0.05	0.00	0.05	0.04	0.07	0.00	0.06	0.06
2	0.05	0.00	0.14	0.12	0.07	0.00	0.16	0.16
3	0.05	0.00	0.26	0.23	0.07	0.00	0.31	0.30
4	0.05	0.00	0.38	0.33	0.07	0.00	0.45	0.44
5	0.05	0.01	0.47	0.42	0.07	0.04	0.59	0.55
6	0.05	0.04	0.56	0.50	0.07	0.07	0.63	0.59
7	0.05	0.14	0.65	0.57	0.07	0.44	0.81	0.71
8	0.05	0.32	0.73	0.64	0.07	0.78	0.91	0.77
9	0.05	0.57	0.81	0.70	0.07	1.13	1.00	0.82
10	0.05	0.86	0.89	0.75	0.07	1.44	1.08	0.86
11	0.05	1.15	0.96	0.80	0.07	1.71	1.14	0.89
12	0.05	1.43	1.02	0.84	0.07	1.94	1.20	0.91
13	0.05	1.69	1.08	0.87	0.07	2.14	1.24	0.93
14	0.05	1.92	1.13	0.89	0.07	2.30	1.28	0.94
15	0.05	2.13	1.17	0.92	0.07	2.44	1.31	0.95
16	0.05	2.32	1.21	0.93	0.07	2.55	1.34	0.96
17	0.05	2.49	1.24	0.95	0.07	2.64	1.36	0.96
18	0.05	2.63	1.27	0.96	0.07	2.72	1.37	0.97
19	0.05	2.76	1.29	0.97	0.07	2.78	1.39	0.97
20	0.05	2.86	1.32	0.98	0.07	2.83	1.40	0.97
21	0.05	2.96	1.33	0.99	0.07	2.87	1.41	0.97
22	0.05	3.04	1.35	0.99	0.07	2.90	1.41	0.98
23	0.05	3.11	1.36	1.00	0.07	2.93	1.42	0.98
24	0.05	3.17	1.37	1.00	0.07	2.95	1.42	0.98
25	0.05	3.22	1.38	1.00	0.07	2.97	1.43	0.98
26	0.05	3.27	1.39	1.00	0.07	2.98	1.43	0.98
27	0.05	3.30	1.40	1.01	0.07	2.99	1.43	0.98
28	0.05	3.34	1.41	1.01	0.07	3.00	1.44	0.98
29	0.05	3.36	1.41	1.01	0.07	3.01	1.44	0.98
30	0.05	3.39	1.41	1.01	0.07	3.01	1.44	0.98
31	0.05	3.41	1.42	1.01	0.07	3.02	1.44	0.98
32	0.05	3.42	1.42	1.01	0.07	3.02	1.44	0.98
33	0.05	3.44	1.42	1.01	0.07	3.02	1.44	0.98
34	0.05	3.45	1.43	1.01	0.07	3.03	1.44	0.98
35	0.05	3.46	1.43	1.01	0.07	3.03	1.44	0.98
36	0.05	3.47	1.43	1.01	0.07	3.03	1.44	0.98
37	0.05	3.48	1.43	1.01	0.07	3.03	1.44	0.98
38	0.05	3.48	1.43	1.01	0.07	3.03	1.44	0.98
39	0.05	3.49	1.43	1.01	0.07	3.03	1.44	0.98
40	0.05	3.51	1.44	1.01	0.07	3.03	1.44	0.98

Table 5. Comparison of age composition inputs into earlier rebuilding analyses versus those input into the 2005 rebuilding model. The 2005 model had inputs up to age 75+, but those values were summed to age 40+ for purposes of comparison.

	Year of Analysis							
	2001		2003		2005			
	1998 Age Comp		2000 Age Comp		2004 Age Comp		2001 Age Comp	
Age	**females**	**males**	**females**	**males**	**females**	**males**	**females**	**males**
0					1215	1215	836	836
1	1338	1338	3449	3449	1723	1723	2795	2795
2	176	176	272	272	334	334	3133	3133
3	791	791	837	837	677	677	299	299
4	1643	1644	175	175	2256	2255	865	865
5	260	262	781	785	2481	2483	202	202
6	417	424	1672	1692	235	234	1538	1549
7	380	389	185	189	644	647	457	465
8	201	208	309	318	148	149	61	62
9	83	86	248	257	1120	1133	171	175
10	271	282	88	91	332	339	53	55
11	214	223	53	55	44	45	71	73
12	228	238	161	169	124	127	23	24
13	93	97	133	139	39	40	197	204
14	60	63	160	168	51	53	81	83
15	34	35	65	68	17	17	25	26
16	30	32	42	44	143	148	29	30
17	77	81	22	24	58	60	13	13
18	111	117	20	22	18	19	15	16
19	115	120	54	57	21	22	22	23
20	56	59	76	80	9	9	39	41
21	29	30	81	84	11	11	48	50
22	19	20	39	41	16	16	9	10
23	16	16	21	22	28	30	3	4
24	18	18	13	14	35	36	4	4
25	55	56	12	12	7	7	5	5
26	4	4	11	11	2	3	3	3
27	40	41	44	45	3	3	13	13
28	0	0	6	6	3	3	4	4
29	1	1	25	26	2	2	4	5
30	71	73	0	0	9	9	4	5
31	3	3	2	2	3	3	3	3
32	36	37	48	49	3	3	2	2
33	0	0	3	3	3	3	2	2
34	0	0	25	26	2	2	3	3
35	0	0	0	0	1	2	3	3
36	25	26	0	0	1	1	2	2
37	10	10	0	0	2	2	2	2
38	8	9	17	18	2	2	1	2
39	8	8	7	7	2	2	1	1
40+	119	121	97	99	10	10	11	11

Table 6. Comparison of fishery selectivity inputs into earlier rebuilding analyses versus those input into the 2005 rebuilding model. The 2005 model had inputs up to age 75, but the values were similar to those at age 40.

	Year of Analysis					
	2001		2003		2005	
Age	Females	Males	Females	Males	Females	Males
0					0.00	0.00
1	0.00	0.00	0.00	0.00	0.00	0.00
2	0.00	0.00	0.00	0.00	0.01	0.01
3	0.02	0.01	0.03	0.02	0.05	0.05
4	0.11	0.08	0.14	0.11	0.24	0.21
5	0.32	0.26	0.36	0.30	0.51	0.43
6	0.57	0.51	0.59	0.54	0.60	0.50
7	0.76	0.72	0.77	0.73	0.85	0.73
8	0.87	0.84	0.87	0.84	0.92	0.81
9	0.93	0.91	0.92	0.90	0.96	0.86
10	0.96	0.94	0.96	0.94	0.98	0.89
11	0.98	0.96	0.97	0.96	0.99	0.91
12	0.98	0.97	0.98	0.97	0.99	0.92
13	0.99	0.98	0.99	0.98	0.99	0.93
14	0.99	0.98	0.99	0.98	1.00	0.94
15	1.00	0.99	0.99	0.98	1.00	0.94
16	1.00	0.99	1.00	0.99	1.00	0.94
17	1.00	0.99	1.00	0.99	1.00	0.95
18	1.00	0.99	1.00	0.99	1.00	0.95
19	1.00	0.99	1.00	0.99	1.00	0.95
20	1.00	0.99	1.00	0.99	1.00	0.95
21	1.00	0.99	1.00	0.99	1.00	0.95
22	1.00	0.99	1.00	0.99	1.00	0.95
23	1.00	0.99	1.00	0.99	1.00	0.95
24	1.00	1.00	1.00	0.99	1.00	0.95
25	1.00	1.00	1.00	0.99	1.00	0.95
26	1.00	1.00	1.00	0.99	1.00	0.95
27	1.00	1.00	1.00	0.99	1.00	0.95
28	1.00	1.00	1.00	0.99	1.00	0.95
29	1.00	1.00	1.00	0.99	1.00	0.95
30	1.00	1.00	1.00	0.99	1.00	0.95
31	1.00	1.00	1.00	0.99	1.00	0.95
32	1.00	1.00	1.00	0.99	1.00	0.95
33	1.00	1.00	1.00	0.99	1.00	0.95
34	1.00	1.00	1.00	0.99	1.00	0.95
35	1.00	1.00	1.00	0.99	1.00	0.95
36	1.00	1.00	1.00	0.99	1.00	0.95
37	1.00	1.00	1.00	0.99	1.00	0.95
38	1.00	1.00	1.00	0.99	1.00	0.95
39	1.00	1.00	1.00	0.99	1.00	0.95
40	1.00	1.00	1.00	0.99	1.00	0.95

Table 7. Model A1 output (2005 update of the rebuilding plan and addendum).

Quantity	P_{MAX} =0.5	P_{MAX} =0.6	P_{MAX} =0.7	P_{MAX} =0.8	P_{MAX} =0.9	F= 0.032*	F=0	40-10 Rule	ABC Rule
F	0.0715	0.0682	0.0645	0.0594	0.0531	0.032	0		0.046
SPR RATE	0.376	0.389	0.405	0.429	0.461	1.000	1.000		0.500
OY_{2007}(mt)	696.1	665	629.5	581.2	521.4	316.9	0	255.1	456
P_{MAX}	50.0	60.0	70.0	80.1	90.0	100.0	100.0	100.0	97.2
T_{MED}	2033.0	2024.7	2019.6	2016.0	2013.6	2010.5	2009.5	2011.2	2012.2

*** The current rebuild fishing mortality**

Table 8. Comparison of 2005 Model A1 results for a variety of assumptions. P=.8 and P=0.9 are based on T_{MAX} of 2033. The 2004-2006 catches were externally-derived estimates supplied to the model. Values are medians from 1000 runs.

	Probability Rebuilt					OY Catch (mt)			
Year	P= .8	P= .9	F=0	F50%	F=0.032	P= .8	P= .9	F50%	F=0.032
2004	0.00	0.00	0.00	0.00	0.00	227	227	227	227
2005	0.00	0.00	0.00	0.00	0.00	269	269	269	269
2006	0.00	0.00	0.00	0.00	0.00	294	294	294	294
2007	0.00	0.00	0.00	0.00	0.00	581	521	456	317
2008	0.00	0.00	0.00	0.00	0.00	615	554	487	343
2009	0.00	0.00	0.00	0.00	0.00	624	565	500	355
2010	0.00	0.00	1.00	0.00	0.00	641	584	519	373
2011	0.00	0.00	1.00	0.00	1.00	650	594	530	385
2012	0.06	0.19	1.00	0.43	1.00	654	600	538	395
2013	0.25	0.42	1.00	0.74	1.00	659	607	546	403
2014	0.38	0.55	1.00	0.80	1.00	662	612	553	412
2015	0.46	0.61	1.00	0.83	1.00	664	615	558	418
2016	0.50	0.65	1.00	0.86	1.00	662	615	560	422
2017	0.54	0.68	1.00	0.87	1.00	663	618	563	427
2018	0.57	0.71	1.00	0.88	1.00	662	617	563	430
2019	0.60	0.74	1.00	0.89	1.00	664	621	567	435
2020	0.62	0.75	1.00	0.90	1.00	661	619	568	438
2021	0.64	0.77	1.00	0.91	1.00	661	620	568	439
2022	0.66	0.79	1.00	0.92	1.00	659	618	569	440
2023	0.68	0.80	1.00	0.93	1.00	661	622	573	445
2024	0.69	0.82	1.00	0.93	1.00	657	617	570	445
2025	0.71	0.82	1.00	0.94	1.00	656	619	571	447
2026	0.72	0.84	1.00	0.94	1.00	659	622	572	449
2027	0.73	0.85	1.00	0.95	1.00	655	619	571	450
2028	0.75	0.86	1.00	0.96	1.00	657	620	575	451
2029	0.76	0.87	1.00	0.96	1.00	656	620	574	451
2030	0.77	0.88	1.00	0.96	1.00	656	618	573	453
2031	0.78	0.89	1.00	0.97	1.00	652	616	571	452
2032	0.79	0.89	1.00	0.97	1.00	650	614	570	452
2033	0.80	0.90	1.00	0.97	1.00	651	615	571	453

Table 9. Comparison of Model A1 results assuming T_{MAX} is 2011, 10 years after the stock was declared overfished. Values are medians from 1000 runs.

Year	Probability Rebuilt						OY Catch (mt)				
	P=0.8	P= 0.9	40-10	F=0	F=0.032	F50%	P=0.8	P=0 .9	40-10	F=0.032	F50%
2007	0.00	0.00	0.00	0.00	0.00	0.00	333	521	255	317	456
2008	0.00	0.00	0.00	0.00	0.00	0.00	360	554	353	343	487
2009	0.00	0.00	0.00	0.00	0.00	0.00	373	565	421	355	500
2010	0.00	0.00	0.00	1.00	0.00	0.00	390	584	494	373	519
2011	0.80	0.90	0.37	1.00	1.00	0.00	403	594	546	385	530

Table 10. Comparison of 2005 Model A1 results with T_{MAX} fixed at the year in the amendment (2044) (Model A1-b) and P_{MAX} either from the rebuilding plan (0.8) or from the amendment (0.9). Values are medians from 1000 runs.

	Probability Rebuilt		OY Catch (mt)	
Year	**P= .8**	**P= .9**	**P= .8**	**P= .9**
2007	0.00	0.00	628	571
2008	0.00	0.00	662	604
2009	0.00	0.00	669	614
2010	0.00	0.00	685	631
2011	0.00	0.00	692	640
2012	0.00	0.08	694	645
2013	0.14	0.28	698	651
2014	0.27	0.41	699	653
2015	0.34	0.48	699	655
2016	0.39	0.53	697	654
2017	0.43	0.56	696	656
2018	0.46	0.59	694	654
2019	0.49	0.62	695	657
2020	0.51	0.64	691	654
2021	0.53	0.67	689	654
2022	0.55	0.68	688	652
2023	0.57	0.70	689	654
2024	0.59	0.71	683	650
2025	0.61	0.73	684	650
2026	0.62	0.74	686	653
2027	0.64	0.75	681	649
2028	0.64	0.77	684	651
2029	0.65	0.79	683	650
2030	0.67	0.79	681	650
2031	0.68	0.81	678	646
2032	0.69	0.82	675	644
2033	0.70	0.83	677	645
2034	0.72	0.84	675	643
2035	0.73	0.85	677	647
2036	0.74	0.86	680	649
2037	0.75	0.86	677	647
2038	0.75	0.87	678	648
2039	0.76	0.87	679	648
2040	0.78	0.88	675	644
2041	0.78	0.88	676	645
2042	0.79	0.89	678	647
2043	0.79	0.90	680	650
2044	0.80	0.90	682	650

Table 11. Comparisons requested by the SSC to evaluate progress towards rebuilding.

	1 (Default)	2	3	4	5	6
P_{MAX}	**estimated**	**0.5**	**estimated**	**P_0**	**estimated**	**P_0**
T_{MAX}	**current T_{TARGET}**	**current T_{TARGET}**	**current T_{MAX}**	**current T_{MAX}**	**new T_{MAX}**	**new T_{MAX}**
BASED ON	**current SPR**	**est SPR**	**current SPR**	**est SPR**	**current SPR**	**est SPR**
Model				**A1-b**	**A1**	
T_{MIN}	2009	2009	2009	2009	2009	2009
T_{MAX}	2030	2030	2044	2044	2033	2033
T_{MED}	2012	2012	2012	2016	2012	2014
P_{MAX}	0.962	0.5	0.986	0.9	0.972	0.9
F	0.0463	0.0701	0.0463	0.0583	0.046	0.0531
SPR rate	0.5	0.381	0.5	0.434	0.5	0.461

Table 12. Comparison of model results with recruitment predicted from stock-recruitment relationship (Model 2) to the model with re-sampled recruitments (Model A1).

	Model A1	Model 2
Age-0 Recruitments		
Estimate B_0 (mean from range)	1968-2003	intial
Resample for Future Recruits (from within range)	1982-2003	S-R
Outputs		
B_0 (10^7 eggs)	25361	26662
B_{MSY} (10^7 eggs)	10144	10665
T_{MIN}	2009	2009
T_{MAX}	2033	2033
P_{MAX}	0.97	0.96
Median year to rebuild given P_{MAX} by T_{MAX}	2012	2014
2007 OY (mt)	456	456
2008 OY (mt)	487	488
2009 OY (mt)	500	500
2010 OY (mt)	519	519
2011 OY (mt)	530	532
2012 OY (mt)	538	540
2013 OY (mt)	546	548
2014 OY (mt)	553	556
2015 OY (mt)	558	563
2016 OY (mt)	560	570
2017 OY (mt)	563	577

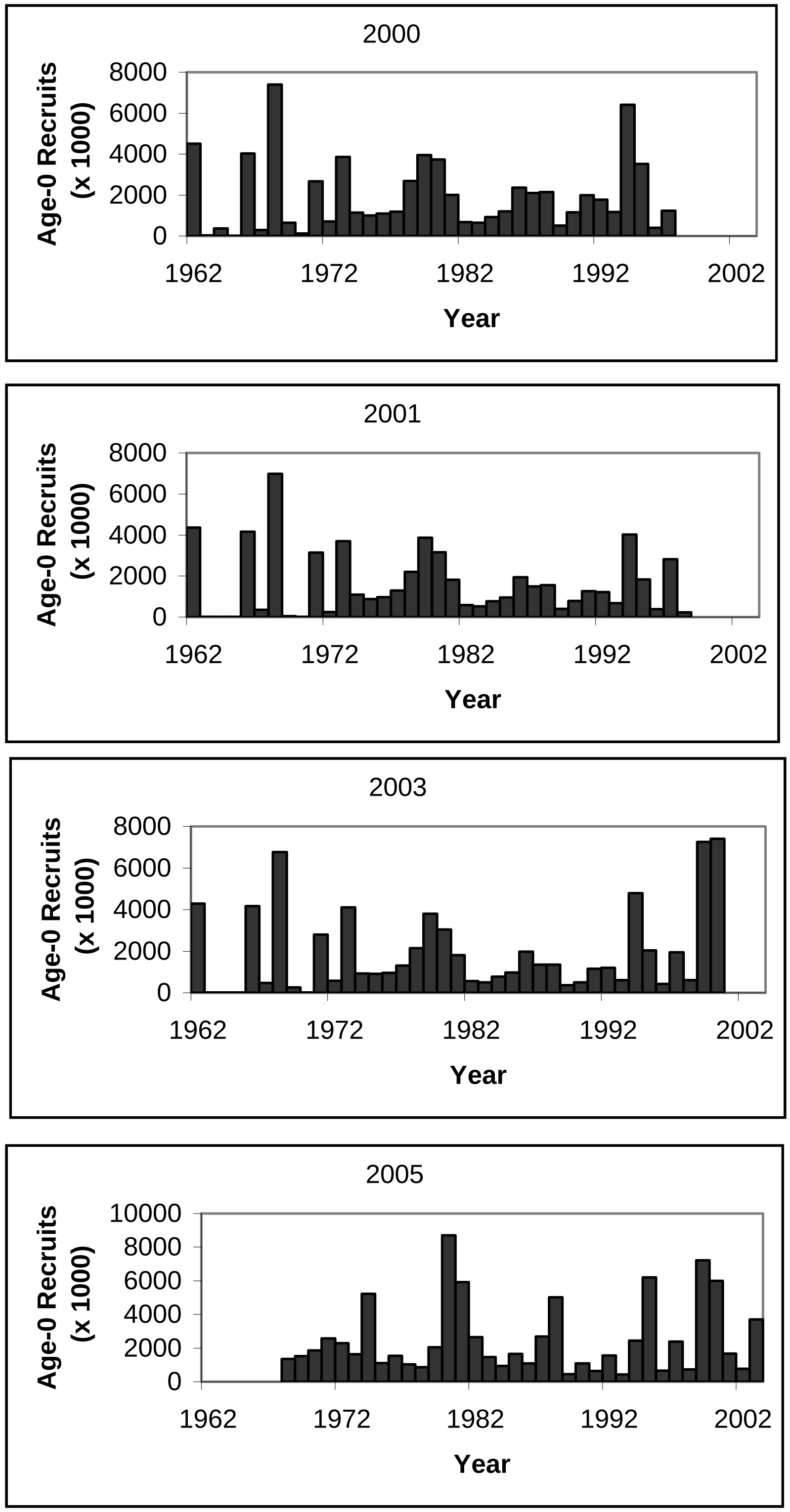

Figure 1. Comparison of recruitments estimated in the three stock assessments for darkblotched rockfish.

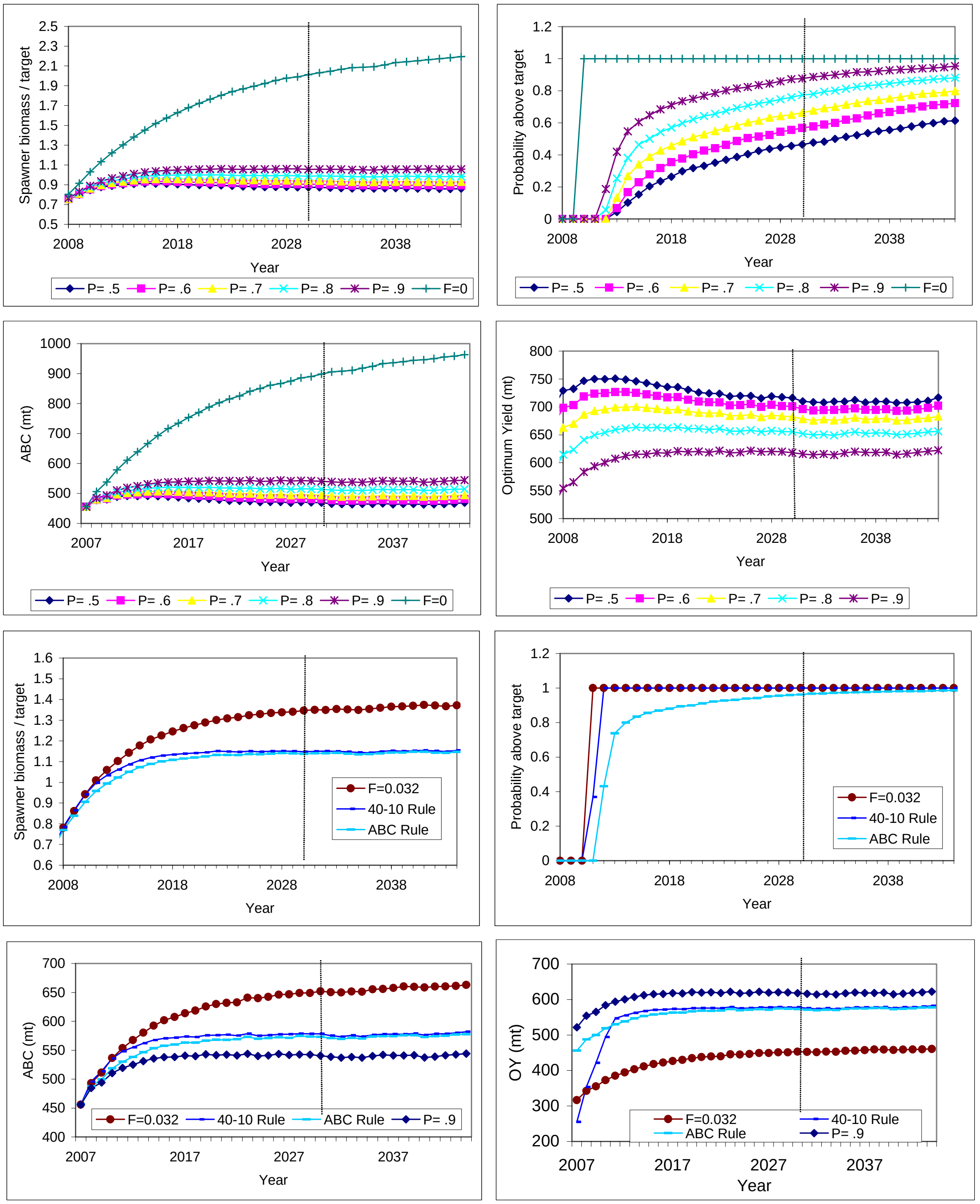

Figure 2. Median time-trajectories for spawning output relative to target level, the probability of being above the target level, the ABC and OY for a set of rebuilding strategies. The vertical dashed line is the year 2030, the target year to rebuild.

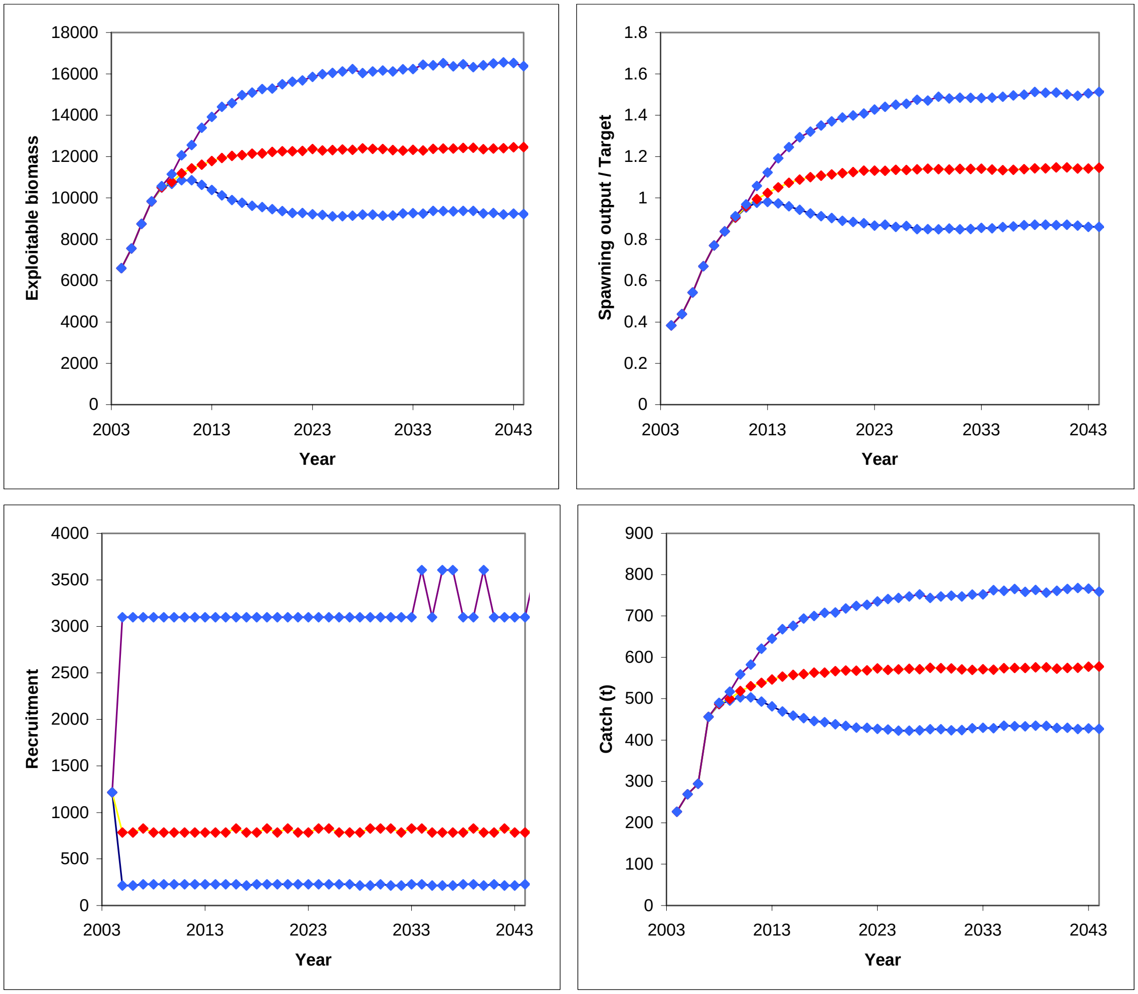

Figure 3. Median and 95% confidence intervals for the ABC harvest strategy, as output by Model A1.

MODEL A1 INPUT FILES

```
#Title
Darkblotched 2005
# Number of sexes
2
# Age range to consider (minimum age; maximum age)
0 75
# Number of fleets
1
# First year of projection
2004
# Year declared overfished
2001
# Is the maximum age a plus-group (1=Yes;2=No)
1
# Generate future recruitments using historical recruitments (1)
historical recruits/spawner (2)  or a stock-recruitment (3)
1
# Constant fishing mortality (1) or constant Catch (2) projections
1
# Fishing mortality based on SPR (1) or actual rate (2)
2
# Pre-specify the year of recovery (or -1) to ignore
-1
# Fecundity-at-age
# 2004 eggs ages 0-75
0.00  0.00  0.00  0.00  0.00  0.04  0.07  0.44  0.78  1.13  1.44  1.71
      1.94  2.14  2.30  2.44  2.55  2.64  2.72  2.78  2.83  2.87  2.90
      2.93  2.95  2.97  2.98  2.99  3.00  3.01  3.01  3.02  3.02  3.02
      3.03  3.03  3.03  3.03  3.03  3.03  3.03  3.03  3.03  3.04  3.04
      3.04  3.04  3.04  3.04  3.04  3.04  3.04  3.04  3.04  3.04  3.04
      3.04  3.04  3.04  3.04  3.04  3.04  3.04  3.04  3.04  3.04  3.04
      3.04  3.04  3.04  3.04  3.04  3.04  3.04  3.04  3.04

# Age specific information (Females then males) weight then selectivity
in 2004
# Females
0.01  0.06  0.16  0.31  0.45  0.59  0.63  0.81  0.91  1.00  1.08  1.14
      1.20  1.24  1.28  1.31  1.34  1.36  1.37  1.39  1.40  1.41  1.41
      1.42  1.42  1.43  1.43  1.43  1.44  1.44  1.44  1.44  1.44  1.44
      1.44  1.44  1.44  1.44  1.44  1.44  1.44  1.44  1.44  1.44  1.44
      1.44  1.44  1.44  1.44  1.44  1.44  1.44  1.44  1.44  1.44  1.44
      1.44  1.44  1.44  1.44  1.44  1.44  1.44  1.44  1.44  1.44  1.44
      1.44  1.44  1.44  1.44  1.44  1.44  1.44  1.44  1.44
0.00  0.00  0.01  0.05  0.24  0.51  0.60  0.85  0.92  0.96  0.98  0.99
      0.99  0.99  1.00  1.00  1.00  1.00  1.00  1.00  1.00  1.00  1.00
      1.00  1.00  1.00  1.00  1.00  1.00  1.00  1.00  1.00  1.00  1.00
      1.00  1.00  1.00  1.00  1.00  1.00  1.00  1.00  1.00  1.00  1.00
      1.00  1.00  1.00  1.00  1.00  1.00  1.00  1.00  1.00  1.00  1.00
      1.00  1.00  1.00  1.00  1.00  1.00  1.00  1.00  1.00  1.00  1.00
      1.00  1.00  1.00  1.00  1.00  1.00  1.00  1.00  1.00
# Males
0.01  0.06  0.16  0.30  0.44  0.55  0.59  0.71  0.77  0.82  0.86  0.89
      0.91  0.93  0.94  0.95  0.96  0.96  0.97  0.97  0.97  0.97  0.98
      0.98  0.98  0.98  0.98  0.98  0.98  0.98  0.98  0.98  0.98  0.98
      0.98  0.98  0.98  0.98  0.98  0.98  0.98  0.98  0.98  0.98  0.98
      0.98  0.98  0.98  0.98  0.98  0.98  0.98  0.98  0.98  0.98  0.98
```

```
      0.98  0.98  0.98  0.98  0.98  0.98  0.98  0.98  0.98  0.98  0.98
      0.98  0.98  0.98  0.98  0.98  0.98  0.98  0.98  0.98
0.00  0.00  0.01  0.05  0.21  0.43  0.50  0.73  0.81  0.86  0.89  0.91
      0.92  0.93  0.94  0.94  0.94  0.95  0.95  0.95  0.95  0.95  0.95
      0.95  0.95  0.95  0.95  0.95  0.95  0.95  0.95  0.95  0.95  0.95
      0.95  0.95  0.95  0.95  0.95  0.95  0.95  0.95  0.95  0.95  0.95
      0.95  0.95  0.95  0.95  0.95  0.95  0.95  0.95  0.95  0.95  0.95
      0.95  0.95  0.95  0.95  0.95  0.95  0.95  0.95  0.95  0.95  0.95
      0.95  0.95  0.95  0.95  0.95  0.95  0.95  0.95  0.95

# M and 2004 age-structure
# Females
0.07  0.07  0.07  0.07  0.07  0.07  0.07  0.07  0.07  0.07  0.07  0.07
      0.07  0.07  0.07  0.07  0.07  0.07  0.07  0.07  0.07  0.07  0.07
      0.07  0.07  0.07  0.07  0.07  0.07  0.07  0.07  0.07  0.07  0.07
      0.07  0.07  0.07  0.07  0.07  0.07  0.07  0.07  0.07  0.07  0.07
      0.07  0.07  0.07  0.07  0.07  0.07  0.07  0.07  0.07  0.07  0.07
      0.07  0.07  0.07  0.07  0.07  0.07  0.07  0.07  0.07  0.07  0.07
      0.07  0.07  0.07  0.07  0.07  0.07  0.07  0.07  0.07
1215  1723  334   677   2256  2481  235   644   148   1120  332   44
      124   39    51    17    143   58    18    21    9     11    16
      28    35    7     2     3     3     2     9     3     3     3
      2     1     1     2     2     2     1     1     1     1     1
      1     1     1     1     0     0     0     0     0     0     0
      0     0     0     0     0     0     0     0     0     0     0
      0     0     0     0     0     0     0     0     1
# Males
0.07  0.07  0.07  0.07  0.07  0.07  0.07  0.07  0.07  0.07  0.07  0.07
      0.07  0.07  0.07  0.07  0.07  0.07  0.07  0.07  0.07  0.07  0.07
      0.07  0.07  0.07  0.07  0.07  0.07  0.07  0.07  0.07  0.07  0.07
      0.07  0.07  0.07  0.07  0.07  0.07  0.07  0.07  0.07  0.07  0.07
      0.07  0.07  0.07  0.07  0.07  0.07  0.07  0.07  0.07  0.07  0.07
      0.07  0.07  0.07  0.07  0.07  0.07  0.07  0.07  0.07  0.07  0.07
      0.07  0.07  0.07  0.07  0.07  0.07  0.07  0.07  0.07
1215  1723  334   677   2255  2483  234   647   149   1133  339   45
      127   40    53    17    148   60    19    22    9     11    16
      30    36    7     3     3     3     2     9     3     3     3
      2     2     1     2     2     2     1     1     1     1     1
      1     1     1     1     0     0     0     0     0     0     0
      0     0     0     0     0     0     0     0     0     0     0
      0     0     0     0     0     0     0     0     1
# 2001 age-structure
836   2795  3133  299   865   202   1538  457   61    171   53    71
      23    197   81    25    29    13    15    22    39    48    9
      3     4     5     3     13    4     4     4     3     2     2
      3     3     2     2     1     1     1     1     1     1     1
      1     1     1     1     1     0     0     0     0     0     0
      0     0     0     0     0     0     0     0     0     0     0
      0     0     0     0     0     0     0     0     1
836   2795  3133  299   865   202   1549  465   62    175   55    73
      24    204   83    26    30    13    16    23    41    50    10
      4     4     5     3     13    4     5     5     3     2     2
      3     3     2     2     2     1     1     1     1     1     1
      1     1     1     1     1     0     0     0     0     0     0
      0     0     0     0     0     0     0     0     0     0     0
      0     0     0     0     0     0     0     0     1
# Year for Tmin Age-structure
```

```
2001
# Number of simulations
1000
#  recruitment and biomass
# Number of historical assessment years
78
# Historical data
# year recruitment spawner in B0 in R project in R/S project
1927  2495  25930 1     0     0
1928  2623  26977 0     0     0
1929  2623  26976 0     0     0
1930  2623  26973 0     0     0
1931  2623  26970 0     0     0
1932  2623  26969 0     0     0
1933  2623  26968 0     0     0
1934  2623  26967 0     0     0
1935  2623  26966 0     0     0
1936  2623  26964 0     0     0
1937  2623  26962 0     0     0
1938  2623  26960 0     0     0
1939  2623  26956 0     0     0
1940  2623  26949 0     0     0
1941  2622  26942 0     0     0
1942  2622  26933 0     0     0
1943  2622  26924 0     0     0
1944  2622  26885 0     0     0
1945  2622  26794 0     0     0
1946  2622  26555 0     0     0
1947  2622  26395 0     0     0
1948  2622  26299 0     0     0
1949  2621  26146 0     0     0
1950  2621  25986 0     0     0
1951  2621  25801 0     0     0
1952  2621  25560 0     0     0
1953  2620  25394 0     0     0
1954  2620  25236 0     0     0
1955  2620  25079 0     0     0
1956  2620  24934 0     0     0
1957  2619  24749 0     0     0
1958  2619  24547 0     0     0
1959  2619  24376 0     0     0
1960  2619  24216 0     0     0
1961  2618  24049 0     0     0
1962  2618  23946 0     0     0
1963  2618  23777 0     0     0
1964  2618  23568 0     0     0
1965  2617  23483 0     0     0
1966  2617  23196 0     0     0
1967  2609  19175 0     0     0
1968  1361  16304 0     0     0
1969  1516  14110 0     0     0
1970  1854  14036 0     0     0
1971  2569  14021 0     0     0
1972  2296  13911 0     0     0
1973  1626  13706 0     0     0
1974  5219  13257 0     0     0
1975  1115  12849 0     0     0
```

```
1976  1547  12567 0     0     0
1977  1037  12294 0     0     0
1978  861   12358 0     0     0
1979  2045  12343 0     0     0
1980  8698  11903 0     0     0
1981  5918  11908 0     0     0
1982  2653  11522 0     1     1
1983  1464  10810 0     1     1
1984  943   10164 0     1     1
1985  1653  9303  0     1     1
1986  1090  8386  0     1     1
1987  2692  8227  0     1     1
1988  5019  7247  0     1     1
1989  455   6627  0     1     1
1990  1087  6090  0     1     1
1991  633   5052  0     1     1
1992  1569  4366  0     1     1
1993  428   4166  0     1     1
1994  2439  3696  0     1     1
1995  6198  3485  0     1     1
1996  650   3280  0     1     1
1997  2385  2985  0     1     1
1998  740   2598  0     1     1
1999  7212  2136  0     1     1
2000  5995  2103  0     1     1
2001  1672  2304  0     1     1
2002  769   2739  0     1     1
2003  3695  3282  0     1     1
2004  2430  3848  0     0     0
# Number of years with pre-specified catches
3
# catches for years with pre-specified catches
2004 227
2005 269
2006 294
# Number of future recruitments to override
0
# Process for overiding (-1 for average otherwise index in data list)
# Which probability to product detailed results for (1=0.5; 2=0.6;
etc.)
9
# Steepness sigma-R Auto-correlation
0.95 0.8 0.00
# Target SPR rate (FMSY Proxy)
0.5
# Target SPR information: Use (1=Yes) and power
0 20
# Discount rate (for cumulative catch)
0.1
# Truncate the series when 0.4B0 is reached (1=Yes)
0
# Set F to FMSY once 0.4B0 is reached (1=Yes)
0
# Percentage of FMSY which defines Ftarget
0.9
# Maximum possible F for projection (-1 to set to FMSY)
2
```

```
# Conduct MacCall transition policy (1=Yes)
0
# Defintion of recovery (1=now only;2=now or before)
2
# Results for rec probs by Tmax (1) or 0.5 prob for various Ttargets
(2)
1
# Definition of the "40-10" rule
10 40
# Produce the risk-reward plots (1=Yes)
0
# Calculate coefficients of variation (1=Yes)
0
# Number of replicates to use
20
# Random number seed
-89102
# Conduct projections for multiple starting values (0=No;else yes)
0
# File with multiple parameter vectors
MCMC.PRJ
# Number of parameter vectors
100
# User-specific projection (1=Yes); Output replaced (1->6)
1 6 0 0.5
# Catches and Fs (Year; 1/2 (F or C); value); Final row is -1
2007 1 0.032
2008 1 0.032
2009 1 0.032
2010 1 0.032
2011 1 0.032
2012 1 0.032
2013 1 0.032
2014 1 0.032
2015 1 0.032
2016 1 0.032
2017 1 0.032
-1 -1 -1
# Split of Fs
2004 1
-1 1
# Time varying weight-at-age (1=Yes;0=No)
0
# File with time series of weight-at-age data
Fecwt.csv
```

Glossary for Terms Used in this Document

ABC	Allowable Biological Catch
B_0	Population spawning output in the unfished state
B_{MSY}	Population spawning output that can support MSY
B40%	Proxy for $B_{MSY} = 0.40*B_0$
F_{MSY}	Fishing mortality rate which will achieve MSY
F50%	Proxy for F_{MSY}
Harvest Control Rule	Fishing mortality rate applied to the exploitable biomass to determine the OY
Mean Generation Time	Time required for a female to reproduce a reproductive female offspring Sum (age x spawn x survival - for each age)/ sum(spawn x survival - for each age)
MSY	Maximum sustained yield
OY	Optimum Yield -the desired fishery catch in a given year
P_0	The probability of rebuilding by TMAX that was selected as policy by the council
$P_{CURRENT}$	The forecast probability of rebuilding within T_{MAX} given the existing harvest rate.
P_{MAX}	Probability that stock will rebuild by T_{MAX}
Spawning Output	Fecundity output by the females in the population (#age*%mature*fecundity)
T_{MAX}	Maximum allowable rebuilding time (T_{MIN} if T_{MIN} is <= 10, otherwise, T_{MIN} + generation time)
T_{MED}	Median year to rebuild given the selected probability of rebuilding by $T_{MAX)}$
T_{MIN}	Time needed to rebuild in the absence of fishing (beginning with the year the stock was declared overfished)
T_{TARGET}	Time needed to have at least 50% probability of rebuilding within T_{MAX} (often median year to rebuild given the selected probability of rebuilding by $T_{MAX)}$

Rebuilding Update for Pacific Ocean Perch

October 6, 2005

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1. Introduction

The Pacific Fishery Management Council (PFMC) adopted Amendment 11 to its Groundfish Management Plan in 1998. This amendment established a definition for an overfished stock of 25% of the unfished spawning biomass ($0.25B_0$). NMFS determined that a rebuilding plan was required for Pacific ocean perch (*Sebastes alutus*) in March 1999 based on the most recent stock assessment at that time (Ianelli and Zimmerman, 1998). The PFMC began developing a rebuilding plan for Pacific ocean perch (based upon a rebuilding analysis; August 1999; A. MacCall, pers. comm.) and submitted this plan to NMFS in February 2000. However, NMFS deferred adoption of the plan until the stock assessment was updated and reviewed, which was later that year (Ianelli *et al.*, 2000). Punt (2002) conducted a rebuilding analysis for Pacific ocean perch based on the stock assessment conducted by Ianelli *et a*l. (2000) that was consistent with the Terms of Reference for rebuilding analyses developed by the PFMC SSC (SSC, 2001; revised in 2005).

A new stock assessment for Pacific ocean perch stock was conducted in 2003 (Hamel *et al*., 2003), and updated in 2005 (Hamel, 2005). This assessment, similar to that of Ianelli *et al*. (2000), involved fitting an age-structured population dynamics model to catch, catch-rate, length-frequency, age-composition, and survey data. Ianelli *et al*. (2000), Hamel *et al*. (2003), and Hamel (2005) present results based on maximum likelihood and Bayesian estimation frameworks. A rebuilding analysis was conducted by Punt (2002), based upon the estimates corresponding to the maximum of the posterior density function (the MPD estimates) from Model 1c of Ianelli *et al*. (2000) because the STAR panel that evaluated the 2000 Pacific Ocean perch stock assessment selected this model variant as the “best assessment” (PFMC, 2000). In contrast, the STAR panel that evaluated the 2003 assessment of Pacific ocean perch endorsed both the MPD estimates and the distributions for the model outputs that arose from the application of the MCMC algorithm to sample equally likely parameter vectors from the posterior distribution (PFMC, 2003). Punt et al. (2003) conducted a rebuilding analysis with runs based upon both the MPD estimates and the MCMC outputs. The council adopted a rebuilding plan based upon the results of the MCMC analysis (sampling from the full Bayesian posterior). For this update to the previous rebuilding analysis for Pacific ocean perch, selections are taken to be the same as those on which the rebuilding analysis conducted by Punt et al. (2005) was based. Analyses using the MPD estimates are conducted for comparison.

2. Specifications

2.1 Selection of B_0

It is common to define B_0 in terms of the recruitment in the first years of the assessment period. However, this rebuilding analysis and those of Punt (2002) and Punt et al. (2003) determines B_0 from the fitted stock-recruitment relationship because this seems inherently more consistent with the assumptions underlying the original stock assessment. The MPD estimate of B_0 is 37,838 units of spawning output[1] while the posterior median and 90% intervals for B_0 are 35,371 and (28,022; 44,866). These values for B_0 are slightly lower than those on which the previous rebuilding analysis was based (MPD: 39,198, posterior: 37,230 (29,035; 47,393)). The MPD estimate of the depletion of the spawning output at the start of 2005 is 0.234 (2003: 0.254) while the posterior median and 90% intervals are 0.276 (0.198; 0.371) (2003: 0.277 (0.201; 0.384)).

2.2 Generation of future recruitment

Recruitment in the assessment and projection models for Pacific ocean perch relate to the abundance of animals aged 3 years. The assessment of Pacific ocean perch by Hamel *et al*. (2003) and its update

[1] Spawning output is defined in terms of mt of mature females.

(Hamel, 2005) both include the assumption that, *apriori*, recruitment is related to spawning output according to a Beverton-Holt stock-recruitment relationship. The rebuilding analysis conducted by Punt et al. (2003) included three approaches: basing the projections on resampling historical recruitments or from those for the years 1965-2001, basing the projections on resampling historical recruits per spawner for those same years, or assuming a Beverton-Holt spawner recruit relationship. The first approach was chosen by the council for the final rebuilding plan.

Figure 1 plots the MPD estimates of recruitment and recruits / spawning output from the assessments conducted by Hamel *et al*. (2003) and Hamel (2005). The rationale for generating future recruitment by sampling historical recruitment for rebuilding analysis conducted by Punt (2002) was that 1965-1998 was a period of relative stability in recruitment. In contrast to recruitment, recruits / spawning output showed an increasing trend over time. The situation is now slightly more complicated because there is no longer an obvious increasing trend in recruits / spawning output with time for either the 2003 or 2005 assessments, nor are the recruitments completely stable. In keeping with the previous decision, resampling historical recruitment (now from the years 1965-2003) is used exclusively for the analyses in this document. Hamel (2005) estimated steepness for Pacific ocean perch to be 0.55.

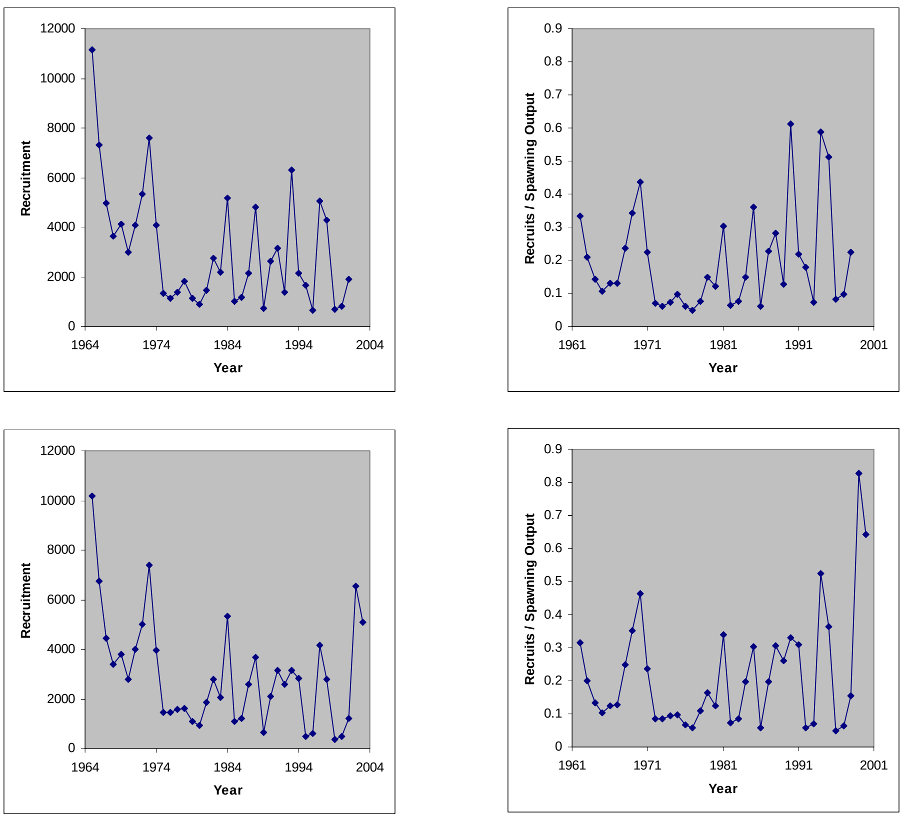

Figure 1: Recruitment and recruits per spawner for assessments of Pacific ocean perch conducted in 2003 and 2005 (upper and lower panels respectively).

2.3 Mean generation time

The mean generation time is defined as the mean age weighted by net spawning output (see Figure 2 for a plot of net spawning output *versus* age based on the MPD estimates). The best estimate of the mean generation time for the full posterior is 28 years, and for the MPD it is 29 years. These are unchanged from the 2003 rebuilding analysis.

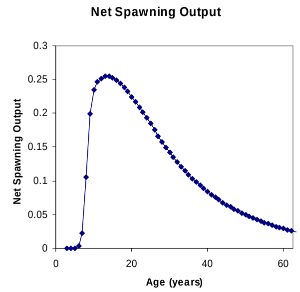

Figure 2: MPD relationship between net spawning output and age for Pacific Ocean perch.

2.4 The harvest strategies

Table 1 summarizes those options considered in the analyses of this paper. These include calculating the probability of rebuilding by T_{target} and T_{max} from the last rebuilding analysis or by a recalculated T_{max} assuming the same rebuild SPR as in the previous analysis (cases 1, 3, and 5). The rebuild SPR of 0.696 was calculated from the rebuild fishing mortality of 0.0257 computed by Punt et al. (2003) and other biological parameters from the 2003. Cases 2, 4, and 6 involve recalculating the SPR given a 50% probability of rebuilding by T_{target} or a 70% probability of rebuilding by T_{max}. Case 7 estimates the probability of rebuilding by the previous T_{max} given that the catch series adopted by the council following the 2003 rebuilding analysis is continued. Case 8 uses the median catch series from case 4. These 8 cases are also explored using the MPD results for comparison.

Table 1: Harvest strategy options considered in this document.

Case	Future recruitment	T_{max}	$SPR_{rebuild}$	P_{max}
1	Recruits	2026	0.696	Re-estimated
2	Recruits	2026	Re-estimated	0.5
3	Recruits	2042	0.696	Re-estimated
4	Recruits	2042	Re-estimated	0.7
5	Recruits	Re-estimated	0.696	Re-estimated
6	Recruits	Re-estimated	Re-estimated	0.7
7	Recruits	2042	2003 catch series	Re-estimated
8	Recruits	2042	Case 4 catch series	Re-estimated

2.5 Other specifications

The calculations of this document were performed using Version 2.8 of the rebuilding software developed by Punt (2005) and the results are based on 1,000 Monte Carlo replicates (analyses based on the MPD estimates) and 3,000 Monte Carlo replicates (analyses based on 1,000 random samples from the full Bayesian posterior distribution). The selection of 1,000 replicates is based on the evaluation of Monte Carlo precision conducted by Punt (2002). The analyses based on full posterior distribution involve 3 simulations for each of 1,000 samples for the posterior.

The definition of “recovery by year *y*” in this analysis is that the spawning output reaches $0.4B_0$ by year *y* (even if it subsequently drops below this level due to recruitment variability). Appendix 1 lists the MPD estimates for the biological and technological parameters and the age-structure of the population at the start of 2000 / 2005, while Appendix 2 lists the MPD time-series of recruitment and spawning output. The input to the rebuilding program for cases 3 and 4 is given as Appendix 3. The catch for 2005 and 2006 were set to 447 mt (the Council-selected *OYs* for 2005-2006).

3. Results

3.1 Time-to-recovery

Figure 3 shows the distribution for the number of years beyond the year 2000 that it would have taken to recover to $0.4B_0$ had there been no harvest since 2000. Results are shown for analyses based on the MPD estimates (left panel) and the full Bayesian posterior (right panel). As expected, the distribution based on the full Bayesian posterior has a much longer tail than that based on the MPD estimates. The median time to recover to 0.4 B_0 in the absence of catches with 50% probability is termed $T_{\min}$. The values for $T_{\min}$ (15 and 19 years respectively for the full Bayesian and MPD results) are greater than the value of $T_{\min}$ from the previous rebuilding analysis (14 and 17 years respectively). If $T_{\max}$ is determined using the new information on the depletion level and the age-structure of the population in 2000, it changes only slightly from 2042 to 2043 if the calculations are based on the full Bayesian estimates but increases to 2048 if the calculations are based on the MPD results.

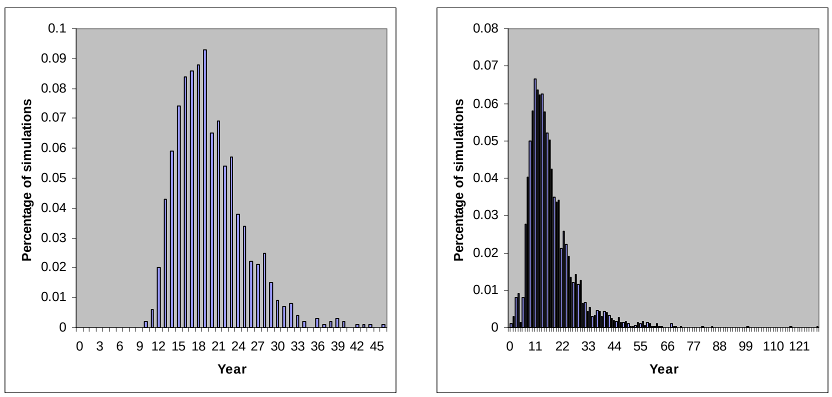

Figure 3: Time to recover to $0.4B_0$ in the absence of catches from 2000 on for the base-case analysis. The results based on the MPD estimates are shown in the left panel and those based on full Bayesian posterior in the right panel.

3.2 OYs and fishing mortalities

Table 2 gives summary statistics from the 2003 rebuilding plan and the current analysis for full posterior and MPD results. Tables 3 and 4 list some key output statistics for six rebuild strategies (probabilities of recovery in the maximum allowable rebuild period of 0.5, 0.7, the 40-10 rule, the ABC rule, the strategy of setting SPR from 2007 equal to 0.696, and going forward with the chosen strategy from the previous rebuilding analysis). Table 3 lists results based on the full Bayesian posterior. Results are shown for each of the analysis options outlined in Table 1. Table 4 lists results based on the MPD estimates.

Table 2: Summary statistics.

Case	2003	Bayesian	MPD
Year in which rebuilding commenced	2000	2000	2000
Present year	2003	2005	2005
Tmin	14 years	15 years	19 years
Mean generation time	28 years	28 years	29 years
Tmax	2042	2043	2048

Table 3: Five management-related quantities for various rebuild strategies for the projections based on the full posterior distribution.

Scenario / Quantity	*Rebuild Strategy*				
	P_{max}=0.5	Defined	P_{max}=0.7	40-10 rule	ABC rule
2003 Rebuilding analysis (T_{max}=2042)					
Fishing mortality rate			0.0257		
SPR			0.696		0.500
OY_{2004} (mt)			443.6	612.6	979.9
P_{max}			70.1	38.9	27.9
T_{target}			2026.4	N/A	N/A
Cases 1/2 (T_{max}=2026)					
Fishing mortality rate	0.0304				
SPR	0.633	0.696			0.500
OY_{2007} (mt)	521.7	397.0		514.5	900.0
P_{max}	50.0	59.7		34.2	26.7
T_{target}	2026.0	2021.4		N/A	N/A
Cases 3/4 (T_{max}=2042)					
Fishing mortality rate			0.0290		
SPR		0.696	0.644		0.500
OY_{2007} (mt)		397.0	498.1	514.5	900.0
P_{max}		78.2	70.0	48.5	38.0
T_{target}		2021.4	2025.0	N/A	N/A
Cases 5/6 (T_{max}=2043)					
Fishing mortality rate			0.0295		
SPR		0.696	0.640		0.500
OY_{2007} (mt)		397.0	505.9	514.5	900.0
P_{max}		78.9	70.0	49.0	38.6
T_{target}		2021.4	2025.4	N/A	N/A
Cases 7/8 (T_{max}=2042)					
Fishing mortality rate					
SPR		N/A	N/A		
OY_{2007} (mt)		449.0	498.0		
P_{max}		74.3	68.2		
T_{target}		2021.3	2024.8		

4. Selection of a preferred variant

The Council interim choice for P_{max} is 70%. The 2007 OYs in Tables 3 and 4, based upon either this P_{max} or the previous SPR, range from 356 to 506 mt. Table 5 shows 10 year projections for the 6 requested runs (Cases 1-6). The 2007 OY from the previous adopted rebuilding plan is 449 mt, within the range of the current estimates. Appendix 4 lists the annual catches (2007+) for five of the harvest strategies in Tables 3 and 4, for cases 3, 4, and 7, including the Pmax = 0.7, the 2003 catch series, SPR = 0.696, the 40-10 rule and the ABC rule. Appendix 5 lists the annual median spawning output for those five rebuilding strategies. Appendix 6 lists the annual median spawning output relative to B_{40} for the five rebuilding strategies. Appendix 7 lists the annual median ABC for the five rebuilding strategies.

Table 4: Five management-related quantities for various rebuild strategies for the projections based on the MPD estimates

Scenario / Quantity	*Rebuild Strategy*				
	P_{max}=0.5	Defined	P_{max}=0.7	40-10 rule	ABC rule
2003 Rebuilding analysis (T_{max}=2042)					
Fishing mortality rate			0.0218		
SPR			0.0731		0.500
OY_{2004} (mt)			334.7	449.3	840.5
P_{max}			69.9	12.2	2.0
T_{target}			2031.6	N/A	N/A
Cases 1/2 (T_{max}=2026)					
Fishing mortality rate	0.0149				
SPR	0.783	0.696			0.500
OY_{2007} (mt)	230.2	356.4		449.3	840.5
P_{max}	50.0	27.9		4.4	0.7
T_{target}	2026.0	2032.6		N/A	N/A
Cases 3/4 (T_{max}=2042)					
Fishing mortality rate			0.0231		
SPR		0.696	0.696		0.500
OY_{2007} (mt)		356.4	356.5	449.3	840.5
P_{max}		70.1	70.0	14.2	4.5
T_{target}		2032.6	2032.6	N/A	N/A
Cases 5/6 (T_{max}=2048)					
Fishing mortality rate			0.0256		
SPR		0.696	0.673		0.500
OY_{2007} (mt)		356.4	394.2	449.3	840.5
P_{max}		78.1	70.0	17.9	6.0
T_{target}		2032.6	2035.6	N/A	N/A
Case 7 (T_{max}=2042)					
Fishing mortality rate					
SPR		N/A	N/A		
OY_{2007} (mt)		449.0	357.0		
P_{max}		57.6	67.9		
T_{target}		2037.5	2032.3		

Figures 5 and 6 contrast the time-trajectory of the probability of recovery and of catch for 5 rebuild strategies, with T_{max} = 2042: Probability of recovery equals 0.7, the 2003 rebuilding plan catch series, zero catch, the 40-10 rule and the ABC rule. Figure 5 shows the results based upon the full Bayesian posterior, and Figure 6 shows the results based upon the MPD figures.

Table 5: Ten year catch/OY projections for the six requested runs.

Year	Run 1	Run 2	Run 3	Run 4	Run 5	Run 6
P	0.597	0.5	0.782	0.7	0.789	0.7
SPR	0.696	0.633	0.696	0.644	0.696	0.640
F	0.0231	0.0304	0.0231	0.0290	0.0231	0.0295
T_{max}			**2042**	**2042**	**2043**	**2043**
T_{target}	**2026**	**2026**	2021	2025	2021	2025
2007	397	522	397	498	397	506
2008	412	538	412	514	412	522
2009	431	561	431	536	431	544
2010	455	588	455	564	455	572
2011	473	609	473	583	473	591
2012	482	617	482	592	482	600
2013	488	621	488	597	488	605
2014	498	633	498	608	498	616
2015	508	643	508	618	508	626
2016	519	655	519	630	519	638

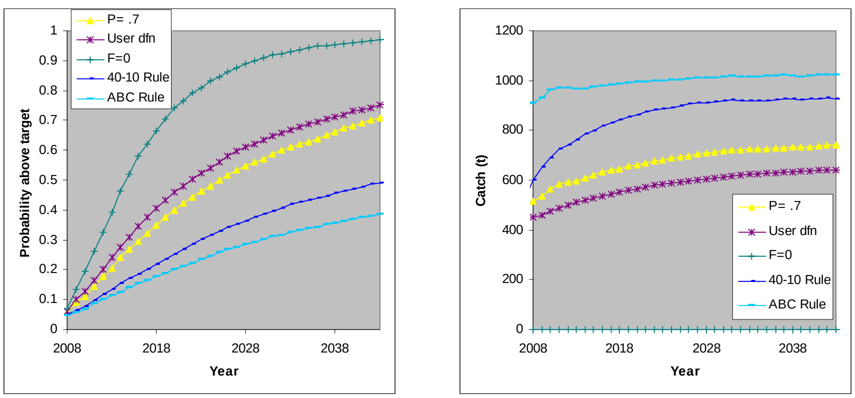

Figure 5: Time trajectories of the probability of recovery and catch for five rebuild strategies by T_{max} = 2042 based upon the full Bayesian posterior.

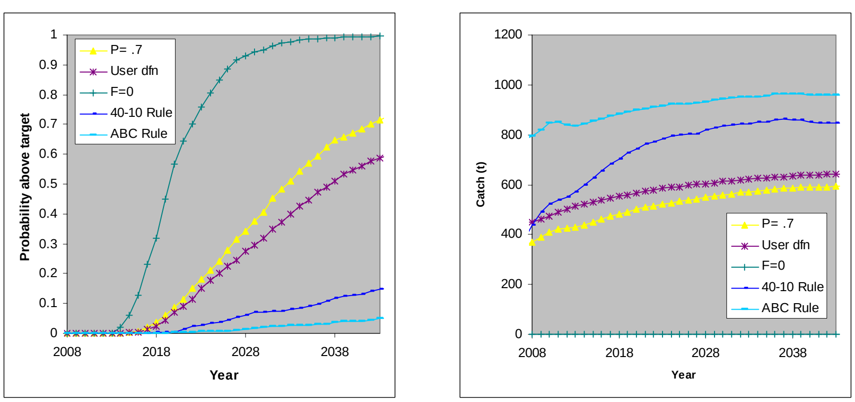

Figure 6: Time trajectories of the probability of recovery and catch for five rebuild strategies by T_{max} = 2042 based upon the MPD results.

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Appendix 1 : Biological and technological parameters used for the rebuilding analyses based on the MPD estimates.

Age	Fecundity	Weight (kg)	Selectivity	Natural mortality	*N* (2000)	*N* (2005)
3	0.000	0.169	0.001	0.0514	490	1385
4	0.000	0.241	0.003	0.0514	353	1316
5	0.000	0.317	0.012	0.0514	2511	4595
6	0.004	0.396	0.048	0.0514	3578	5608
7	0.028	0.474	0.163	0.0514	479	981
8	0.137	0.550	0.383	0.0514	384	378
9	0.274	0.622	0.598	0.0514	2028	271
10	0.339	0.690	0.810	0.0514	2071	1917
11	0.375	0.752	1.000	0.0514	1554	2703
12	0.404	0.809	0.992	0.0514	1697	357
13	0.431	0.861	0.933	0.0514	1006	283
14	0.454	0.908	0.860	0.0514	269	1480
15	0.475	0.950	0.860	0.0514	1360	1503
16	0.494	0.987	0.860	0.0514	842	1127
17	0.510	1.021	0.860	0.0514	344	1233
18	0.525	1.050	0.860	0.0514	270	733
19	0.538	1.076	0.860	0.0514	1143	196
20	0.550	1.099	0.860	0.0514	386	992
21	0.560	1.119	0.860	0.0514	464	614
22	0.569	1.137	0.860	0.0514	268	251
23	0.576	1.153	0.860	0.0514	118	197
24	0.583	1.166	0.860	0.0514	122	834
25+	0.589	1.178	0.860	0.0514	3405	3475

Appendix 2 : MPD historical series of spawning output and recruitment.

Year	Recruitment (age 3)	Spawning output
1956	3701	33537
1957	46180	32332
1958	4026	31204
1959	18498	30754
1960	8784	30435
1961	4151	30558
1962	3554	32282
1963	4872	33901
1964	14223	33527
1965	10177	33191
1966	6753	30670
1967	4433	21919
1968	3381	16088
1969	3795	14210
1970	2783	15892
1971	3984	16714
1972	4994	17089
1973	7387	17255
1974	3967	16928
1975	1468	16669
1976	1460	16736
1977	1586	16708
1978	1636	17112
1979	1108	16983
1980	938	16470
1981	1855	15632
1982	2803	14828
1983	2046	14243
1984	5319	13121
1985	1096	12094
1986	1215	11228
1987	2593	10597
1988	3660	10254
1989	635	9921
1990	2100	9527
1991	3152	9139
1992	2583	8592
1993	3133	8365
1994	2837	7970
1995	501	7652
1996	591	7578
1997	4178	7607
1998	2784	7763
1999	372	7902
2000	490	7925
2001	1206	8012
2002	6543	8222
2003	5093	8640
2004	1385	8846
2005	1385	8846

Appendix 3 : The input file for the base-case rebuilding analysis

```
#Title
POP Re2005
# Number of sexes
1
# Age range to consider (minimum age; maximum age)
3 25
# Number of fleets
1
# First year of projection
2005
# Year declared overfished
2000
# Is the maximum age a plus-group (1=Yes;2=No)
1
# Generate future recruitments using historical recruitments (1)  historical recruits/spawner (2)  or a stock-recruitment (3)
1
# Constant fishing mortality (1) or constant Catch (2) projections
1
# Fishing mortality based on SPR (1) or actual rate (2)
1
# Pre-specify the year of recovery (or -1) to ignore
35
# Fecundity-at-age
# 3 4 5 6 7 8 9 10 11 12 13 14 15 16 17 18 19 20 21 22 23 24 25
3.84E-06 4.03E-05 0.000392248 0.003560962 0.028260766 0.1374925 0.273954602 0.338584679 0.375081501 0.404469053 0.430553194
0.453991276 0.4749965 0.493739 0.510395 0.52515 0.53818 0.549655 0.559745 0.568595 0.576345 0.58313 0.589055
# Age specific information (Females then males) weight  selectivity
0.169105 0.240603 0.317273 0.395966 0.474162 0.54997 0.62206 0.689572 0.752022 0.80921 0.861146 0.907988 0.949993 0.987478 1.02079 1.0503
1.07636 1.09931 1.11949 1.13719 1.15269 1.16626 1.17811
        0.000903593     0.003300729     0.012388376     0.047593441     0.163229009     0.382540283
        0.598099334     0.809628096     1       0.991963314     0.932527674     0.860131135     0.860131135
        0.860131135     0.860131135     0.860131135     0.860131135     0.860131135     0.860131135
        0.860131135     0.860131135     0.860131135     0.860131135
# M and current age-structure
0.0513825 0.0513825 0.0513825 0.0513825 0.0513825 0.0513825 0.0513825 0.0513825 0.0513825 0.0513825 0.0513825 0.0513825 0.0513825
        0.0513825 0.0513825 0.0513825 0.0513825 0.0513825 0.0513825 0.0513825 0.0513825 0.0513825 0.0513825
1385.26 1315.86 4595.37 5607.68 981.432 378.161 271.302 1916.72 2703.19 357.442 282.7   1480.32 1503.2
        1126.99 1233.43 733.158 195.904 991.757 614.288 250.854 197.062 833.566 3475.15
# Age-structure at declaration
        490.092 353.044 2511.34 3578.08 479.42  383.831 2028.39 2071.01 1553.79 1696.58 1006.08 268.582
        1359.69 842.181 343.918 270.169 1142.81 385.819 464.475 268.23  118.46  122.402 3405
# Year for Tmin Age-structure
2000
# Number of simulations
3000
#  recruitment and biomass
# Number of historical assessment years
51
# Historical data
# year recruitment spawner in B0 in R project in R/S project
1955    4917.35 37837.7 1       0       0
1956    3701.21 33536.7 0       0       0
1957    46180.4 32331.7 0       0       0
1958    4025.69 31204   0       0       0
1959    18497.7 30753.6 0       0       1
1960    8784.3  30435.3 0       0       1
1961    4150.88 30557.9 0       0       1
1962    3553.65 32281.5 0       0       1
1963    4871.81 33900.7 0       0       1
1964    14222.6 33527.1 0       0       1
1965    10177   33191.1 0       1       1
1966    6752.62 30670.1 0       1       1
1967    4433.1  21918.6 0       1       1
1968    3381.03 16087.5 0       1       1
1969    3795.42 14209.6 0       1       1
1970    2783.04 15892.2 0       1       1
1971    3984.48 16713.8 0       1       1
1972    4994.01 17089   0       1       1
1973    7386.61 17255.1 0       1       1
1974    3966.51 16928.4 0       1       1
```

1975	1467.6	16669.2	0	1	1
1976	1459.93	16735.7	0	1	1
1977	1585.72	16707.5	0	1	1
1978	1636.11	17112.3	0	1	1
1979	1107.56	16982.5	0	1	1
1980	937.97	16469.5	0	1	1
1981	1854.81	15631.7	0	1	1
1982	2802.99	14828.1	0	1	1
1983	2046.46	14242.8	0	1	1
1984	5318.98	13120.6	0	1	1
1985	1096.11	12093.5	0	1	1
1986	1214.67	11228	0	1	1
1987	2592.61	10596.6	0	1	1
1988	3660.31	10253.9	0	1	1
1989	634.96	9920.8	0	1	1
1990	2100.48	9527.23	0	1	1
1991	3152.13	9138.56	0	1	1
1992	2582.58	8591.56	0	1	1
1993	3132.81	8365.16	0	1	1
1994	2836.94	7969.99	0	1	1
1995	501.47	7652.18	0	1	1
1996	590.583	7577.77	0	1	1
1997	4177.68	7607.47	0	1	1
1998	2783.69	7762.58	0	1	1
1999	371.673	7901.71	0	1	1
2000	490.092	7925.14	0	1	1
2001	1206.17	8012.21	0	1	1
2002	6543.38	8221.56	0	1	1
2003	5092.95	8639.65	0	1	1
2004	1385.26	8846.15	0	0	0
2005	1385.26	8845.86	0	0	0

```
# Number of years with pre-specified catches
2
# catches for years with pre-specified catches
2005	447
2006	447
# Number of future recruitments to override
0
# Process for overriding (-1 for average otherwise index in data list)
# Which probability to product detailed results for (1=0.5; 2=0.6; etc.)
3
# Steepness sigma-R Auto-correlation
0.550651	1	0
# Target SPR rate (FMSY Proxy)
0.5
# Target SPR information: Use (1=Yes) and power
0	20
# Discount rate (for cumulative catch)
0.1
# Truncate the series when 0.4B0 is reached (1=Yes)
0
# Set F to FMSY once 0.4B0 is reached (1=Yes)
0
# Percentage of FMSY which defines Ftarget
0.9
# Maximum possible F for projection (-1 to set to FMSY)
-1
# Conduct MacCall transition policy (1=Yes)
0
# Definition of recovery (1=now only;2=now or before)
2
# Results for rec probs by Tmax (1) or 0.5 prob for various Ttargets (2)
1
"# Definition of the ""40-10"" rule"
10	40
# Produce the risk-reward plots (1=Yes)
0
# Calculate coefficients of variation (1=Yes)
0
# Number of replicates to use
10
# Random number seed
```

```
-99004
# Conduct projections for multiple starting values (0=No;else yes)
1
# File with multiple parameter vectors
mcmcreb.dat
# Number of parameter vectors
1000
# User-specific projection (1=Yes); Output replaced (1->9)
1	5	0	0.1
# Catches and Fs (Year; 1/2/3 (F or C or SPR); value); Final row is -1
2007	3	0.696
-1	-1	-1
# Split of Fs
2005	1
-1	1
# Time varying weight-at-age (1=Yes;0=No)
0
# File with time series of weight-at-age data
HakWght.Csv
```

Appendix 4 : Median annual catches (mt) for five rebuilding strategies.

(a) Projections based on the full posterior estimates; Future recruitment = recruits

Year	Prob=0.7	2003 Prj	SPR=0.696	40-10 rule	ABC rule
2007	498	449	397	514	900
2008	514	450	412	599	911
2009	536	460	431	654	931
2010	564	474	455	689	961
2011	583	488	473	724	970
2012	592	500	482	741	972
2013	597	512	488	762	967
2014	608	521	498	784	967
2015	618	529	508	797	973
2016	630	537	519	817	977
2017	638	544	528	828	981
2018	645	553	535	841	986
2019	655	559	545	855	990
2020	661	565	551	861	994
2021	668	572	558	873	995
2022	678	578	566	880	998
2023	682	584	572	886	999
2024	688	588	578	892	1001
2025	693	591	583	899	1005
2026	698	596	588	904	1007
2027	704	601	593	911	1012
2028	709	604	599	911	1010
2029	712	607	603	915	1013
2030	715	613	607	918	1014
2031	719	616	609	920	1017
2032	720	619	612	918	1017
2033	724	624	615	918	1017
2034	724	626	616	919	1015
2035	726	628	619	919	1020
2036	728	630	621	922	1020
2037	730	632	623	926	1023
2038	733	634	625	925	1019
2039	733	637	626	922	1016
2040	734	637	627	928	1017
2041	737	639	630	925	1022
2042	740	641	632	931	1021
2043	742	642	633	927	1022
2044	741	642	634	926	1024
2045	741	644	634	929	1019
2046	745	644	638	929	1025
2047	746	647	639	928	1026
2048	747	646	641	921	1022
2049	746	647	640	926	1022
2050	746	649	640	926	1023

(b) Projections based on the MPD estimates; Future recruitment = recruits

Year	Prob=0.7	2003 Prj	SPR=0.696	40-10 rule	ABC rule
2007	357	449	356	370	780
2008	370	450	370	437	793
2009	390	460	390	490	818
2010	411	474	411	521	846
2011	422	488	422	537	851
2012	425	500	425	550	841
2013	429	512	429	569	835
2014	439	521	439	599	842
2015	450	529	450	626	853
2016	461	537	461	653	864
2017	472	544	472	680	874
2018	483	553	482	702	884
2019	491	559	491	727	893
2020	501	565	501	743	898
2021	508	572	508	761	903
2022	514	578	514	771	912
2023	522	584	522	784	915
2024	528	588	527	793	922
2025	534	591	534	798	922
2026	538	596	538	801	923
2027	542	601	542	804	928
2028	549	604	549	817	933
2029	554	607	554	825	938
2030	558	613	557	834	944
2031	562	616	562	840	948
2032	569	619	568	842	951
2033	571	624	571	843	950
2034	574	626	574	850	952
2035	577	628	577	853	956
2036	582	630	582	858	963
2037	586	632	585	863	962
2038	588	634	588	860	963
2039	590	637	590	858	962
2040	589	637	589	851	959
2041	590	639	590	847	960
2042	591	641	590	849	958
2043	593	642	592	847	958
2044	594	642	594	849	959
2045	595	644	595	853	960
2046	598	644	598	858	961
2047	600	647	600	851	962
2048	599	646	599	854	965
2049	603	647	602	852	965
2050	603	649	603	852	963

Appendix 5 : Time trajectories of median spawning output for five rebuilding strategies.

(a) Projections based on the full posterior estimates; Future recruitment = recruits

Year	Prob=0.7	2003 Prj	SPR=0.696	40-10 rule	ABC rule
2007	9775	9775	9775	9775	9775
2008	10469	10500	10518	10444	10258
2009	10892	10934	10989	10830	10490
2010	11092	11183	11244	10931	10489
2011	11328	11460	11528	11119	10533
2012	11581	11755	11832	11255	10598
2013	11776	12010	12078	11382	10637
2014	12003	12276	12366	11505	10678
2015	12226	12544	12620	11630	10714
2016	12413	12786	12857	11692	10757
2017	12571	12956	13051	11853	10815
2018	12747	13139	13258	11919	10884
2019	12912	13358	13474	12025	10982
2020	13109	13580	13706	12095	10988
2021	13210	13749	13841	12158	11019
2022	13332	13900	14004	12204	11074
2023	13436	14054	14159	12275	11127
2024	13553	14215	14274	12311	11155
2025	13676	14347	14430	12364	11207
2026	13797	14453	14590	12386	11212
2027	13906	14585	14729	12424	11232
2028	13984	14727	14839	12453	11258
2029	14030	14829	14901	12424	11253
2030	14060	14921	14946	12453	11234
2031	14136	15008	15034	12447	11233
2032	14210	15097	15117	12475	11249
2033	14279	15147	15208	12503	11263
2034	14305	15196	15266	12536	11314
2035	14319	15247	15319	12544	11340
2036	14385	15297	15355	12512	11360
2037	14415	15372	15410	12536	11350
2038	14458	15425	15462	12550	11342
2039	14529	15450	15561	12575	11373
2040	14551	15488	15591	12569	11383
2041	14568	15545	15611	12542	11373
2042	14587	15595	15657	12496	11341
2043	14593	15636	15676	12512	11362
2044	14604	15667	15696	12515	11378
2045	14604	15684	15689	12512	11357
2046	14637	15710	15726	12520	11386
2047	14650	15663	15739	12539	11417
2048	14703	15770	15800	12553	11394
2049	14672	15789	15780	12541	11387
2050	14691	15773	15806	12551	11391

(b) Projections based on the MPD estimates; Future recruitment = recruits

Year	Prob=0.7	2003 Prj	SPR=0.696	40-10 rule	ABC rule
2007	9147	9147	9147	9147	9147
2008	9881	9835	9881	9874	9671
2009	10344	10259	10344	10304	9923
2010	10481	10362	10482	10391	9851
2011	10593	10444	10594	10449	9756
2012	10806	10627	10807	10606	9769
2013	11080	10868	11080	10823	9862
2014	11376	11131	11376	11049	9974
2015	11626	11347	11627	11228	10068
2016	11878	11562	11879	11417	10162
2017	12152	11811	12153	11587	10269
2018	12415	12030	12416	11767	10394
2019	12671	12270	12672	11914	10507
2020	12912	12487	12913	12026	10579
2021	13084	12675	13085	12139	10637
2022	13252	12828	13254	12188	10715
2023	13432	12985	13434	12272	10727
2024	13599	13161	13600	12346	10819
2025	13773	13284	13775	12385	10867
2026	13865	13398	13867	12391	10875
2027	13988	13504	13990	12407	10919
2028	14135	13657	14137	12505	10964
2029	14289	13796	14291	12551	11036
2030	14427	13912	14429	12608	11097
2031	14529	14038	14530	12625	11155
2032	14655	14102	14657	12644	11168
2033	14727	14212	14728	12665	11180
2034	14829	14340	14831	12705	11235
2035	14943	14438	14945	12731	11303
2036	15029	14484	15031	12770	11328
2037	15100	14587	15102	12784	11316
2038	15169	14648	15171	12754	11338
2039	15182	14662	15184	12732	11305
2040	15177	14676	15179	12704	11315
2041	15271	14704	15274	12681	11282
2042	15290	14755	15292	12706	11272
2043	15305	14744	15307	12683	11312
2044	15363	14818	15365	12698	11319
2045	15367	14825	15369	12718	11330
2046	15445	14881	15447	12724	11354
2047	15498	14941	15501	12712	11305
2048	15449	14960	15451	12729	11309
2049	15523	14944	15526	12713	11365
2050	15530	15034	15532	12731	11317

Appendix 6 : Time trajectories of median spawning output relative to target for five rebuilding strategies.

(a) Projections based on the full posterior estimates; Future recruitment = recruits

Year	Prob=0.7	2003 Prj	SPR=0.696	40-10 rule	ABC rule
2007	0.69	0.69	0.69	0.69	0.69
2008	0.75	0.75	0.75	0.75	0.73
2009	0.78	0.78	0.78	0.77	0.75
2010	0.79	0.80	0.80	0.78	0.75
2011	0.80	0.81	0.82	0.79	0.75
2012	0.82	0.83	0.84	0.80	0.75
2013	0.84	0.85	0.86	0.81	0.75
2014	0.85	0.87	0.88	0.82	0.76
2015	0.86	0.89	0.89	0.83	0.77
2016	0.88	0.90	0.91	0.83	0.77
2017	0.89	0.92	0.93	0.84	0.77
2018	0.90	0.93	0.94	0.84	0.77
2019	0.92	0.94	0.96	0.85	0.78
2020	0.93	0.96	0.97	0.85	0.78
2021	0.93	0.97	0.97	0.86	0.78
2022	0.94	0.98	0.99	0.86	0.78
2023	0.95	0.99	1.00	0.86	0.78
2024	0.96	1.00	1.01	0.86	0.78
2025	0.97	1.01	1.02	0.86	0.79
2026	0.97	1.02	1.03	0.87	0.79
2027	0.98	1.03	1.04	0.87	0.79
2028	0.99	1.04	1.04	0.87	0.79
2029	0.99	1.04	1.05	0.87	0.79
2030	1.00	1.05	1.06	0.87	0.79
2031	1.00	1.06	1.06	0.87	0.80
2032	1.01	1.06	1.07	0.87	0.80
2033	1.01	1.07	1.08	0.87	0.79
2034	1.01	1.07	1.08	0.87	0.79
2035	1.01	1.07	1.08	0.87	0.80
2036	1.01	1.08	1.08	0.88	0.80
2037	1.01	1.08	1.09	0.87	0.80
2038	1.02	1.08	1.09	0.87	0.80
2039	1.02	1.08	1.09	0.88	0.80
2040	1.03	1.09	1.10	0.88	0.81
2041	1.03	1.09	1.10	0.88	0.81
2042	1.03	1.10	1.11	0.88	0.80
2043	1.03	1.10	1.11	0.88	0.80
2044	1.04	1.10	1.11	0.88	0.80
2045	1.04	1.10	1.11	0.88	0.80
2046	1.04	1.10	1.12	0.88	0.80
2047	1.04	1.10	1.12	0.87	0.80
2048	1.04	1.11	1.12	0.87	0.80
2049	1.04	1.11	1.11	0.87	0.80
2050	1.04	1.11	1.12	0.87	0.80

(b) Projections based on the MPD estimates; Future recruitment = recruits

Year	Prob=0.7	2003 Prj	SPR=0.696	40-10 rule	ABC rule
2007	0.61	0.61	0.61	0.61	0.61
2008	0.65	0.65	0.65	0.65	0.64
2009	0.69	0.68	0.69	0.68	0.66
2010	0.69	0.69	0.69	0.69	0.65
2011	0.70	0.69	0.70	0.69	0.65
2012	0.72	0.70	0.72	0.70	0.65
2013	0.73	0.72	0.73	0.72	0.65
2014	0.75	0.74	0.75	0.73	0.66
2015	0.77	0.75	0.77	0.74	0.67
2016	0.79	0.77	0.79	0.76	0.67
2017	0.81	0.78	0.81	0.77	0.68
2018	0.82	0.80	0.82	0.78	0.69
2019	0.84	0.81	0.84	0.79	0.70
2020	0.86	0.83	0.86	0.80	0.70
2021	0.87	0.84	0.87	0.80	0.70
2022	0.88	0.85	0.88	0.81	0.71
2023	0.89	0.86	0.89	0.81	0.71
2024	0.90	0.87	0.90	0.82	0.72
2025	0.91	0.88	0.91	0.82	0.72
2026	0.92	0.89	0.92	0.82	0.72
2027	0.93	0.89	0.93	0.82	0.72
2028	0.94	0.90	0.94	0.83	0.73
2029	0.95	0.91	0.95	0.83	0.73
2030	0.96	0.92	0.96	0.84	0.74
2031	0.96	0.93	0.96	0.84	0.74
2032	0.97	0.93	0.97	0.84	0.74
2033	0.98	0.94	0.98	0.84	0.74
2034	0.98	0.95	0.98	0.84	0.74
2035	0.99	0.96	0.99	0.84	0.75
2036	1.00	0.96	1.00	0.85	0.75
2037	1.00	0.97	1.00	0.85	0.75
2038	1.01	0.97	1.01	0.85	0.75
2039	1.01	0.97	1.01	0.84	0.75
2040	1.01	0.97	1.01	0.84	0.75
2041	1.01	0.97	1.01	0.84	0.75
2042	1.01	0.98	1.01	0.84	0.75
2043	1.01	0.98	1.01	0.84	0.75
2044	1.02	0.98	1.02	0.84	0.75
2045	1.02	0.98	1.02	0.84	0.75
2046	1.02	0.99	1.02	0.84	0.75
2047	1.03	0.99	1.03	0.84	0.75
2048	1.02	0.99	1.02	0.84	0.75
2049	1.03	0.99	1.03	0.84	0.75
2050	1.03	1.00	1.03	0.84	0.75

Appendix 7 : Time trajectories of ABC for five rebuilding strategies.

(a) Projections based on the full posterior estimates; Future recruitment = recruits

Year	Prob=0.7	2003 Prj	SPR=0.696	40-10 rule	ABC rule
2007	900	900	900	900	900
2008	930	932	935	927	911
2009	970	976	980	965	931
2010	1017	1026	1031	1006	961
2011	1043	1059	1063	1025	970
2012	1063	1082	1087	1040	972
2013	1075	1096	1103	1042	967
2014	1089	1112	1121	1054	967
2015	1112	1137	1150	1068	973
2016	1128	1157	1167	1076	977
2017	1141	1173	1187	1085	981
2018	1159	1195	1206	1093	986
2019	1178	1217	1230	1100	990
2020	1191	1232	1245	1107	994
2021	1204	1249	1262	1110	995
2022	1215	1262	1276	1114	998
2023	1225	1274	1291	1119	999
2024	1235	1288	1304	1121	1001
2025	1244	1302	1315	1124	1005
2026	1252	1314	1326	1128	1007
2027	1261	1321	1336	1129	1012
2028	1271	1333	1349	1131	1010
2029	1273	1344	1353	1134	1013
2030	1276	1353	1359	1138	1014
2031	1285	1359	1368	1133	1017
2032	1286	1365	1370	1132	1017
2033	1292	1371	1377	1134	1017
2034	1297	1376	1384	1138	1015
2035	1301	1382	1390	1140	1020
2036	1307	1383	1398	1141	1020
2037	1311	1389	1401	1137	1023
2038	1314	1396	1409	1137	1019
2039	1313	1401	1408	1135	1016
2040	1318	1403	1413	1139	1017
2041	1320	1406	1416	1141	1022
2042	1324	1411	1420	1141	1021
2043	1329	1412	1427	1142	1022
2044	1332	1414	1429	1140	1024
2045	1335	1417	1435	1142	1019
2046	1339	1420	1438	1142	1025
2047	1338	1425	1442	1140	1026
2048	1335	1428	1439	1135	1022
2049	1333	1425	1438	1132	1022
2050	1334	1426	1438	1131	1023

(b) Projections based on the MPD estimates; Future recruitment = recruits

Year	Prob=0.7	2003 Prj	SPR=0.696	40-10 rule	ABC rule
2007	780	780	780	780	780
2008	811	807	811	810	793
2009	853	846	853	850	818
2010	900	889	900	892	846
2011	924	911	924	911	851
2012	930	914	930	912	841
2013	939	921	939	916	835
2014	960	939	960	932	842
2015	985	961	985	951	853
2016	1010	983	1010	970	864
2017	1032	1003	1032	984	874
2018	1056	1024	1056	999	884
2019	1075	1042	1075	1011	893
2020	1097	1060	1097	1020	898
2021	1111	1077	1112	1029	903
2022	1126	1089	1126	1036	912
2023	1142	1104	1142	1042	915
2024	1154	1117	1154	1047	922
2025	1168	1126	1168	1049	922
2026	1178	1137	1178	1051	923
2027	1187	1145	1187	1056	928
2028	1201	1160	1201	1058	933
2029	1212	1166	1213	1064	938
2030	1221	1178	1221	1071	944
2031	1231	1186	1231	1072	948
2032	1245	1195	1245	1074	951
2033	1249	1203	1249	1075	950
2034	1256	1213	1256	1078	952
2035	1263	1221	1264	1082	956
2036	1274	1227	1274	1082	963
2037	1281	1235	1281	1083	962
2038	1286	1244	1286	1082	963
2039	1291	1248	1291	1081	962
2040	1289	1248	1290	1079	959
2041	1291	1245	1291	1078	960
2042	1292	1248	1292	1079	958
2043	1296	1251	1296	1076	958
2044	1300	1254	1300	1077	959
2045	1302	1254	1302	1078	960
2046	1309	1263	1309	1079	961
2047	1313	1268	1313	1079	962
2048	1311	1269	1311	1080	965
2049	1318	1272	1319	1078	965
2050	1319	1275	1319	1079	963

Rebuilding analysis for widow rockfish in 2005

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Introduction

In 1998, the PFMC adopted Amendment 11 of the Groundfish Management Plan, which established a minimum stock size threshold of 25% of unfished spawning potential. Based on the stock assessment in 2000 (Williams et al. 2000), widow rockfish was formally declared to be overfished in 2001, thereby requiring the development of a Rebuilding Plan. The 2003 stock assessment (He et al. 2003b) estimated that the spawning output in 2002 was just below 25% of unfished spawning output. However, in the most recent stock assessment (He et al. 2005), the base model estimated that the population has never been overfished, although one of alternative models did indicate that the population was overfished in early 2000s. This rebuilding analysis provides information needed to develop the Rebuilding Plan for widow rockfish, and is in accord with the SSC Terms of Reference for Groundfish Rebuilding Analyses.

Data and Parameters

This rebuilding analysis uses the SSC Default Rebuilding Analysis program as implemented by Punt (2005) (Version 2.8a, April 2005). Historical estimates of spawning output and recruitment are taken from the 2005 assessment by He et al. (2005). Life history parameters and selectivity are based on a simplification of the two-area, two-sex, four-fishery selectivity model used in the assessment (Appendix A). The rebuilding analyses are based on a coastwide population. However, fecundity- and weight-at-age differ between the southern and northern areas. Therefore, spatially-averaged fecundity- and weight-at-age, based on a weighting factor computed from the total catches for two areas from the last seven years, are used in the rebuilding analysis. The age-specific selectivity pattern is calculated by averaging selectivity functions for four fisheries, using weighting factors computed from the total catches by each fishery over the last five years. Fecundity-at-age, weight-at-age and selectivity-at-age are presented in Figures 1 and 2. These functions are very similar to those used in the 2002 and 2003 rebuilding analysis for widow rockfish (MacCall and Punt 2001, He et al. 2003a).

Management Reference Points

***B_{MSY}*:** The rebuilding target is the spawning output that produces MSY, B_{MSY}. B_{MSY} cannot be determined easily, but experience in other fisheries has shown that $\mathrm{B_{MSY}}$ is often near 40% of the average initial unfished spawning output (B_0), and this value ($B_{40\%}$) is used here as a proxy for B_{MSY} (see the SSC's Terms of Reference). Values of B_0 are estimated by multiplying mean recruitment by the spawning output-per-recruit at F=0. As in the previous rebuilding analysis, the average recruitment used when computing B_0 was based on the pre-fishery recruitments (the 1958-79 year-classes). The following table shows the current population status from the base model in the stock assessment, and the population status estimated in the 2003 rebuilding analysis.

Estimated parameter	Value (2005)	Value (2003)
Estimated B_0 (millions of eggs)	49,676	43,580
Rebuilding target (millions of eggs)	19,870	17,432
Current spawning output (millions of eggs)	15,444	9,756
Percent of B_t/B_0 (depletion rate)	31.09%	22.39%

Mean generation time: If the stock cannot be rebuilt within ten years, then the maximum time allowed for rebuilding, T_{max}, is the length of time required to rebuild at F=0 (T_{min}) plus one mean generation time. Mean generation time can be estimated from the net maternity function (product of survivorship and fecundity at age), and for widow rockfish is estimated to be 17 years, which is slightly different from the value estimated in the 2003 rebuilding analysis (16 years, He et al. 2003a).

Simulation Model

The simulation model tracks numbers at age, with age 20 being treated as a plus-group. Fecundity-, weight-, and selectivity-at-age are given in Appendix A and plotted in Figures 1 and 2. When computing $T_{\min}$, the population simulations begin with the age-structure at the start of 2001 because 2001 was the year in which widow rockfish was declared to be overfished. The 2004 age-structure was used for estimating the Optimal Yield (OY) for 2006 and beyond. The detailed specifications of the simulation model are given by Punt (2005).

Initial test runs were conducted to determine the number of simulations needed to achieve stable outputs. The test was conducted using the base model from the stock assessment with 500, 1,000, 2,000, 3,000, 5,000, and 10,000 simulations. The results showed that the outputs did not change much with increasing numbers of simulations once the number of simulations reached 2,000. Therefore, all of the model runs in this rebuilding analysis are based on 2,000 simulations.

Twelve simulation scenarios were constructed from a combination of four stock assessment models and three methods of generating future recruitments. Four stock assessment models are: Model T1, Model M015, Model T2, and Model M011 (He et al. 2005). Model T2 is the base model. Selection of these models is based on different values of recruitment steepness, natural mortality, and fishery selectivity. Details on these models are in He et al. (2005). Three methods of generating future recruitment are: (1) future recruitment for all years is generated using the stock-recruitment relationship estimated in the stock assessment; (2) future recruitment for all years is generated by re-sampling historical recruits-per-spawner ratios; and (3) future recruitment from 2005 to 2007 is pre-specified using the juvenile (age 0 fish) survey indices from the NMFS Santa Cruz Laboratory, and future recruitment for all other years is generated by re-sampling historical recruits-per-spawner ratios. Method 3 was used in the 2003 rebuilding analysis, because the juvenile (age-0 fish) survey conducted by the Santa Cruz Laboratory indicated a strong recruitment of age-0 fish in 2002 (Fig. 8 in He et al. 2005). This 2002 year-class is not included in the stock assessment, but could potentially impact estimates of future population size. The 2005 STAR panel pointed out that there is great uncertainty associated with using the juvenile survey data.

The total catch of widow rockfish in 2005 is estimated at 284mt in all simulations, which is the same as the harvest guideline (OY) for 2005.

Rebuilding Projections

The rebuilding projections used $B_{40\%}$ as the rebuilding targets for the models. Table 2 lists the Optimum Yield (OY) for 2006, the constant fishing mortality (*F*, expressed as SPR) from 2006, the probability that the population will be rebuilt by $T_{\max}$ ($P_{\max}$), and median time in years from 2001 until the population will be rebuilt with 50% probability (T_{target}) for nine rebuild strategies and the four assessment models. Results for three methods of generating future recruitments are presented in Table 2a, Table 2b, and Table 2c, respectively. The first five rebuilding strategies apply constant fishing mortality rates from 2004 that correspond to five probabilities of being rebuilt by T_{max} (50%, 60%, 70%, 80%, and 90%, P_{max} = 0.5, 0.6, 0.7, 0.8, and 0.9, respectively). The sixth rebuilt is to set $T_{target} = T_{mid}$, where T_{mid} is the middle year between $T_{\min}$ and $T_{\max}$, and to set the probability of rebuilding by T_{mid} to be 50%. The seventh rebuilding strategy is no fishing ($F = 0$), the eighth is the "40:10" control rule, and the ninth is the ABC rule.

Figure 3 shows time series of the probability of the spawning output exceeding the target for six rebuilding strategies and a scenario of no fishing for the base model. Two other rebuilding strategies (40:10 rule and ABC rule) have zero probability of the spawning output exceeding the target. Also, comparisons of spawning biomass over target between the base assessment model (Model T2) and other assessment models indicates that Model M011 predicts initial increases of spawning biomass and then continuous decline of spawning biomass (Fig. 4). This suggests that it would be inadequate to use Model M011 as an assessment model to predict OY in the near future, although the model estimates the current depletion rate to be 38.49% (Table 15, He et al. 2005).

Table 3 shows Optimum Yields for the next 10 years (2007-2016) under the eight rebuilding strategies for four assessment models. In this table, future recruitments are generated using the stock-recruitment relationship. Table 4 shows the same information but with future recruitments generated by re-sampling recruits-per-spawner ratios in past years. Table 5 is same as Table 4 but with pre-specified 2005-2007 recruitments.

In general, Model M015 predicts the smallest OYs while Model M011 predicts the largest OYs, regardless of how future recruitments are generated. The OY for 2007 predicted by Model T2 (base model) is 1,352mt (Table 3), which is much greater than the OY for 2005 (284mt). This prediction is based on using the stock-assessment relationship for generating future recruitment and the default P_{max} for widow rockfish. Model M015 predicts the least OY for 2006 (538mt) while Model M011 predicts the most OY for 2006 (4503mt) (Table 3). As noted previously, Model M011 will have decreasing spawning biomass trend in the future (Figure 4).

Projections with future recruitments generated by re-sampling recruits-per-spawner ratios have higher OYs than those with future recruitments generated by the stock-recruitment relationship (Tables 3 and 4). This is the case for all four stock assessment models. If future recruitments are generated by re-sampling recruits-per-spawner ratios and with pre-specified 2005-2007 recruitments, projections have even higher OYs than those without pre-specified recruitments (Tables 4 and 5). It is evident that the projections largely depend on how future recruitments are generated. The following analyses are based on using the stock-recruitment relationship, which is believed to be more reasonably estimated in the current assessment than those in the past assessments.

Table 6 shows projected OYs for 2007-2016 from the base assessment model (Model T2) for six rebuilding runs requested for species currently managed under rebuilding plans (Appendix B). These runs have pre-specified probabilities of recovery, recovery times, and different fishing mortality (SPR) rates as in the current (2005) rebuilding plan. If the current SPR is used in the projections (Runs #1, #3, and #5), projected OYs are lower than if the current T_{target} or T_{max} are used (Runs #2 and #4). However, Runs #1, #3, and #5 still have higher OYs (447mt for 2007, for example) than those estimated in the 2003 rebuilding analysis (OY is 289mt for 2006, He et al. 2004a).

A decision table, which is copied from the 2005 assessment (He et al. 2005), is presented in Table 7. States of nature are presented by four assessment models. Management actions include the catches predicted by each of these four models. Future recruitments are generated using the stock-recruitment relationship. It is important to notice again that if management actions use the catches predicted by Model M011, all four models predict that the population will decline and be more depleted in the future than the current level.

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Table 1. Specifications of four stock assessment models based on different recruitment steepness, natural mortality and selectivity (He et al. 2005). Probability for each model is assigned by the 2005 STAR Panel. Model T2 is the base model.

Model name	Recruitment steepness	Natural mortality	Selectivity	Probability
Model T1	0.45	0.125	Double logistic / logistic	0.2
Model M015	0.25	0.150	Double logistic	0.1
Model T2 (base model)	0.28	0.125	Double logistic	0.4
Model M011	0.32	0.110	Double logistic	0.3

Table 2. Optimum yield (OY, mt) for 2006, spawner per recruit rate (SPR), probability of recovery by $T_{\max}$ ($P_{\max}$), and the year in which the probability of rebuild is 0.5 (T_{target}) for nine rebuilding strategies. Future recruitments are generated using three methods: Table 2a – using the stock-recruitment relationship; Table 2b – by re-sampling recruits-per-spawner ratios in past years; and Table 2c – by resampling recruits-per-spawner ratios in past years and with pre-specified 2005-2007 recruitments. NA = not applicable.

Table 2a: Future recruitments are generated using the stock-recruitment relationship.

		Rebuilding strategy								
Model		$P_{\max} = 50\%$	$P_{\max} = 60\%$	$P_{\max} = 70\%$	$P_{\max} = 80\%$	$P_{\max} = 90\%$	T_{mid} & P_{mid}=50%	$F = 0$	40:10	ABC
Model T1	OY	2457	2276	2091	1881	1626	2034	0	2569	3861
	SPR	0.633	0.653	0.675	0.701	0.734	0.682	1.0	NA	NA
	P_{max}	49.9	60.0	69.9	80.1	89.9	72.8	100.0	13.2	2.5
	T_{target}	2029	2025	2023	2021	2019	2023	2012	2070	NA
Model M015	OY	687	538	389	201	0.2	545	0	3121	5114
	SPR	0.906	0.926	0.946	0.971	1.0	0.924	1.0	NA	NA
	P_{max}	50.1	69.9	70.0	80.0	88.4	59.5	88.4	0	0
	T_{target}	2048	2042	2037	2032	2028	2042	2028	NA	NA
Model T2 (base model)	OY	1551	1352	1148	903	609	1328	0	4249	5334
	SPR	0.812	0.834	0.857	0.886	0.921	0.837	1.0	NA	NA
	P_{max}	50.1	60.0	69.9	79.9	90.0	61.1	98.5	0	0
	T_{target}	2033	2027	2023	2020	2017	2027	2013	NA	NA
Model M011	OY	4415	4388	4378	4375	4375	4413	0	5531	5574
	SPR	0.575	0.577	0.578	0.578	0.578	0.575	1.0	NA	NA
	P_{max}	50.0	59.9	70.6	79.6	90.8	50.4	100.0	1.8	1.6
	T_{target}	2011	2008	2007	2007	2007	2010	2007	NA	NA

Table 2b: Future recruitments are generated by re-sampling recruits-per-spawner ratio in past years.

Model		Rebuilding strategy								
		$P_{\max} = 50\%$	$P_{\max} = 60\%$	$P_{\max} = 70\%$	$P_{\max} = 80\%$	$P_{\max} = 90\%$	T_{mid} & P_{mid}=50%	$F = 0$	40:10	ABC
Model T1	OY	2590	2476	2341	2190	1940	2205	0	2569	3851
	SPR	0.619	0.631	0.646	0.663	0.693	0.661	1.0	NA	NA
	P_{max}	50.1	59.9	70.0	79.9	90.0	78.7	100.0	11.9	0.7
	T_{target}	2030	2028	2026	2023	2021	2024	2012	2054	NA
Model M015	OY	809	682	559	413	231	647	0	3122	5115
	SPR	0.890	0.907	0.923	0.942	0.967	0.911	1.0	NA	NA
	P_{max}	50.0	60.0	70.0	79.9	89.9	62.9	95.7	0.0	0.0
	T_{target}	2045	2040	2036	2033	2029	2039	2026	NA	NA
Model T2 (base model)	OY	1754	1593	1415	1231	929	1525	0	4298	5335
	SPR	0.791	0.808	0.827	0.848	0.882	0.815	1.0	NA	NA
	P_{max}	50.1	60.0	69.9	80.0	89.9	63.7	99.8	0	0
	T_{target}	2032	2027	2024	2021	2018	2026	2012	NA	NA
Model M011	OY	4444	4381	4378	4376	4374	4444	0	5531	5573
	SPR	0.573	0.577	0.578	0.578	0.578	0.573	1.0	NA	NA
	P_{max}	50.1	59.5	69.8	80.5	91.6	50.5	100	0.7	0.4
	T_{target}	2011	2008	2007	2007	2007	2010	2007	NA	NA

Table 2c: Future recruitments are generated by re-sampling recruits-per-spawner ratio in past years and with pre-specified 2005-2007 recruitments.

Model		Rebuilding strategy								
		$P_{\max} = 50\%$	$P_{\max} = 60\%$	$P_{\max} = 70\%$	$P_{\max} = 80\%$	$P_{\max} = 90\%$	T_{mid} & P_{mid}=50%	$F = 0$	40:10	ABC
Model T1	OY	2865	2727	2612	2460	2260	2456	0	2572	3865
	SPR	0.590	0.604	0.616	0.633	0.655	0.634	1.0	NA	NA
	P_{max}	50.1	60.1	70.0	80.1	90.0	80.3	100.0	19.1	0.6
	T_{target}	2027	2025	2022	2021	2019	2019	2011	2046	NA
Model M015	OY	1027	903	763	627	402	855	0	3161	5121
	SPR	0.864	0.879	0.896	0.914	0.944	0.885	1.0	NA	NA
	P_{max}	50.1	60.0	69.9	80.1	90.0	63.4	98.6	0	0
	T_{target}	2036	2032	2028	2025	2022	2030	2018	NA	NA
Model T2	OY	2190	2049	1905	1738	1549	1967	0	4254	5340
(base model)	SPR	0.747	0.761	0.775	0.793	0.813	0.769	1.0	NA	NA
	P_{max}	50.0	59.9	69.9	79.9	90.0	65.9	100.0	0	0
	T_{target}	2026	2021	2018	2015	2013	2020	2011	NA	NA
Model M011	OY	4624	4595	4593	4587	4572	4573	0	5532	5573
	SPR	0.561	0.563	0.563	0.563	0.564	0.564	1.0	NA	NA
	P_{max}	50.0	60.0	69.8	80.2	90.5	85.5	100.0	0	0
	T_{target}	2011	2011	2011	2011	2010	2010	2007	NA	NA

Table 3. Projected Optimal Yields (OY, mt) for 2006-2015 for four alternative assessment models. Model T2 is the base model. Future recruitments are generated using the stock-recruitment relationship.

Model	Year	Pmax=0.5	Pmax=0.6	Pmax=0.7	Pmax=0.8	Pmax=0.9	Pmid=0.5	40-10 Rule	ABC Rule
T1	2007	2458	2277	2091	1881	1626	2034	2569	3862
	2008	2487	2312	2131	1925	1672	2075	2731	3802
	2009	2465	2298	2125	1927	1681	2072	2758	3679
	2010	2434	2275	2109	1917	1679	2058	2733	3562
	2011	2415	2262	2102	1916	1683	2052	2711	3473
	2012	2421	2272	2114	1930	1699	2065	2708	3439
	2013	2450	2302	2145	1961	1730	2096	2752	3452
	2014	2479	2333	2177	1994	1761	2128	2799	3463
	2015	2523	2376	2221	2038	1803	2173	2859	3484
	2016	2550	2405	2251	2067	1834	2202	2912	3484
M015	2007	687	538	389	201	0	546	3121	5114
	2008	709	556	403	209	0	565	3118	4897
	2009	707	556	404	210	0	564	2954	4569
	2010	691	544	396	207	0	552	2719	4224
	2011	675	533	388	203	0	541	2504	3944
	2012	663	524	382	200	0	532	2340	3766
	2013	661	523	382	200	0	530	2246	3666
	2014	660	523	382	200	0	530	2170	3581
	2015	665	527	385	203	0	535	2120	3510
	2016	668	530	388	204	0	538	2070	3411
T2 (base)	2007	1554	1352	1148	903	609	1328	4249	5334
	2008	1588	1385	1180	931	631	1362	4161	5144
	2009	1572	1375	1175	930	633	1353	3899	4842
	2010	1532	1343	1150	913	623	1321	3583	4523
	2011	1493	1311	1125	895	613	1291	3305	4260
	2012	1464	1287	1106	881	605	1267	3102	4087
	2013	1456	1282	1103	880	605	1262	2980	3995
	2014	1449	1277	1099	878	604	1257	2875	3913
	2015	1455	1283	1105	884	609	1263	2805	3851
	2016	1452	1282	1106	885	611	1262	2729	3767
M011	2007	4529	4503	4493	4491	4490	4528	5547	5628
	2008	4465	4440	4431	4429	4428	4463	5321	5471
	2009	4307	4284	4276	4274	4273	4305	4952	5215
	2010	4130	4109	4101	4100	4099	4128	4579	4954
	2011	3983	3964	3957	3956	3955	3982	4279	4742
	2012	3888	3869	3862	3860	3859	3886	4058	4606
	2013	3841	3823	3816	3815	3814	3839	3921	4532
	2014	3781	3764	3757	3756	3755	3780	3781	4444
	2015	3746	3729	3723	3722	3721	3745	3681	4374
	2016	3693	3678	3672	3671	3670	3692	3562	4289

Table 4. Projected Optimal Yields (OY, mt) for 2006-2015 for four alternative assessment models. Model T2 is the base model. Future recruitments are generated by re-sampling recruits-per-spawner ratios in past years.

Model	Year	Pmax=0.5	Pmax=0.6	Pmax=0.7	Pmax=0.8	Pmax=0.9	Pmid=0.5	40-10 Rule	ABC Rule
T1	2007	2590	2477	2341	2190	1939	2205	2569	3862
	2008	2614	2506	2375	2228	1983	2243	2734	3803
	2009	2582	2480	2356	2216	1980	2230	2752	3675
	2010	2514	2418	2301	2170	1946	2183	2680	3512
	2011	2487	2396	2284	2157	1940	2169	2639	3425
	2012	2478	2389	2279	2155	1944	2168	2625	3372
	2013	2506	2419	2310	2187	1975	2200	2652	3384
	2014	2551	2464	2356	2232	2020	2245	2725	3414
	2015	2605	2518	2411	2288	2075	2301	2819	3453
	2016	2654	2568	2461	2338	2126	2350	2901	3473
M015	2007	809	682	559	413	231	647	3122	5115
	2008	835	705	579	428	240	669	3128	4906
	2009	835	706	581	431	243	671	2983	4605
	2010	816	691	570	423	239	657	2758	4260
	2011	801	680	561	417	236	646	2567	4019
	2012	790	671	554	413	233	638	2418	3838
	2013	786	668	552	412	233	636	2313	3743
	2014	787	669	553	413	234	637	2245	3663
	2015	794	676	560	418	237	644	2214	3597
	2016	802	683	565	423	240	650	2173	3505
T2	2007	1754	1593	1415	1231	929	1524	4250	5335
	2008	1789	1629	1451	1265	960	1560	4172	5153
	2009	1778	1622	1448	1266	964	1555	3936	4882
	2010	1730	1582	1415	1239	947	1517	3630	4567
	2011	1698	1555	1393	1222	936	1492	3401	4348
	2012	1671	1531	1373	1207	927	1471	3210	4180
	2013	1660	1523	1367	1201	924	1463	3085	4085
	2014	1657	1521	1367	1203	927	1462	2998	4021
	2015	1668	1532	1377	1213	936	1472	2940	3971
	2016	1677	1543	1389	1225	946	1484	2887	3900
M011	2007	4559	4497	4495	4492	4491	4558	5548	5629
	2008	4499	4442	4440	4438	4436	4499	5336	5481
	2009	4371	4319	4316	4314	4313	4371	5009	5265
	2010	4188	4140	4138	4136	4135	4188	4639	4998
	2011	4093	4047	4045	4043	4043	4092	4411	4851
	2012	4008	3964	3962	3960	3960	4008	4219	4726
	2013	3957	3915	3913	3912	3911	3957	4078	4651
	2014	3926	3886	3884	3883	3882	3926	3964	4589
	2015	3890	3851	3850	3848	3847	3890	3856	4518
	2016	3858	3821	3819	3818	3817	3858	3756	4445

Table 5. Projected Optimal Yields (OY, mt) for 2006-2015 for four alternative assessment models. Model T2 is the base model. Future recruitments are generated by re-sampling recruits-per-spawner ratios in past years and with pre-specified 2005-07 recruitments.

Model	Year	Pmax=0.5	Pmax=0.6	Pmax=0.7	Pmax=0.8	Pmax=0.9	Pmid=0.5	40-10 Rule	ABC Rule
T1	2007	2865	2727	2612	2460	2260	2453	2572	3865
	2008	2903	2770	2659	2512	2316	2504	2779	3841
	2009	2993	2862	2753	2606	2410	2599	3000	3900
	2010	3102	2972	2862	2715	2517	2707	3244	3992
	2011	3165	3036	2928	2782	2585	2774	3424	4028
	2012	3162	3038	2933	2791	2599	2784	3477	3984
	2013	3110	2992	2893	2757	2572	2750	3412	3880
	2014	3110	2996	2898	2765	2584	2759	3399	3852
	2015	3106	2995	2901	2772	2597	2766	3385	3809
	2016	3126	3019	2927	2802	2628	2795	3402	3796
M015	2007	1027	903	763	626	402	855	3126	5121
	2008	1067	940	796	655	422	891	3194	4970
	2009	1128	995	845	696	450	943	3335	4983
	2010	1194	1054	896	740	479	1000	3530	5059
	2011	1233	1090	928	767	498	1035	3644	5038
	2012	1230	1089	928	768	500	1034	3559	4846
	2013	1192	1057	902	747	487	1004	3310	4534
	2014	1166	1034	884	732	478	983	3082	4313
	2015	1143	1015	868	721	471	965	2880	4097
	2016	1133	1007	862	716	469	958	2731	3931
T2	2007	2190	2049	1905	1738	1549	1967	4254	5340
	2008	2239	2099	1955	1789	1598	2018	4237	5207
	2009	2321	2179	2034	1865	1670	2097	4284	5200
	2010	2409	2265	2117	1944	1744	2181	4381	5237
	2011	2452	2308	2159	1986	1784	2225	4404	5196
	2012	2429	2289	2144	1974	1777	2208	4264	5024
	2013	2355	2222	2083	1920	1730	2144	3989	4764
	2014	2305	2176	2042	1884	1700	2101	3769	4581
	2015	2259	2134	2005	1852	1672	2062	3562	4406
	2016	2233	2112	1986	1836	1660	2041	3394	4264
M011	2007	4734	4707	4705	4699	4684	4685	5552	5633
	2008	4697	4671	4669	4663	4650	4651	5397	5526
	2009	4740	4715	4714	4708	4695	4696	5342	5531
	2010	4807	4783	4781	4776	4763	4764	5356	5574
	2011	4809	4786	4785	4779	4767	4768	5317	5546
	2012	4723	4701	4699	4694	4682	4683	5152	5417
	2013	4544	4524	4522	4517	4507	4507	4840	5183
	2014	4439	4420	4418	4414	4404	4405	4615	5036
	2015	4327	4309	4308	4303	4294	4295	4380	4880
	2016	4232	4215	4214	4210	4201	4202	4182	4743

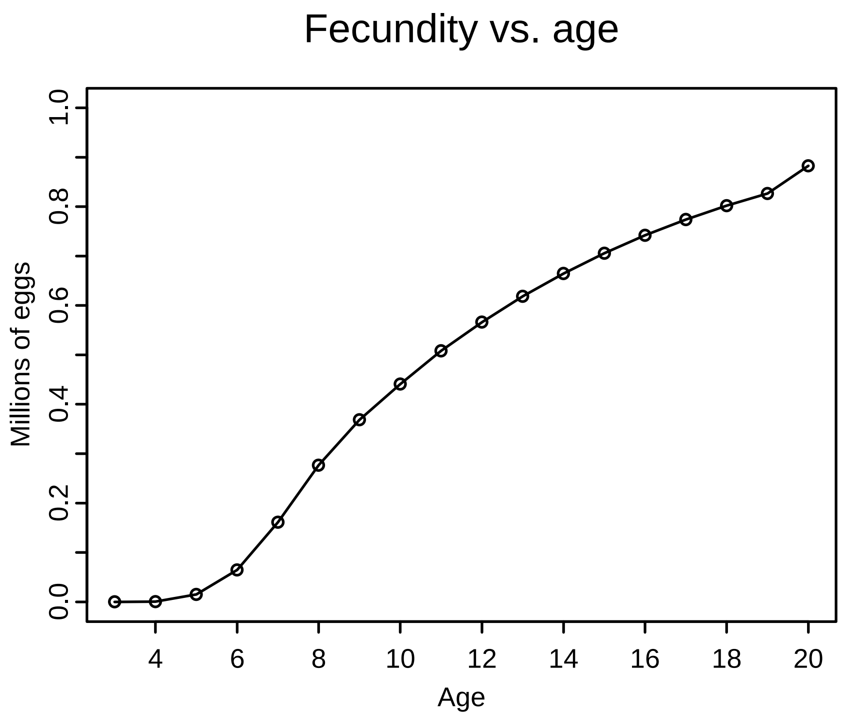
Table 6. Projected Optimal Yields (OY, mt) for 2007-2016 from the base model (Model T2) for nine rebuilding runs with pre-specified probabilities of recovery, recovery times, and different SPR (fishing mortality) rates. Specifications for some runs are in Appendix B. SPR rates and recovery time are either old (estimated in the 2003 rebuilding analysis) or new (estimated in specific runs). Future recruitments are generated using the stock-recruitment relationship.

	Run #1	Run #2	Run #3	Run #4A	Run #4	Run #5	Run #6	Run#6	Run#6 (40:10 rule)
Probability of recovery	0.9625 (estimated)	0.5 (Fixed)	0.9765 (estimated)	0.8 (Fixed)	0.6 (P_0, Fixed)	0.9395 (estimated)	0.6 (P_0, Fixed)	0.8	<0.001
Recovery time	2038 (Old Ttarget)	2038 (Old Ttarget)	2042 (Old Tmax)	2042 (Old Tmax)	2042 (Old Tmax)	2033 (New Tmax)	2033 (New Tmax)	2033 (New Tmax)	N/A
SPR	0.936 (Old)	0.798 (New)	0.936 (Old)	0.855 (New)	0.810 (New)	Old	0.834 (New)	0.886 (New)	N/A
Fishing mortality	0.0093	0.0354	0.0093	0.0243	0.0329	0.0093	0.0283	0.0188	N/A
2007	447	1683	447	1162	1568	447	1352	903	4249
2008	464	1716	464	1194	1601	464	1385	931	4161
2009	466	1696	466	1189	1586	466	1375	930	3899
2010	460	1650	460	1163	1544	460	1343	913	3583
2011	453	1606	453	1138	1505	453	1311	895	3305
2012	447	1575	447	1118	1476	447	1287	881	3102
2013	448	1564	448	1115	1468	448	1282	880	2980
2014	448	1556	448	1111	1460	448	1277	878	2875
2015	452	1561	452	1118	1467	452	1283	884	2805
2016	454	1557	454	1118	1463	454	1282	885	2729

Table 7 (next page). Decision table copied from the 2005 stock assessment (He et al. 2005). States of nature are represented by four alternative models. Management actions include the catches predicted by each of these four alternative models. Future recruitments are generated using the stock-recruitment relationship. It is important to notice that if management actions use the catches predicted by Model 011, all four models predict that the population will decline and be more depleted in the future than the current level. Series in bold font show decreasing population abundance. Also notice that catch for 2006 for Model M011 is not pre-specified because of difficulty in obtaining rebuilding results.

			State of Nature							
			Model T1		Model M015		Model T2 (base)		Model M011	
Management action	Year	Total catch (mt)	Spawning output	Depletion (%)	Spawning output	Depletion (%)	Spawning output	Depletion (%)	Spawning output	Depletion (%)
Model T1	2005	285	8992	25.3	12052	25.8	15444	31.1	20351	38.5
	2006	289	9746	27.4	12546	26.8	16018	32.2	21030	39.8
	2007	2277	10655	30.0	13234	28.3	16839	33.9	21149	40.0
	2008	2312	11092	31.2	13477	28.8	17230	34.7	21625	40.9
	2009	2298	11361	31.9	13524	28.9	17407	35.0	21910	41.4
	2010	2275	11527	32.4	13408	28.7	17421	35.1	22058	41.7
	2011	2262	11648	32.8	13195	28.2	17328	34.9	22135	41.9
	2012	2272	11754	33.0	12933	27.7	17185	34.6	22166	41.9
	2013	2302	11880	33.4	12697	27.2	17016	34.3	22139	41.9
	2014	2333	12030	33.8	12465	26.7	16847	33.9	22111	41.8
	2015	2376	12214	34.3	12292	26.3	16720	33.7	22088	41.8
Model M015	2005	285	8992	25.3	12052	25.8	15444	31.1	20351	38.5
	2006	289	9746	27.4	12546	26.8	16018	32.2	21030	39.8
	2007	538	10655	30.0	13234	28.3	16839	33.9	21149	40.0
	2008	556	11459	32.2	13832	29.6	17590	35.4	21989	41.6
	2009	556	12113	34.1	14248	30.5	18150	36.5	22665	42.9
	2010	544	12663	35.6	14493	31.0	18548	37.3	23213	43.9
	2011	533	13153	37.0	14618	31.3	18824	37.9	23683	44.8
	2012	524	13604	38.3	14668	31.4	19035	38.3	24093	45.6
	2013	523	14058	39.5	14715	31.5	19182	38.6	24427	46.2
	2014	523	14512	40.8	14751	31.6	19331	38.9	24751	46.8
	2015	527	14997	42.2	14844	31.8	19512	39.3	25079	47.4
Model T2 (base)	2005	285	8992	25.3	12052	25.8	15444	31.1	20351	38.5
	2006	289	9746	27.4	12546	26.8	16016	32.2	21030	39.8
	2007	1352	10655	30.0	13234	28.3	16839	33.9	21149	40.0
	2008	1385	11287	31.7	13666	29.2	17421	35.1	21819	41.3
	2009	1375	11759	33.1	13907	29.7	17801	35.8	22310	42.2
	2010	1343	12129	34.1	13982	29.9	18017	36.3	22670	42.9
	2011	1311	12449	35.0	13950	29.8	18125	36.5	22955	43.4
	2012	1287	12746	35.8	13864	29.7	18170	36.6	23190	43.9
	2013	1282	13061	36.7	13788	29.5	18184	36.6	23363	44.2
	2014	1277	13382	37.6	13718	29.3	18206	36.6	23530	44.5
	2015	1283	13748	38.7	13700	29.3	18270	36.8	23717	44.9
Model M011	2005	285	**8992**	**25.3**	**12052**	**25.8**	**15444**	**31.1**	**20351**	**38.5**
	2006	4388	**9746**	**27.4**	**12546**	**26.8**	**16018**	**32.2**	**21030**	**39.8**
	2007	4503	**10655**	**30.0**	**13234**	**28.3**	**16839**	**33.9**	**21149**	**40.0**
	2008	4440	**10624**	**29.9**	**13025**	**27.9**	**16771**	**33.8**	**21162**	**40.0**
	2009	4285	**10425**	**29.3**	**12624**	**27.0**	**16483**	**33.2**	**20969**	**39.7**
	2010	4109	**10159**	**28.6**	**12101**	**25.9**	**16058**	**32.3**	**20665**	**39.1**
	2011	3964	**9901**	**27.8**	**11538**	**24.7**	**15577**	**31.4**	**20330**	**38.4**
	2012	3869	**9679**	**27.2**	**10988**	**23.5**	**15102**	**30.4**	**19996**	**37.8**
	2013	3823	**9546**	**26.8**	**10515**	**22.5**	**14661**	**29.5**	**19664**	**37.2**
	2014	3764	**9446**	**26.6**	**10083**	**21.6**	**14242**	**28.7**	**19351**	**36.6**
	2015	3729	**9415**	**26.5**	**9735**	**20.8**	**13914**	**28.0**	**19080**	**36.1**

Figure 1. Fecundity-at-age and weight-at-age by sex for widow rockfish as used in the rebuilding analyses.



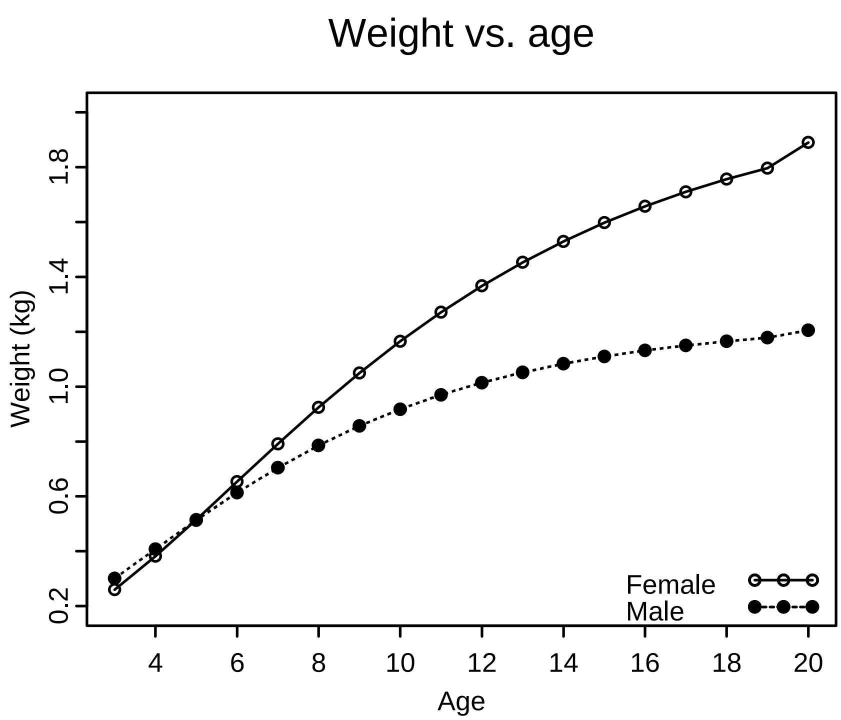


Figure 2. The selectivity pattern for widow rockfish used in the rebuilding analyses.

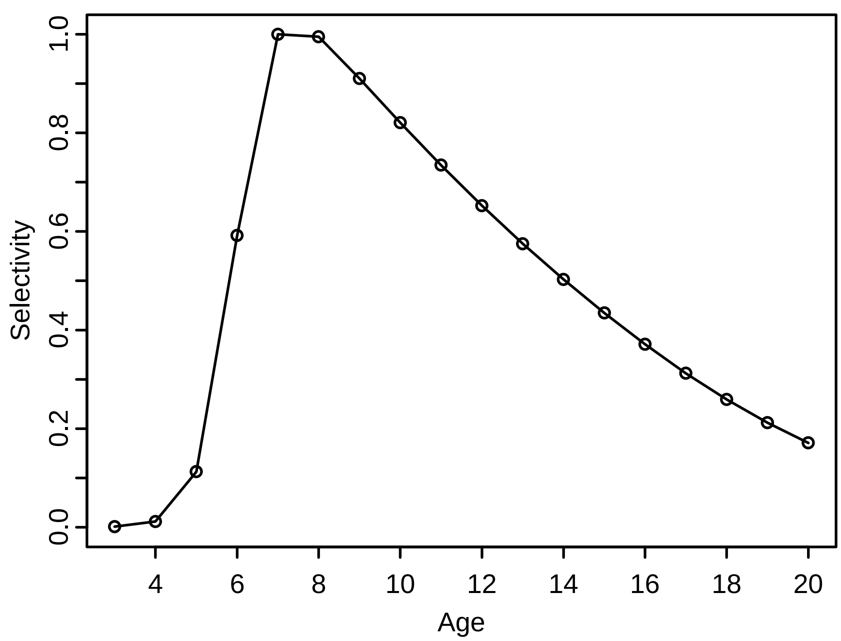


Figure 3. Time-series of the probability of the spawning output exceeding the target ($0.4B_0$) for five rebuilding strategies of $P_{\max} = 0.5 - 0.9$ (upper panel) and two rebuilding strategies of T_{mid} and no fishing (lower panel). The results are the base model (Model T2) with future recruitments generated using the stock-recruitment relationship. The vertical lines are new T_{target}.

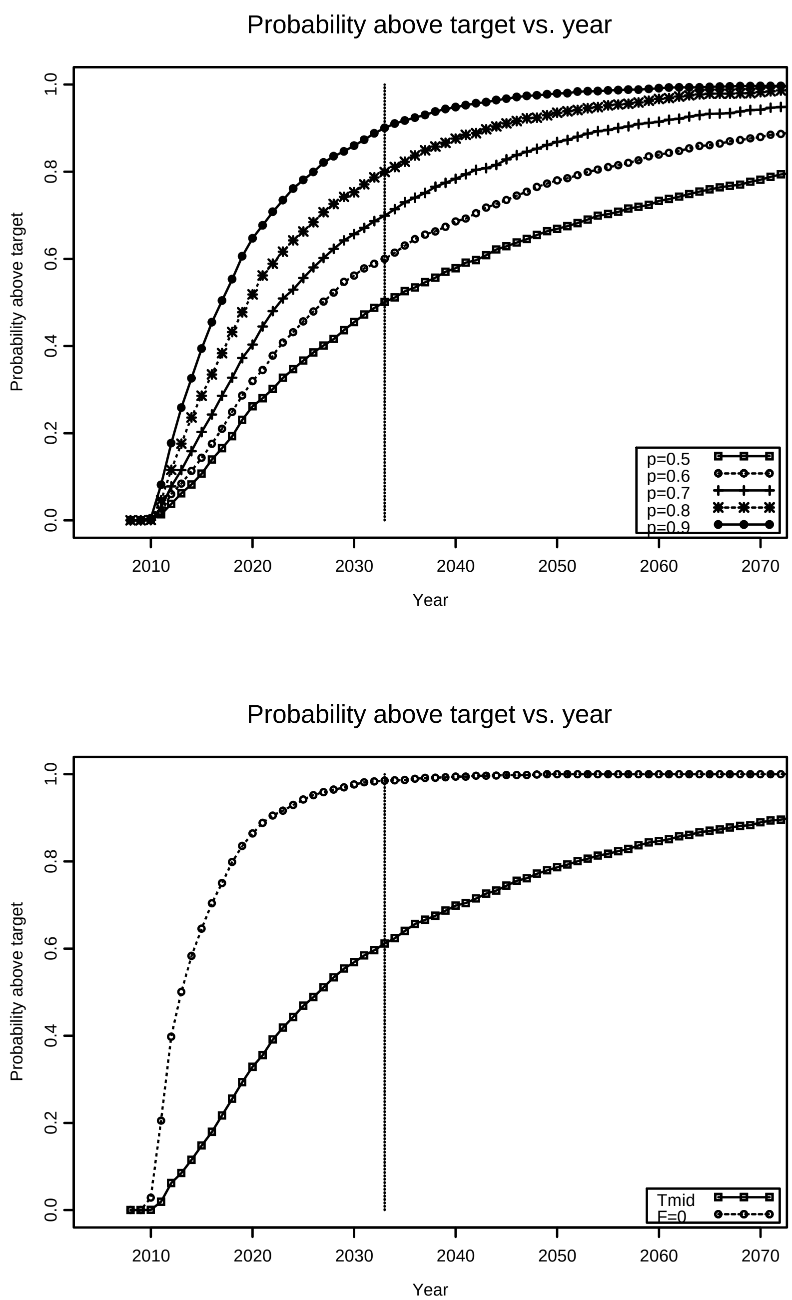
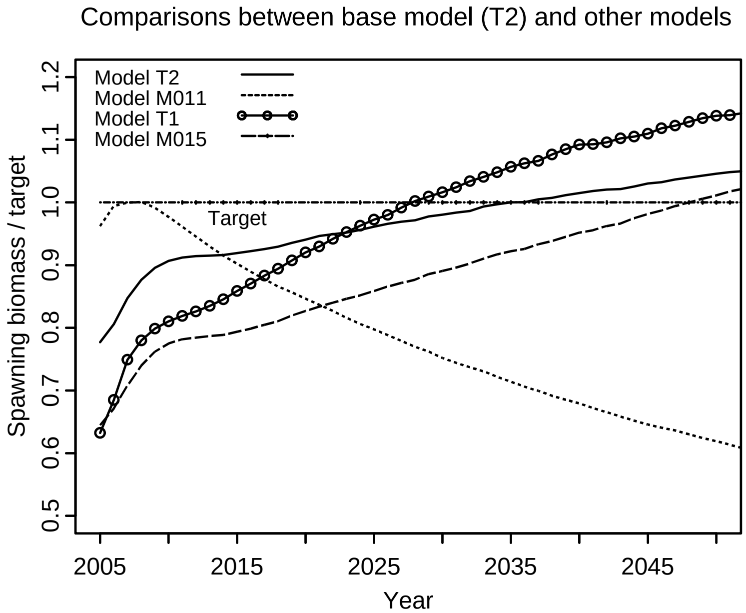


Figure 4. Time series of spawning biomass over target for the base model (T2) and other models. Targets are defined as P_{max} =60%. Future recruitments are generated using the stock-recruitment relationship. Notice that the harvest strategies are different before and after recovery occurs. Also notice that Model M011 predicts an initial increases of spawning biomass and then continuous decline of spawning biomass.



Appendix A. The "rebuild.dat" file used in the rebuilding analysis for Model T2. Model T2 is the stock assessment base model.

```
# Rebuild.dat for 2005 widow rebuiding
Widow (RecruitOverRiding=0, UseXHhPrior=1, PowCoefficientSCLabIndex=?)
# Number of sexes
2
# Age range to consider (minimum age; maximum age)
3 20
# Number of fleets to consider
1
# First year of the projection
2005
# Year declared overfished
2001
# Is the maximum age a plus-group (1=Yes;2=No)
1
# Generate future recruitments using historical recruitments (1), historical recruits/spawner (2), or a stock-recruitment (3)
3
# Constant fishing mortality (1) or constant Catch (2) projections
1
# Fishing mortality based on SPR (1) or actual rate (2)
2
# Pre-specify the year of recovery (or -1) to ignore
-1
# Fecundity-at-age
# A blank comment line - needed for the program to run
 0.0001 0.0002 0.0151 0.0645 0.1612 0.2765 0.3685 0.4409 0.5083 0.5663 0.6184 0.6648 0.7059 0.7422 0.7741 0.8021 0.8266
0.8829
# Age specific information (Females then males), weight and selectivity
# Females
```

0.2595 0.3814 0.5152 0.6538 0.7916 0.9244 1.0495 1.1655 1.2714 1.3673 1.4532 1.5298 1.5977 1.6576 1.7103 1.7566 1.7970
1.8899
0.0011 0.0117 0.1129 0.5920 1.0000 0.9950 0.9105 0.8210 0.7346 0.6525 0.5752 0.5027 0.4346 0.3711 0.3125 0.2592 0.2120
0.1712
Males
0.3001 0.4071 0.5131 0.6131 0.7042 0.7853 0.8562 0.9174 0.9698 1.0142 1.0517 1.0833 1.1097 1.1318 1.1502 1.1656 1.1784
1.2053
0.0011 0.0117 0.1129 0.5920 1.0000 0.9950 0.9105 0.8210 0.7346 0.6525 0.5752 0.5027 0.4346 0.3711 0.3125 0.2592 0.2120
0.1712
Age specific information (Females then males), natural mortality and numbers at age
Females
0.1250 0.1250 0.1250 0.1250 0.1250 0.1250 0.1250 0.1250 0.1250 0.1250 0.1250 0.1250 0.1250 0.1250 0.1250 0.1250 0.1250
0.1250
8821.83 7651.89 9287.03 8870.50 2911.46 1861.43 1470.15 2207.72 2168.79 1535.05 3930.71
2004.23 838.17 640.11 790.19 264.72 505.85 4741.80
Males
0.1250 0.1250 0.1250 0.1250 0.1250 0.1250 0.1250 0.1250 0.1250 0.1250 0.1250 0.1250 0.1250 0.1250 0.1250 0.1250 0.1250
0.1250
8821.83 7651.89 9287.03 8870.50 2911.46 1861.43 1470.15 2207.72 2168.79 1535.05 3930.71
2004.23 838.17 640.11 790.19 264.72 505.85 4741.80
Initial age-structure (for Tmin)
12910.05 4245.58 2742.71 2235.07 3441.90 3375.30 2372.11 6030.39 3054.12 1269.36 964.01
1184.08 394.90 751.57 795.60 639.59 513.07 5027.01
12910.05 4245.58 2742.71 2235.07 3441.90 3375.30 2372.11 6030.39 3054.12 1269.36 964.01
1184.08 394.90 751.57 795.60 639.59 513.07 5027.01
Year for Tmin Age-structure
2001
Number of simulations
2000
Recruitment and Spanwer biomasses
Number of historical assessment years
47
Historical data: Year, Recruitment, Spawner biomass, Used to compute B0, Used to project based
on R, Used to project based on R/S
1958 34509 44904 1 0 0
1959 34837 44906 1 0 0
1960 35136 44922 1 0 0
1961 35165 44996 1 0 0
1962 33910 45168 1 0 0
1963 32743 45437 1 0 0
1964 29179 45759 1 0 0
1965 31198 46084 1 0 0
1966 23707 46351 1 0 0
1967 37326 45676 1 0 0
1968 39174 44743 1 0 0
1969 40118 44157 1 0 0
1970 41811 43994 1 0 0
1971 44367 44042 1 0 0
1972 40465 44391 1 0 0
1973 89102 45063 1 0 0
1974 32175 45835 1 0 0
1975 12357 46972 1 0 0
1976 10109 48588 1 0 0
1977 16332 50426 1 0 0
1978 21602 51386 1 0 0
1979 10252 51001 1 0 0
1980 38903 49123 1 0 0
1981 57581 42492 1 0 0
1982 20937 34716 1 0 0
1983 66061 27663 0 0 0
1984 77951 25244 0 0 0
1985 28033 24086 0 0 0
1986 28601 23757 0 1 1
1987 28770 24357 0 1 1
1988 22501 24756 0 1 1
1989 9962 24891 0 1 1
1990 24254 23705 0 1 1
1991 15480 22428 0 1 1

1992	15827	21660	0	1	1
1993	29059	20622	0	1	1
1994	43799	19016	0	1	1
1995	13461	17848	0	1	1
1996	15161	16806	0	1	1
1997	12223	16474	0	1	1
1998	6587	16406	0	1	1
1999	7052	16567	0	1	1
2000	9623	16306	0	1	1
2001	25820	15664	0	1	1
2002	23850	15241	0	1	1
2003	17341	15138	0	1	1
2004	17644	15337	0	1	1

```
# Number of years with pre-specified catches
2
# Catches for years with pre-specified catches
2005 285
2006 289
# Number of future recruitments to override
3
# Process for overiding (-1 for average otherwise index in data list)
2005 0 0
2006 0 0
2007 0 0
# Which probability to product detailed results for (1=0.5,2=0.6,etc.)
2
# Steepness and sigma-R and auto-correlations
  0.280964  0.500000 0.000000
# Target SPR rate (FMSY Proxy)
0.500000
# Target SPR information: Use (1=Yes) and power
0 20
# Discount rate (for cumulative catch)
0.100000
# Truncate the series when 0.4B0 is reached (1=Yes)
0
# Set F to FMSY once 0.4B0 is reached (1=Yes; 2=Apply 40:10 rule after recovery)
0
# Percentage of FMSY which defines Ftarget
0.900000
# Maximum possible F for projection (-1 to set to FMSY)
2
# Conduct MacCall transition policy (1=Yes)
0
# Defintion of recovery (1=now only;2=now or before)
2
# Results for rec probs by Tmax (1) or 0.5 prob for various Ttargets
1
# Definition of the 40-10 rule
10 40
# Produce the risk-reward plots (1=Yes)
0
# Calculate coefficients of variation (1=Yes)
0
# Number of replicates to use
20
# First Random number seed
-89102
# Conduct projections for multiple starting values (0=No;else yes)
0
# File with multiple parameter vectors
MCMC.PRJ
# Number of parameter vectors
100
# User-specific projection (1=Yes); Output replaced (1->6)
1 7 0 0.5
# Catches and Fs (Year; 1/2 (F or C); value); Final row is -1
2007 1 0.000000
```

2010 1 0.000000
2100 1 0.000000
-1 -1 -1
Split of Fs
2005 1
-1 1
Time varying weight-at-age (1=Yes;0=No)
0
File with time series of weight-at-age data
HakWght.Csv

20

4

Appendix B: Rebuilding Runs Requested for Species Currently Managed Under Rebuilding Plans

During recent weeks, there has been considerable dialogue regarding the most appropriate measures for evaluating the adequacy of rebuilding progress for species that are currently managed under rebuilding plans. A conference call was held last Friday (including participants from the NW Center, NW Region, Council staff, and the SSC) to discuss the uncertainties that have emerged since the June Council meeting. Following that call, an effort was made to identify a set of rebuilding runs which would allow authors to complete the analytical work that may be required by the Council (and advisors) and NMFS to evaluate rebuilding adequacy later this year. These runs are described in the table below. We are hopeful that there will be no need for any additional runs by authors who complete these six. Authors should be sure to address A) - C) below before proceeding to D).

A. Convert the current F to an SPR (this can be achieved straightforwardly given the biological parameters – reported in the rebuilding analysis).
B. Define how B_0 is to be calculated for the current rebuilding analysis (from the assessment; based on average recruitment over the early years, etc.)
C. Define how future recruitment is to be generated.
D. Do the following analyses. Report, T_{MIN}, T_{MAX}, T_{TARGET}, SPR/F, Probability of recovery by T_{MAX}, probability of recovery by T_{TARGET}.

For runs #1 and 2, the existing T_{TARGET} should be substituted for T_{MAX} in Puntalyzer setup. Run #1 will provide the likelihood of achieving T_{TARGET} with the current SPR, which can then be compared to the 50% likelihood estimated originally. Run #2 provides the SPR that restores a 50% likelihood of rebuilding by T_{TARGET}. Similarly, run #3 estimates the likelihood of rebuilding by the existing T_{MAX} with the current SPR, and run #4 estimates the SPR that would be required to restore a P_0 likelihood of rebuilding in T_{MAX}. Runs #5 and 6 provide comparable outputs relative to the "new" T_{MAX}, as calculated using outputs from 2005 assessments.

Run #	Prob (recovery)	By	Based on
#1 (default)	Estimated	Current T_{TARGET}	Current SPR
#2 (T_{TARGET} with 50% prob)	0.5	Current T_{TARGET}	Estimated SPR
#3 (#1 based on T_{MAX})	Estimated	Current T_{MAX}	Current SPR
#4 (#2 based on T_{MAX})	P_0	Current T_{MAX}	Estimated SPR
#5 (#3 with re-estimated T_{MAX})	Estimated	T_{MAX} (re-estimated)	Current SPR
#6 (#4 with re-estimated T_{MAX})	P_0	T_{MAX} (re-estimated)	Estimated SPR

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Rebuilding Analysis for Yelloweye Rockfish for 2005

September 28, 2005

Tien-Shui Tsou and Farron R. Wallace
Washington State Department of Fish and Wildlife

Summary

The rebuilding analysis for yelloweye rockfish was first conducted in 2002 based upon the 2001 assessment (Wallace 2001). Methot and Piner (2002) updated the rebuilding analysis based upon the 2002 assessment (Methot *et al*. 2003). This document updates those results based upon the new assessment update (Wallace *et al*. 2005) reviewed in August of 2005.

As in the last rebuilding analysis, future recruitment is based upon the estimated spawner-recruit relationship with a steepness of 0.437 and Sigma R = 0.40. Age specific fishery selectivity, body weight, and maturity data were updated. The estimated mean generation time is 44 years, same as that reported in the previous rebuilding analysis. In the absence of fishing, the stock is estimated to rebuild by 2036. Based on current SPR (SSC runs 1, 3, and 5), the probability of rebuild by T_{TARGET} and T_{MAX} is lower than 1%. The following table summarizes results from SSC runs 2, 4, and 6, where SPR rates were re-estimated, and 10-year OY projects under each scenario.

	SSC run 2	SSC Run 4	SSC Run 6
P_0	0.5	0.8	0.8
Rebuild by T_{TARGET}	2058	--	--
Rebuild by T_{MAX}	--	2071	2080
SPR	0.764	0.744	0.717
F	0.0114	0.0126	0.0143
2007	16.8	18.5	21.0
2008	17.0	18.8	21.3
2009	17.3	19.0	21.5
2010	17.5	19.2	21.7
2011	17.7	19.4	22.0
2012	17.9	19.6	22.2
2013	18.1	19.9	22.4
2014	18.3	20.1	22.6
2015	18.6	20.3	22.9
2016	18.8	20.6	23.1

Introduction

The first and second full assessments for yelloweye rockfish were conducted in 2001 (Wallace 2001) and 2002 (Methot *et al*. 2003). Both assessments were length-based models and used an earlier version of the Stock Synthesis program (Methot 1990). Wallace (2001) conducted two area assessments by using data from California and Oregon. Methot *et al*. (2003) incorporated Washington catch and age data, and treated the stock as one single assemblage off the California, Oregon, and Washington (W-O-C) coast. Their results indicated that the stock was depleted at 24% of B_0 in 2002. A subsequent rebuilding analysis was conducted (Methot and Piner 2002) and the estimated rebuilding parameters were adopted by the PFMC in 2004 (PFMC 2004). The parameters in the 2004 rebuilding plan are as follows:

Year stock declared overfished:	2002
Year rebuilding plan adopted:	2004
B_0:	3,875 mt
B_{MSY}:	1,550 mt
$B_{CURRENT}$ (% OF B0):	24% in 2002
T_{MIN}:	2027
T_{MAX}:	2071
P_{MAX}:	80%
T_{TARGET}:	2058
Harvest control rule:	F = 0.0153

Based on the harvest control rule (F = 0.0153), the optimum yield (OY) for 2004 was determined to be 22 mt.

This rebuilding analysis is based upon the updated yelloweye rockfish stock assessment conducted in 2005 (Wallace *et al*. 2005). Wallace *et al*. (2005) used Stock Synthesis 2 modeling framework to estimate model parameters and management quantities. As in the 2002 assessment, the stock was treated as a single stock off the W-O-C coast. Catch time series for each State used in the 2002 assessment were entirely revised; however, none of the abundance indices were revised. Age and length compositions collected since 2001 were appended to the model and ageing error was revised. Results from 2005 assessment indicated that depletion level of yelloweye rockfish in 2004 was at 21% of B_0, which is further depleted than the 24% in Method *et al*. (2003). The purpose of this document is to use results from the most recent assessment (Wallace *et al*. 2005) to update estimates of the potential rate of rebuilding of yelloweye rockfish.

Methods

We followed the guidelines from the SSC Terms of Reference for Groundfish Rebuilding Analyses dated 20 April 2005 and used the SSC Default Rebuilding Analysis as implemented by Punt (April 2005, version 2.8a). Life history parameters, age structures, and historical estimates of spawning output and recruitments are taken from Wallace *et al*. (2005). The age-specific selectivity pattern is calculated by averaging selectivity functions for seven fisheries (Wallace *et al*. 2005), weighted by total catches of each fishery over the last five years. For estimating B_0, 1953 – 1990 recruitments are selected. Future recruitments are generated by using the Beverton-Holt spawner-recruit relationship with a steepness of 0.437 and Sigma R = 0.40, which is the same as in the previous rebuilding analysis.

A set of six rebuilding runs was requested in the SSC Terms of Reference for species currently managed under rebuilding plans.

Run #	**Prob (recovery)**	**By**	**Based on**
#1 (default)	Estimated	Current T_{TARGET}	Current SPR
#2 (T_{TARGET} with 50% prob)	0.5	Current T_{TARGET}	Estimated SPR
#3 (#1 based on T_{MAX})	Estimated	Current T_{MAX}	Current SPR
#4 (#2 based on T_{MAX})	P_0	Current T_{MAX}	Estimated SPR
#5 (#3 with re-estimated T_{MAX})	Estimated	T_{MAX} (re-estimated)	Current SPR
#6 (#4 with re-estimated T_{MAX})	P_0	T_{MAX} (re-estimated)	Estimated SPR

To compute current SPR rate for three of the six SSC runs, effort was made to re-construct 2002 rebuilding analysis by using current rebuilding computer application (Punt 2005, version 2.8a). We could not get a solution using the materials and methods documented in the Methot and Piner (2002) without substantially increasing steepness of the spawner-recruitment curve. It is to be noted that age specific weight, selectivity, and maturity data used in this rebuilding analysis were re-estimated in 2005 stock assessment; hence they are different from those used in the 2002 rebuilding analysis. Also, Methot and Piner (2002) used ages 3 – 70 and we used ages 0 – 70.

Results

The results from this analysis indicate that the yelloweye rockfish stock is behind in rebuilding schedule and will take longer time to rebuild then as indicated in the 2002 rebuilding analysis (Methot and Piner 2002). New T_{MIN} of 2036 and T_{MAX} of 2080 are 9 years longer than the T_{MIN} of 2027 and T_{MAX} of 2071 reported in the previous analysis (Table 1). Probabilities of recovery by current T_{TARGET} (2058) and T_{MAX} (2071) based on current SPR are low (Table 2). Probability of recovery by re-estimated T_{MAX} (2080) with current SPR is also low. The current harvest control rule (F = 0.0153) is too high to rebuild the stock by current T_{TARGET} and current T_{MAX} (Tables 3 and 4). Based on SSC run 6 settings (Table 5), where T_{MAX} and SPR are re-estimated and P_o = 80%, OY is projected to be 21.0 mt in 2007 and the stock is estimated to rebuild in year 2076. The longer recovery period predicted in this analysis may be due to the lower depletion level in 2004 and the re-estimated biological parameters in the 2005 assessment.

Literature Cited

Methot, R.D. 1990. Synthesis model: an adaptive framework for analysis of diverse stock assessment data. Int. N. Pac. Fish. Comm. Bull. 50:259-277.

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Methot, R.D., F.R. Wallace, and K.R. Piner 2003. Status of the Yelloweye rockfish (*Sebastes ruberrimus*) off the U.S. west coast in 2002. Pacific Fishery Management Council.

PFMC. 2004. Appendix H to Amendment 16-3 to the Pacific coast groundfish fishery management plan. Yelloweye rockfish (*Sebastes ruberrimus*) draft rebuilding plan. Adopted April 2004. Pacific Fishery Management Council.

Wallace, F.R., T. Tsou, and T.H. Jagielo. Status of the Yelloweye rockfish (*Sebastes ruberrimus*) off the U.S. West Coast in 2005. Pacific Fishery Management Council.

Table 1. Key parameters re-estimated in this rebuilding analysis.

FMSY proxy	0.032
FMSY SPR / SPR(F=0)	0.5
Virgin SPR	39.20
Generation time	44
Minimum Rebuild Time (from ydecl, 2002)	34
Maximum Rebuild Time (from yinit, 2004)	73
Virgin Spawning Output	7329
Target Spawning Output	2932
Current Spawning Output	1596
Spawning Output (ydecl)	1501
T_{MIN}	2036
T_{MAX}	2080
Prob (<0.4B0) in ydecl	1
Prob (<0.25 B0) in ydecl	1

Table 2. Summary of the six requested rebuilding runs to evaluate progress towards rebuilding. Estimated values are in bold.

Run #	Prob (recovery)	By	Based on	SPR	2007 OY
1	**0.000**	2058	Current SPR	0.591	34.6
2	0.5	2058	estimated SPR	**0.764**	**16.8**
3	**0.001**	2071	Current SPR	0.591	34.6
4	0.8	2071	estimated SPR	**0.744**	**18.5**
5	**0.003**	**2080**	Current SPR	0.591	34.6
6	0.8	**2080**	estimated SPR	**0.717**	**21.0**

Table 3. Summary table for analyses based on current T_{TARGET} (SSC runs 1 and 2).

Rebuild by current T_{TARGET} = 2058	P_{MAX}					F=0	Current SPR
	0.5	0.6	0.7	0.8	0.9		
Fishing rate	0.0114	0.0108	0.0102	0.0092	0.0082	0	User Specified
SPR RATE	0.764	0.773	0.785	0.802	0.821	0.000	0.591
2007 OY	16.8	16	15	13.6	12.1	0	34.6
Prob to rebuild by T_{MAX}	50.1	60.1	69.9	80.1	90.0	100.0	0.1
Median time to rebuild	51	49.1	47.3	44.8	42.5	29.6	-1
Prob overfished after rebuild	0	0	0	0	0	0.0	0.0
Median time to rebuild (yrs)	2058	2056.1	2054.3	2051.8	2049.5	2036.6	
Probability above current spawning outptut in 100 years	100	100	100	100	100	100.0	100.0
Probability above current spawning outptut in 200 years	100	100	100	100	100	100.0	100.0
Probability below 0.01B0 in 100 years	0	0	0	0	0	0.0	0.0
Probability below 0.01B0 in 200 years	0	0	0	0	0	0.0	0.0
Lower 5th percentile, spawning output / target in Tmax	0.901	0.914	0.929	0.951	0.977	1.203	0.685
Median spawning output / target in Tmax	1	1.015	1.031	1.055	1.083	1.330	0.780
Upper 5th percentile, spawning output / target in Tmax	1.115	1.131	1.149	1.176	1.206	1.478	0.9

Table 4. Summary table for analyses based on current T_{MAX} (SSC runs 3 and 4).

Rebuild by current T_{MAX} = 2071	P_{MAX}					F=0	Current SPR
	0.5	0.6	0.7	0.8	0.9		
Fishing rate	0.0149	0.0142	0.0134	0.0126	0.0115	0	User Specified
SPR RATE	0.708	0.718	0.731	0.744	0.761	0.000	0.591
2007 OY	21.9	20.9	19.7	18.5	17	0	34.6
Prob to rebuild by T_{MAX}	50	60.0	69.9	80.0	89.9	100.0	0.1
Median time to rebuild	64	61	57.4	54.5	51.4	29.6	-1
Prob overfished after rebuild	0	0	0	0	0	0.0	0.0
Median time to rebuild (yrs)	2071	2068	2064.4	2061.5	2058.4	2036.6	
Probability above current spawning outptut in 100 years	100	100	100	100	100	100.0	100.0
Probability above current spawning outptut in 200 years	100	100	100	100	100	100.0	100.0
Probability below 0.01B0 in 100 years	0	0	0	0	0	0.0	0.0
Probability below 0.01B0 in 200 years	0	0	0	0	0	0.0	0.0
Lower 5th percentile, spawning output / target in Tmax	0.883	0.901	0.922	0.944	0.972	1.361	0.685
Median spawning output / target in Tmax	1	1.02	1.044	1.068	1.099	1.528	0.780
Upper 5th percentile, spawning output / target in Tmax	1.121	1.142	1.169	1.195	1.229	1.699	0.9

Table 5. Summary table for analysis based on the re-estimated T_{MAX} (SSC runs 5 and 6).

Rebuild by re-estimated T_{MAX} = 2080	P_{MAX}					F=0	Current SPR
	0.5	0.6	0.7	0.8	0.9		
Fishing rate	0.0162	0.0156	0.015	0.0143	0.0134	0	User Specified
SPR RATE	0.687	0.696	0.706	0.717	0.731	0.000	0.591
2007 OY	23.9	23	22	21	19.7	0	34.6
Prob to rebuild by T_{MAX}	49.9	60.0	69.9	80.0	89.9	100.0	0.3
Median time to rebuild	73	68.5	64.6	61.3	57.4	29.6	-1
Prob overfished after rebuild	0	0	0	0	0	0.0	0.0
Median time to rebuild (yrs)	2080	2075.5	2071.6	2068.3	2064.4	2036.6	
Probability above current spawning outptut in 100 years	100	100	100	100	100	100.0	100.0
Probability above current spawning outptut in 200 years	100	100	100	100	100	100.0	100.0
Probability below 0.01B0 in 100 years	0	0	0	0	0	0.0	0.0
Probability below 0.01B0 in 200 years	0	0	0	0	0	0.0	0.0
Lower 5th percentile, spawning output / target in Tmax	0.886	0.904	0.923	0.943	0.97	1.473	0.7
Median spawning output / target in Tmax	1	1.019	1.04	1.063	1.092	1.645	0.8
Upper 5th percentile, spawning output / target in Tmax	1.128	1.149	1.172	1.197	1.23	1.833	0.9

Appendix. Input data for SSC runs 5 and 6

```
#1 Title
Yelloweye - STAR panel model (2005 base model)
#2 Number of sexes
1
#3 Age range to consider (minimum age; maximum age)
0 70
#4 Number of fleets
1
#5 First year of projection (Yinit, last year of assessment)
2004
#6 Year declared overfished (Ydecl, the first year of zero OY)
2002
#7 Is the maximum age a plus-group (1=Yes;2=No)
1
#8 Generate future recruitments using historical recruitments (1)  historical recruits/spawner (2)  or a stock-recruitment (3)
3
#9 Constant fishing mortality (1) or constant Catch (2) projections
1
#10 Fishing mortality based on SPR (1) or actual rate (2)
1
#11 Pre-specify the year of recovery (or -1) to ignore
-1
#12 Fecundity-at-age
#0	1	2	3	4	5	6	7	8	9	10	11	12	13
	14	15	16	17	18	19	20	21	22	23	24	25	26
	27	28	29	30	31	32	33	34	35	36	37	38	39
	40	41	42	43	44	45	46	47	48	49	50	51	52
	53	54	55	56	57	58	59	60	61	62	63	64	65
	66	67	68	69	70
 0	0	0	0.00001	0.00001	0.00002	0.00012	0.00059	0.00257
	0.00986	0.03223	0.08614	0.18720	0.33964	0.53421
	0.75494	0.98649	1.21780	1.44239	1.65719	1.86122
	2.05459	2.23789	2.41187	2.57722	2.73459	2.88453
	3.02746	3.16379	3.29381	3.41782	3.53605	3.64873
	3.75606	3.85825	3.95547	4.04793	4.13579	4.21922
	4.29842	4.37353	4.44474	4.51221	4.57610	4.63657
	4.69377	4.74786	4.79898	4.84728	4.89289	4.93595
	4.97659	5.01493	5.05109	5.08518	5.11732	5.14761
	5.17615	5.20303	5.22835	5.25219	5.27417	5.29485
	5.31432	5.33264	5.34988	5.36610	5.38135	5.39570
	5.40920	5.42189
#13 Age specific information (Females then males) weight  selectivity
# weighted average selectivity from 7 fisheries
0.0021	0.0118	0.0331	0.1309	0.1383	0.1880	0.2668	0.3610	0.4679	0.5859	0.7134	0.8491	0.9915
	1.1390	1.2905	1.4446	1.6003	1.7564	1.9122	2.0668	2.2196	2.3698	2.5171	2.6610	2.8012
	2.9374	3.0693	3.1968	3.3199	3.4384	3.5523	3.6615	3.7663	3.8665	3.9622	4.0536	4.1408
	4.2238	4.3028	4.3779	4.4492	4.5169	4.5811	4.6420	4.6996	4.7542	4.8059	4.8547	4.9009
	4.9445	4.9857	5.0246	5.0613	5.0959	5.1285	5.1593	5.1884	5.2157	5.2415	5.2657	5.2886
	5.3096	5.3293	5.3479	5.3654	5.3819	5.3973	5.4119	5.4256	5.4385	5.4507
0.0000	0.0000	0.0000	0.0033	0.0045	0.0152	0.0431	0.0975	0.1746	0.2583	0.3374	0.4097	0.4772
	0.5419	0.6039	0.6619	0.7139	0.7586	0.7953	0.8242	0.8458	0.8609	0.8705	0.8753	0.8762
	0.8739	0.8691	0.8623	0.8539	0.8445	0.8343	0.8237	0.8128	0.8019	0.7911	0.7805	0.7701
```

```
0.7601 0.7505 0.7413 0.7325 0.7241 0.7162 0.7086 0.7015 0.6948 0.6885 0.6825 0.6769
0.6717 0.6667 0.6621 0.6577 0.6536 0.6497 0.6461 0.6427 0.6395 0.6366 0.6338 0.6311
0.6287 0.6265 0.6244 0.6224 0.6206 0.6188 0.6172 0.6156 0.6142 0.6128
#14 M and initial age-structure
# for both female and male
0.045 0.045 0.045 0.045 0.045 0.045 0.045 0.045 0.045 0.045 0.045 0.045 0.045 0.045
0.045 0.045 0.045 0.045 0.045 0.045 0.045 0.045 0.045 0.045 0.045 0.045 0.045
0.045 0.045 0.045 0.045 0.045 0.045 0.045 0.045 0.045 0.045 0.045 0.045 0.045
0.045 0.045 0.045 0.045 0.045 0.045 0.045 0.045 0.045 0.045 0.045 0.045 0.045
0.045 0.045 0.045 0.045 0.045 0.045 0.045 0.045 0.045 0.045 0.045 0.045 0.045
0.045 0.045 0.045 0.045 0.045
99.1905 91.8831 83.9813 76.7590 71.5077 70.7876 64.6572
59.9013 50.4972 37.8697 31.0196 29.2413 27.0497
31.9434 42.4556 45.8211 39.1614 35.8022 45.0433
63.8793 67.0023 38.1170 27.2053 24.9897 25.8319
27.3087 13.2838 8.3970 7.9898 11.0186 12.2653 8.2142 6.6661
6.5892 8.9204 7.3214 4.1168 2.8078 2.1887 1.8787 1.7494 1.7485 1.8423 1.9926 2.1214
2.1031 1.9362 1.7787 1.7398 1.8629 2.3107 2.2559 2.2013 2.1467 2.0917 2.0366 1.9816
1.9272 1.8738 1.8214 1.7700 1.7194 1.6695 1.6201 1.5713 1.5231 1.4753 1.4282 1.3817
1.3359 31.3499
#15 Initial age-structure for Tmin
91.8993 83.9960 78.2496 77.4634 70.7692 65.6012 55.3610
41.5805 34.1181 32.2154 29.8439 35.2864 46.9488
50.7188 43.3844 39.6934 49.9720 70.9085 74.4082
42.3446 30.2301 27.7726 28.7110 30.3531 14.7642
9.3322 8.8787 12.2427 13.6259 9.1238 7.4029 7.3161 9.9027 8.1261 4.5685
3.1152 2.4279 2.0837 1.9400 1.9386 2.0424 2.2087 2.3511 2.3305 2.1453 1.9706 1.9273
2.0634 2.5591 2.4982 2.4376 2.3769 2.3159 2.2547 2.1936 2.1332 2.0740 2.0160 1.9590
1.9028 1.8475 1.7928 1.7388 1.6853 1.6324 1.5802 1.5287 1.4780 1.4280 1.3790 31.8758
#16 Year for Tmin Age-structure (Yinit or Ydecl)
2002
#17 Number of simulations
1000
#  recruitment and biomass
#18 Number of historical assessment years
52
# Historical data
#19 year recruitment spawner in B0 in R project in R/S project
1953 194.30 7616.60 1 1 0
1954 196.46 7363.68 1 1 0
1955 154.67 7363.68 1 1 0
1956 141.06 7326.69 1 1 1
1957 140.76 7289.63 1 1 1
1958 149.44 7252.56 1 1 1
1959 158.08 7215.57 1 1 1
1960 154.98 7178.72 1 1 1
1961 141.07 7142.12 1 1 1
1962 125.93 7105.83 1 1 1
1963 114.87 7069.88 1 1 1
1964 109.85 7034.18 1 1 1
1965 112.03 6998.34 1 1 1
1966 123.02 6961.55 1 1 1
1967 147.50 6922.62 1 1 1
1968 200.21 6880.39 1 1 1
1969 326.23 6834.18 1 1 1
1970 360.41 6783.93 1 1 1
```

1971	239.10	6721.78	1	1	1
1972	215.49	6643.59	1	1	1
1973	234.98	6545.60	1	1	1
1974	308.68	6429.03	1	1	1
1975	242.44	6292.86	1	1	1
1976	152.44	6136.51	1	1	1
1977	137.49	5961.41	1	1	1
1978	184.57	5769.40	1	1	1
1979	318.52	5570.13	1	1	1
1980	250.69	5332.85	1	1	1
1981	200.59	5091.07	1	1	1
1982	180.00	4576.07	1	1	1
1983	208.12	4243.87	1	1	1
1984	303.84	3940.69	1	1	1
1985	243.25	3774.49	1	1	1
1986	146.13	3574.64	1	1	1
1987	100.69	3456.59	1	1	1
1988	97.26	3281.88	1	1	1
1989	102.34	3088.85	1	1	1
1990	86.72	2831.84	0	0	0
1991	60.54	2664.92	0	0	0
1992	48.05	2411.94	0	0	0
1993	49.01	2159.36	0	0	0
1994	49.27	1962.46	0	0	0
1995	57.19	1859.49	0	0	0
1996	72.68	1738.52	0	0	0
1997	82.26	1642.82	0	0	0
1998	84.79	1520.40	0	0	0
1999	88.71	1505.68	0	0	0
2000	85.64	1449.61	0	0	0
2001	87.87	1483.79	0	0	0
2002	91.90	1501.40	0	0	0
2003	96.12	1550.05	0	0	0
2004	99.19	1595.52	0	0	0

#20 Number of years with pre-specified catches
3
#21 catches for years with pre-specified catches
2004 22
2005 26
2006 27
#22 Number of future recruitments to override
0
#23 Process for overiding (-1 for average otherwise index in data list)
#24 Which probability to product detailed results for (1=0.5; 2=0.6; 3=0.7; 4=0.8; 5=0.9; 6=Ttarget of Tmin+0.75(Tmax-Tmin); 7="F=0"; 8="40-10" rule; 9=ABC rule)
4
#25 Steepness sigma-R Auto-correlation (0.437 and 0.4 form yeye base model, same as in 2002 rebuilding)
0.437 0.40 0.00
#26 Target SPR rate (FMSY Proxy)
0.5
#27 Target SPR information: Use (1=Yes) and power
0 20
#28 Discount rate (for cumulative catch)
0.1
#29 Truncate the series when 0.4B0 is reached (1=Yes)
0

#30 Set F to FMSY once 0.4B0 is reached (1=Yes)
0
#31 Percentage of FMSY which defines Ftarget (see equation 7c and instrucion for #33)
0.9
#32 Maximum possible F for projection (-1 to set to FMSY, it is recommended the -1 be used, see instruciont #32)
-1
#33 Conduct MacCall transition policy (1=Yes)
0
#34 Defintion of recovery (1=now only;2=now or before, 2 is less conservative and should be for "rebuilt" case)
1
#35 Results for rec probs by Tmax (1) or 0.5 prob for various Ttargets (2)
1
#36 Definition of the "40-10" rule (should not be changed unless the "40-10" rule is changed)
10 40
#37 Produce the risk-reward plots (1=Yes,, don't do this untill the final calculation)
0
#38 Calculate coefficients of variation (1=Yes)
0
#39 Number of replicates to use (at least 10, this number is ignored unless #38 is 1)
20
#40 Random number seed (a number between -1 and -99999)
-34530
#41 Conduct projections for multiple starting values (0=No based on the "best estimates" ;else yes)
0
#42 File with multiple parameter vectors
MCMC.PRJ
#43 Number of parameter vectors (only matters if #41 is not zero)
100
#44 User-specific projection (1=Yes); Output replaced (1->9); type (0, 1, 2, 3); value (only used when type is not 0)
1 6 0 0.5
#45 Catches and Fs (Year; 1 or 2 (F/SPR or C); value); Final row is -1
2007 3 0.591
-1 -1 -1
#46 Split of Fs (first year MUST be Yinit)
2004 1
2005 1
2006 1
-1 1
Time varying weight-at-age (1=Yes;0=No)
0
File with time series of weight-at-age data
HakWght.Csv

Stock Assessment of Petrale Sole: 2004

Han-Lin Lai[1], Melissa A Haltuch[2], André E. Punt[2], Jason M. Cope[2]

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September 2005

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Executive Summary

Stock: This is a stock assessment of petrale sole (*Eopsetta jordani*) in U.S. waters off California, Oregon, and Washington. Genetic information and stock structure are not well known for this species. Previous assessments of petrale sole in the U.S. Vancouver and Columbia INPFC areas (named the Northern assessment area for this assessment) were conducted by Demory (1984), Turnock et al. (1993), and Sampson and Lee (1999). In this assessment, petrale sole in the Eureka, Monterey and Conception INPFC areas (the Southern assessment area) are assessed separately from those in the Northern assessment area. Data on growth, CPUE, and the geographical distribution of petrale sole along the U.S. Pacific coast support the use of two separate assessment areas.

Catches: Almost all catches of petrale sole have been taken with trawl gears. Recent petrale sole catch statistics by fishing year are summarized in Table E-1 and Figure E-1. Monthly catches demonstrate a strong seasonality in the two assessment areas with the catches during the winter months (November to February) being higher than during the summer months (March to October). As a result, the assessment is based on winter and summer fishing seasons with a fishing year that starts on November 1 and ends on October 31. In the Northern assessment area, the fisheries are divided into WA-Winter, WA-Summer, OR-Winter and OR-summer fisheries. In the Southern assessment area, the fisheries are divided into winter and summer fisheries. For the period 1981–2004, the calendar year landings (PacFIN database) ranged between 824–1,778 mt in the Northern assessment area and 420–992 mt in the Southern assessment area. Catches for 1956–81 were obtained from Sampson and Lee (1999) based on the HAL database, which has been archived by PacFIN. Pre-1956 catches were estimated from several reports: Heimann and Carlisle (1970) for the Southern assessment area, Cleaver (1951) and Smith (1950) for Oregon, and WDF (1956) and Alverson and Chatwin (1957) for Washington. Discard rates for petrale sole were estimated by Demory (1984) for the period 1977–82, by Sampson and Lee (1999) for the period 1986–87 (based on the studies of Pikitch et al. (1988)), and by the NWFSC Groundfish Observer program for the period 2001–04.

Data and Assessment: A variety of data sources were used in the assessment: 1) biomass indices and length compositions from the NMFS Triennial Surveys in 1980, 1983, 1986, 1989, 1992, 1995, 1998, 2001, and 2004; 2) standardized CPUE indices for 1987–2003 for each fishery; 3) length compositions of ODFW and WDFW commercial landings from the PacFIN BDS database; and 4) length and age compositions of California commercial landings from the CALCOM database. The data sources included in the assessment were analyzed using the length-and-age structured Stock Synthesis 2 (SS2) Model developed by Dr. Richard Methot (NOAA Fisheries).

Unresolved Problems and Major Uncertainties: The major sources of uncertainty in this stock assessment include: 1) comparability of age data between age-reading laboratories and within laboratories over time (due to changes in ageing methods, and inadequate otolith sampling and between-laboratory variation); 2) the impact of fishery regulations on the utility of CPUE as an index of relative abundance for recent years (i.e., after 1999); 3) the use of an assumed value for the rate of natural mortality; 4) the impact of sampling and ageing methods on the values for the parameters of the von Bertalanffy growth curve; 5) the lack of historical discard rates and lengths, and 6) the impact of assumptions regarding length-based selectivity and retention curves for fisheries and surveys.

Reference Points: The Pacific Fishery Management Council uses the 40:10 control rule as the default harvest rate policy for groundfish. The target (MSY-proxy) harvest rate for petrale sole is $F_{40\%}$. The target spawning biomass levels, 0.4 SB_0, are 5,753 mt and 6,394 mt in the northern and southern areas, respectively. Given the life history of petrale sole, this corresponds to an exploitation rate of 12% and 14%, respectively for the Northern and Southern assessment areas based on the exploitation rates in 2004. At this exploitation rate, the recruits, spawning stock biomass, Maximum Sustainable Yield (MSY), and age 3^+ biomass are:

	Estimates	
	Northern Area	Southern Area
Unfished Spawning Stock Biomass (SB_0)	14,382	15,985
Unfished Summary Biomass, Age 3^+	25,165	28,920
Unfished Recruitment (age0)	12,174	14,829
SB_{MSY}	2,658	4,121
Basis for SB_{MSY}	SB_{MSY}	SB_{MSY}
SPR_{MSY}	0.214	0.330
Basis for SPR_{MSY}	F_{MSY}	F_{MSY}
Exploitation Rate at SPR_{MSY}	0.12	0.14
MSY	1,760	1,404

Stock Biomass: The estimated spawning stock biomass of petrale sole in the Northern assessment area reached the historical low in 1992 (1,267 mt or 8.8% SB_0, Figure E-2). It has increased steadily since that point: to 1,554 mt (11% SB_0) in 1995, and to 4,960 mt (34% SB_0) in 2005 (Table E-1). The estimated spawning stock biomass of petrale sole in the Southern assessment area reached the historical low in 1986 (1,012 mt or 6% SB_0, Figure E-2). The biomass in the Southern assessment area was generally stable over the next ten years, reaching 1,252 mt (8% SB_0) by 1995. However, the estimated spawning biomass has increased rapidly in recent years, with a value of 4,667 mt (29% SB_0) in 2005 (Table E-1).

Recruitment: Annual recruitment was treated as stochastic, and estimated as annual deviations from log-mean recruitment. In the Northern assessment area, recruitment decreased since 1980 and reached the historical low in 1989, but generally increased after

1990 (Figure E-2). In the Southern assessment area, recruitment decreased through the 1980s, reaching the historical low during 1988, but generally increased after 1990 (Figure E-2).

Exploitation Status: The current assessment indicates that petrale sole was below 25% of SB_0 during 1980–2002 in the northern assessment area (Figure E-2) and during 1974–2004 in the southern assessment area (Figure E-2). The depletion level in 2005 is estimated to be 34% and 29% of SB_0 respectively for the northern and southern areas.

Management Performance: Petrale sole off the U.S. west coast have been managed historically using a coastwide ABC which represents the sum of ABCs calculated for the four INPFC areas (U.S. Vancouver-Columbia, Eureka, Monterey, and Conception; Table E-1). During 1995–2000, the coastwide total annual catch (landings and discard combined) did not exceed the ABC. However, the total annual catch in the Northern assessment area has exceeded the portion of the ABC attributed to that area since 2001.

Forecasts: A 12-year forecast of stock abundance and yield was developed using the base model (Table E-2). The 40:10 control rule reduces forecasted yields in the both assessment areas below those corresponding to $F_{40\%}$ because the stocks are estimated to be lower than the management target of $SB_{40\%}$. The 2004 exploitation rate was used to distribute catches among the four fisheries in the Northern assessment area. In contrast, the 5-yr (2000–4) average relative exploitation rate was used to distribute catches between the winter and summer fisheries in the Southern assessment area.

Decision Table: Decision tables (Table E-3) for the Northern and Southern assessment areas were constructed using three possible management actions: 1) catches are set at the forecast (40-10 control rule) catch level using a low spawning biomass model, 2) catches are set at the forecast catch level using the base model, and 3) catches are set at the forecast catch level using a high spawning biomass model. The results for 12-year projections of spawning biomass and stock depletion are evaluated for the base model as well as high and low spawning biomass models.

Research and Data Needs: The STAT identifies the following research needs (not in priority order):

A. Survey age data should be made available. Young individuals are not well represented in the fishery age and length compositions owing to discarding. The 2004 survey age determination data provide the growth parameters used in the assessment model for the Northern assessment area   It would be beneficial to future assessments if age data from surveys were available because they provide recruitment information as well as age compositions and information about growth.

B. Increase efforts to collect commercial fishery length and age data. Length and age data are sporadic after 1999. Without age data, the ability to estimate year-class strength and the extent of variation in recruitment is compromised. Uncertainty will continue unless additional length and age composition data become available.

C. Age-error matrices. Estimation of the age compositions and mean-size-at-age for petrale sole may be compromised because of the use of different ageing methods over time and sampling designs that differ among the states. Between-agencies age error matrices should be constructed.

D. Effect of fishery regulations. The impacts of trip-limits and other management approaches, such as closed areas, on discards and fishery selectivity requires further study.

E. Studies on stock structure of petrale sole.

F. Collect length compositions for discarded petrale sole.

G. Winter-summer spawning migration should investigated in the field and be incorporated into future assessment models.

H. Examine the advantages and disadvantages of different ways for constructing age and size compositions.

Table E-1. A summary of reference point statistics.

Element		1995	1996	1997	1998	1999	2000	2001	2002	2003	2004	2005
Total Catch (mt)[1]	Coastwide	1,669	1,942	2,061	1,724	1,616	1,892	1,959	2,009	1,832	2,377	
North	Landings	920	932	880	1,015	857	1,059	1,180	1,258	1,270	1,716	
	Predicted Discards*	71	73	70	74	62	78	89	91	87	134	
South	Landings	662	914	1,084	619	680	736	674	644	464	514	
	Predicted Discards	17	23	27	15	17	18	17	16	12	13	
ABC (mt)	Coastwide	2,700	2,700	2,700	2,700	2,700	2,950	2,762	2,762	2,762	2,762	2,736**
	North	1,200	1,200	1,200	1,200	1,200	1,450	1,262	1,262	1,262	1,262	2,045**
	South	1,500	1,500	1,500	1,500	1,500	1,500	1,500	1,500	1,500	1,500	691**
SPR	North	0.2225	0.2258	0.2445	0.2333	0.3062	0.3039	0.3126	0.3241	0.3573	0.3199	
	South	0.2942	0.2425	0.1881	0.3240	0.3129	0.2877	0.3041	0.3453	0.5355	0.6582	
Age3+ Biomass	Coastwide	8,292	8,763	9,313	10,037	10,985	12,005	12,887	15,392	17,956	20,831	23,056
(mt)	North	4,584	4,660	5,153	6,086	6,843	7,782	8,545	10,347	11,343	11,959	12,032
	South	3,708	4,103	4,159	3,951	4,142	4,223	4,343	5,046	6,613	8,872	11,024
Spawing Biomass	Coastwide	2,807	3,165	3,334	3,358	3,784	4,411	4,813	5,178	5,911	7,687	9,628
(mt)	North Estimate	1,554	1,601	1,639	1,779	2,062	2,602	3,038	3,383	3,863	4,631	4,960
	std deviation	166	173	182	197	227	273	324	378	445	543	644
	South Estimate	1,252	1,564	1,695	1,579	1,723	1,809	1,775	1,795	2,048	3,056	4,667
	std deviation	281	311	335	342	363	380	384	401	455	602	888
Recruitment	Coastwide	18,260	15,427	18,141	22,593	49,709	29,184	24,183	19,034	23,499	18,977	22,191
	North Estimate	13,041	10,832	10,966	11,501	23,398	12,239	10,227	11,522	15,546	9,661	11,401
	std deviation	3,143	2,802	3,372	3,612	4,549	3,987	3,530	4,124	6,945	4,836	503
	South Estimate	5,219	4,595	7,175	11,092	26,311	16,945	13,956	7,512	7,953	9,315	10789.9
	std deviation	1,474	1,393	1,731	2,776	6,701	5,191	5,345	3,577	3,764	4,340	1,014
Depletion	Coastwide	9%	10%	11%	11%	12%	15%	16%	17%	19%	25%	32%
	North	11%	11%	11%	12%	14%	18%	21%	24%	27%	32%	34%
	(std deviation)										(4%)	(5%)
	South	8%	10%	11%	10%	11%	11%	11%	11%	13%	19%	29%
	(std deviation)										(4%)	(5%)

1 All catches are reported by fishing year
* based on assumed discard rates of 10% in summer and 5% in winter
** PFMC GMT projected coastwide OY/ABC = 2,762 mt with the landed catch split 75:25 between the northern and southern areas

Table E-2. 12-yr forecasts for the Northern and Southern assessment areas.

Northern Assessment Area

					WA Winter Fishery				WA Summer Fishery				OR Winter Fishery				OR Summer Fishery			
Year	Age3+ (mt)	SB (mt)	Depletion	age0 (,000)	Total Catch	Retain-ed	Discard-ed	Harvest Rate	Total Catch	Retain-ed	Discard-ed	Harvest Rate	Total Catch	Retain-ed	Discard-ed	Harves t Rate	Total Catch	Retain-ed	Discard-ed	Harvest Rate
2005	12,032	4,960	34%	10,061	353	317	35	4.7%	349	314	35	4.7%	811	730	81	10.9%	583	525	58	7.9%
2006	12,130	4,859	34%	11,378	353	317	35	4.8%	349	314	35	4.8%	811	730	81	10.9%	583	525	58	8.1%
2007	11,718	4,716	33%	11,344	218	196	22	3.0%	213	192	21	2.9%	501	451	50	6.9%	356	321	36	4.8%
2008	11,953	5,077	35%	11,426	239	215	24	3.1%	230	207	23	3.0%	550	495	55	7.2%	385	347	39	5.0%
2009	12,102	5,245	36%	11,461	250	225	25	3.2%	237	213	24	3.0%	574	517	57	7.2%	396	357	40	5.0%
2010	12,170	5,276	37%	11,468	252	226	25	3.2%	238	214	24	3.0%	579	521	58	7.3%	398	358	40	5.0%
2011	12,228	5,299	37%	11,472	252	227	25	3.2%	238	215	24	3.0%	580	522	58	7.3%	399	359	40	5.0%
2012	12,288	5,332	37%	11,478	253	228	25	3.2%	240	216	24	3.0%	583	524	58	7.3%	401	361	40	5.1%
2013	12,343	5,366	37%	11,485	255	230	26	3.2%	242	217	24	3.0%	587	528	59	7.3%	404	364	40	5.1%
2014	12,390	5,396	38%	11,491	257	231	26	3.2%	243	219	24	3.0%	590	531	59	7.3%	406	366	41	5.1%
2015	12,428	5,421	38%	11,496	258	232	26	3.2%	244	220	24	3.0%	594	534	59	7.3%	409	368	41	5.1%
2016	12,458	5,440	38%	11,499	259	233	26	3.2%	245	221	25	3.0%	596	537	60	7.3%	410	369	41	5.1%

Southern assessment area

					Winter Fishery				Summer Fishery			
Year	Biomass Age3+ (mt)	SB (mt)	Depletion Level	Recruits age0 (,000)	Total Catch	Retention	Discard	Harvest Rate	Total Catch	Retention	Discard	Harvest Rate
2005	11,024	4,667	29.2%	10,790	400	390	10	7.3%	267	260	7	4.9%
2006	12,485	5,998	37.4%	12,759	400	390	10	6.5%	267	260	7	4.7%
2007	13,346	6,838	42.4%	13,119	1,052	1,025	26	17.0%	576	562	14	11.3%
2008	12,776	6,467	40.1%	12,969	934	911	23	17.0%	509	497	13	11.3%
2009	12,272	5,959	37.0%	12,740	836	815	21	16.5%	465	454	12	11.0%
2010	12,019	5,569	34.6%	12,543	785	766	20	16.1%	451	440	11	10.8%
2011	12,002	5,380	33.4%	12,439	781	762	20	15.9%	460	448	11	10.6%
2012	12,110	5,369	33.4%	12,433	801	781	20	15.9%	474	462	12	10.6%
2013	12,245	5,436	33.8%	12,470	821	801	21	16.0%	485	473	12	10.7%
2014	12,356	5,510	34.3%	12,511	835	814	21	16.1%	492	480	12	10.7%
2015	12,430	5,564	34.6%	12,540	842	821	21	16.2%	495	482	12	10.8%
2016	12,476	5,592	34.8%	12,555	844	823	21	16.2%	495	483	12	10.8%

Table E-3. The decision tables for petrale sole in the northern, southern and coastwide assessment areas.

Northern Assessment Area

Management Action	Year	40:10 adj. Catch	Low Spawning Biomass Model (Base Model 2004 SB-1.25*SD) SB	Depletion	Base Model (Base Model 2004 SB) SB	Depletion	High Spawning Biomass Model (Base Model 2004 SB+1.25*SD) SB	Depletion
Low catch	2005	2,095	4,038	28%	4,960	34%	5,915	41%
(from Low Spawning	2006	2,095	3,742	26%	4,859	34%	6,035	42%
Biomass Model)	2007	818	3,454	24%	4,716	33%	6,054	42%
	2008	1,001	3,977	28%	5,340	37%	6,780	47%
	2009	1,128	4,344	30%	5,735	40%	7,193	50%
	2010	1,207	4,569	32%	5,937	41%	7,356	51%
	2011	1,267	4,744	33%	6,071	42%	7,424	51%
	2012	1,316	4,888	34%	6,167	43%	7,445	51%
	2013	1,356	5,004	35%	6,230	43%	7,428	51%
	2014	1,388	5,099	36%	6,268	44%	7,383	51%
	2015	1,415	5,174	36%	6,285	44%	7,321	51%
	2016	1,436	5,233	37%	6,286	44%	7,246	50%
Medium catch	2005	2,095	4,038	28%	4,960	34%	5,915	41%
(from Base Model)	2006	2,095	3,742	26%	4,859	34%	6,035	42%
	2007	1,289	3,454	24%	4,716	33%	6,054	42%
	2008	1,405	3,721	26%	5,077	35%	6,512	45%
	2009	1,457	3,867	27%	5,245	36%	6,694	46%
	2010	1,466	3,922	27%	5,276	37%	6,685	46%
	2011	1,469	3,985	28%	5,299	37%	6,643	46%
	2012	1,477	4,062	28%	5,332	37%	6,603	46%
	2013	1,487	4,141	29%	5,366	37%	6,561	45%
	2014	1,497	4,216	29%	5,396	38%	6,516	45%
	2015	1,505	4,285	30%	5,421	38%	6,469	45%
	2016	1,511	4,347	30%	5,440	38%	6,421	44%
High catch	2005	2,095	4,038	28%	4,960	34%	5,915	41%
(from High Spawning	2006	2,095	3,742	26%	4,859	34%	6,035	42%
Biomass Model)	2007	1,754	3,454	24%	4,716	33%	6,054	42%
	2008	1,788	3,470	24%	4,818	34%	6,248	43%
	2009	1,769	3,411	24%	4,776	33%	6,215	43%
	2010	1,720	3,313	23%	4,650	32%	6,047	42%
	2011	1,675	3,270	23%	4,565	32%	5,897	41%
	2012	1,642	3,278	23%	4,533	32%	5,794	40%
	2013	1,614	3,313	23%	4,532	32%	5,722	40%
	2014	1,596	3,362	23%	4,551	32%	5,675	39%
	2015	1,584	3,418	24%	4,581	32%	5,643	39%
	2016	1,575	3,475	24%	4,614	32%	5,621	39%

Table E-3. Continued.

Southern Assessment Area

Management Action	Year	40:10 adj. Catch	Low Spawning Biomass Model (Base Model 2004 SB-1.25*SD) SB	Depletion	Base Model (Base Model 2004 SB) SB	Depletion	High Spawning Biomass Model (Base Model 2004 SB+1.25*SD) SB	Depletion
Low catch	2005	667	3,630	22%	4,667	29%	5,735	43%
(from Low Spawning	2006	667	4,431	26%	5,998	38%	7,863	59%
Biomass Model)	2007	1,048	4,960	30%	6,838	43%	9,070	68%
	2008	975	4,897	29%	6,870	43%	9,190	69%
	2009	929	4,730	28%	6,691	42%	8,931	67%
	2010	932	4,620	28%	6,526	41%	8,595	65%
	2011	982	4,640	28%	6,476	41%	8,320	63%
	2012	1,050	4,779	29%	6,543	41%	8,133	61%
	2013	1,109	4,955	30%	6,654	42%	7,988	60%
	2014	1,152	5,111	31%	6,757	42%	7,859	59%
	2015	1,180	5,229	31%	6,835	43%	7,734	58%
	2016	1,200	5,311	32%	6,886	43%	7,612	57%
Medium catch	2005	667	3,630	22%	4,667	29%	5,735	43%
(from Base Model)	2006	667	4,431	26%	5,998	38%	7,863	59%
	2007	1,628	4,960	30%	6,838	43%	9,070	68%
	2008	1,444	4,498	27%	6,467	40%	8,826	67%
	2009	1,301	4,008	24%	5,959	37%	8,269	62%
	2010	1,237	3,677	22%	5,569	35%	7,730	58%
	2011	1,241	3,557	21%	5,380	34%	7,331	55%
	2012	1,275	3,610	22%	5,369	34%	7,078	53%
	2013	1,307	3,729	22%	5,436	34%	6,905	52%
	2014	1,327	3,827	23%	5,510	34%	6,769	51%
	2015	1,337	3,876	23%	5,564	35%	6,651	50%
	2016	1,340	3,879	23%	5,592	35%	6,543	49%
High catch	2005	667	3,630	22%	4,667	29%	5,735	43%
(from High Spawning	2006	667	4,431	26%	5,998	38%	7,863	59%
Biomass Model)	2007	2,458	4,960	30%	6,838	43%	9,070	68%
	2008	2,058	3,934	23%	5,893	37%	8,307	63%
	2009	1,797	3,036	18%	4,965	31%	7,361	55%
	2010	1,648	2,434	15%	4,291	27%	6,556	49%
	2011	1,579	2,146	13%	3,927	25%	5,994	45%
	2012	1,546	2,097	13%	3,820	24%	5,659	43%
	2013	1,524	2,139	13%	3,841	24%	5,461	41%
	2014	1,504	2,151	13%	3,889	24%	5,337	40%
	2015	1,478	2,085	12%	3,918	25%	5,250	40%
	2016	1,456	1,947	12%	3,920	25%	5,185	39%

Table E-3. Continued.

Coastwide

Management Action	Year	40:10 adj. Catch	Low Spawning Biomass Model (Base Model 2004 SB-1.25*SD) SB	Depletion	Base Model (Base Model 2004 SB) SB	Depletion	High Spawning Biomass Model (Base Model 2004 SB+1.25*SD) SB	Depletion
Low catch	2005	2,762	7,667	25%	9,628	32%	11,650	38%
(Projected from Low	2006	2,762	8,173	27%	10,858	36%	13,898	46%
Spawning Biomass	2007	1,866	8,415	28%	11,554	38%	15,124	50%
Model)	2008	1,976	8,873	29%	12,211	40%	15,970	53%
	2009	2,057	9,074	30%	12,426	41%	16,124	53%
	2010	2,139	9,189	30%	12,463	41%	15,951	53%
	2011	2,249	9,385	31%	12,546	41%	15,744	52%
	2012	2,366	9,667	32%	12,710	42%	15,577	51%
	2013	2,465	9,959	33%	12,884	42%	15,416	51%
	2014	2,541	10,210	34%	13,026	43%	15,243	50%
	2015	2,595	10,403	34%	13,121	43%	15,055	50%
	2016	2,635	10,544	35%	13,172	43%	14,857	49%
Medium catch	2005	2,762	7,667	25%	9,628	32%	11,650	38%
(from Base Model)	2006	2,762	8,173	27%	10,858	36%	13,898	46%
	2007	2,916	8,415	28%	11,554	38%	15,124	50%
	2008	2,849	8,220	27%	11,544	38%	15,338	51%
	2009	2,758	7,875	26%	11,204	37%	14,963	49%
	2010	2,702	7,598	25%	10,846	36%	14,415	47%
	2011	2,710	7,542	25%	10,679	35%	13,974	46%
	2012	2,752	7,673	25%	10,701	35%	13,681	45%
	2013	2,794	7,869	26%	10,802	36%	13,466	44%
	2014	2,824	8,043	26%	10,907	36%	13,286	44%
	2015	2,841	8,161	27%	10,985	36%	13,120	43%
	2016	2,851	8,226	27%	11,031	36%	12,964	43%
High catch	2005	2,762	7,667	25%	9,628	32%	11,650	38%
(Projected from High	2006	2,762	8,173	27%	10,858	36%	13,898	46%
Spawning Biomass	2007	4,212	8,415	28%	11,554	38%	15,124	50%
Model)	2008	3,845	7,404	24%	10,711	35%	14,554	48%
	2009	3,566	6,447	21%	9,741	32%	13,577	45%
	2010	3,368	5,746	19%	8,941	29%	12,603	42%
	2011	3,254	5,415	18%	8,492	28%	11,891	39%
	2012	3,189	5,375	18%	8,353	28%	11,452	38%
	2013	3,138	5,451	18%	8,372	28%	11,183	37%
	2014	3,100	5,514	18%	8,440	28%	11,012	36%
	2015	3,062	5,503	18%	8,499	28%	10,893	36%
	2016	3,032	5,422	18%	8,534	28%	10,806	36%

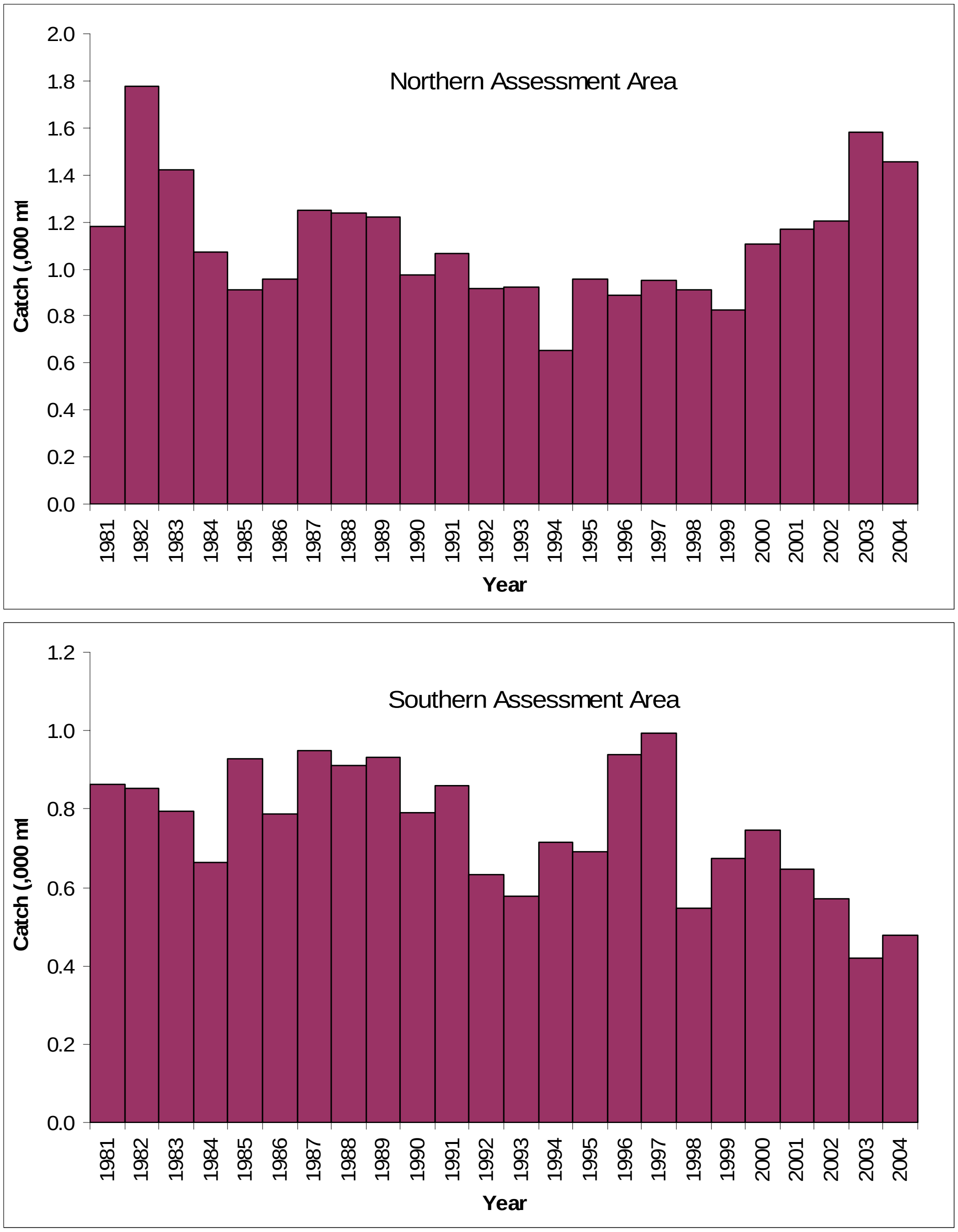


Figure E-1. Annual landings (1982–2004) extracted from the PacFIN database.

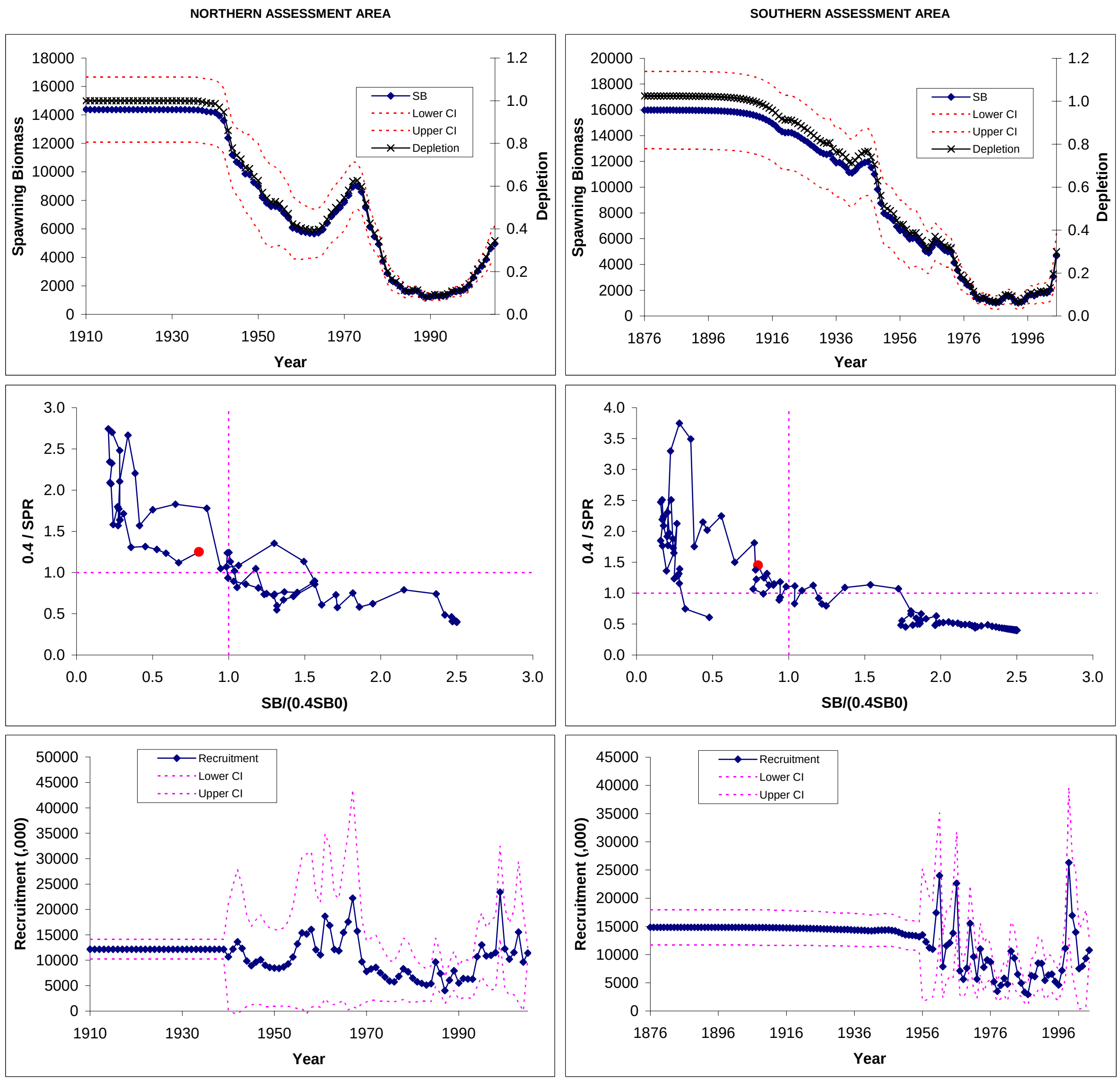


Figure E-2. Trajectories of spawning biomass (SB), depletion, recruitment and spawning potential ratio relative to the proxy target of 40% vs. estimated spawning biomass relative to the proxy 40% level.

Updated Rebuilding Analysis for Canary Rockfish Based on Stock Assessment in 2005

October 2005

Richard Methot
National Marine Fisheries Service

Summary

The rebuilding analysis for canary rockfish was first conducted in 2000 based on the 1999 stock assessment then updated in 2002 on the basis of the first coastwide assessment. The 2005 stock assessment, as amended following SSC review in September 2005, included a base model and an alternative model based on a different configuration regarding male-female selectivity. The two models were considered equally plausible by the SSC and both are carried into the rebuilding analysis. By re-sampling from alternative input parameter sets, the rebuilding analysis result now integrates across the two alternate models, the probability profile of different spawner-recruitment steepness levels within each model, and the variability in future recruitments. As a result, this document dated Oct. 7, 2005 is a complete replacement for the preliminary rebuilding analysis presented to the SSC in September.

The mean estimate of the B_0 is 34,155 mt of female spawning biomass and the stock is at 9.4% of this level at the beginning of 2005 when integrated across the steepness profiles for each model. The steepness of the spawner-recruitment relationship, which largely determines the rate of increase in recruitment as the stock rebuilds, is 0.32 in the base model, 0.45 in the alternate model, and has a mean estimate of 0.40 when integrated across the probability profiles for the two models. The estimated generation time increased from 19 years in the 2002 model to 23 years due to a decrease in the estimate of natural mortality for older females. The current OY of about 47 mt is not overfishing and the stock is expected to continue rebuilding at that level of harvest. The current rebuilding harvest rate would produce an OY of 43 mt in 2007 and has a 57.4% probability of rebuilding by the current T_{target} (2074) and a 58.5% probability of rebuilding by the current T_{max} (2076). Because this new analysis is now able to incorporate 3 sources of uncertainty, rather than just 1, it takes rather large changes in harvest rate (and short-term OY) to make large changes in the probability of rebuilding. The harvest rate that would produce a 50% probability of rebuilding by T_{target} (2074) is twice the level that would produce a 60% probability of rebuilding by T_{max} (2076).

Introduction

The stock assessment for canary rockfish in 1999 documented that the stock had declined below the overfished level (25% of B_0) in the northern area (Columbia and U.S. Vancouver INPFC areas; Crone et al., 1999) and in the southern area (Williams et al., 1999). Canary rockfish was determined to be in an "overfished" state on Jan. 1, 2000 and development of a rebuilding plan was initiated while preliminary rebuilding estimates were implemented through adjustments of annual management measures. The first rebuilding analysis (Methot, 2000) used results from the northern area assessment to project rates of potential stock recovery. The stock was found to have extremely low productivity. The initial rebuilding OY for 2001 and 2002 was set at 93 mt based upon a 50% probability of rebuilding by the year 2057 and maintaining a constant catch throughout the rebuilding period. The rebuilding analysis was updated in 2002 (Methot and Piner, 2002) to incorporate the coastwide assessment results and to switch to a constant exploitation rate, as in other west coast groundfish rebuilding plans. The results of the 2002 assessment and rebuilding analysis indicated that the spawning stock abundance, as a percentage of its unfished level, reached a low of 6.6% in 2000, the year of the overfished declaration. By 2002 it had increased to 7.9%. The generation time was calculated to be 19 years. The rate of rebuilding was based on the estimated spawner-recruitment relationship with steepness of 0.33 and sampling lognormally distributed random recruitment deviations around this relationship. The time to rebuild with no fishing, T_{min}, was estimated to be year 2057. The T_{max} was calculated to be the year 2076 (2057 plus 19 years for the generation time) and the T_{target} was set to 2074 on the basis of a rebuilding rate that would achieve a 60% probability of rebuilding by 2076. This rebuilding harvest rate produced an OY in 2003 of 41 mt. The rate of rebuilding was most sensitive to the steepness of the spawner-recruitment relationship. In addition, the 2002 analysis demonstrated the sensitivity of the OY to the commercial:recreational allocation because of the difference in selectivity between the two gear groups. Final rebuilding calculations were based upon a 50:50 commercial:recreational split in catch. The rebuilding plan that incorporated these results was completed as Amendment 16 to the groundfish fishery management plan in 2003.

This document presents an updated rebuilding analysis based upon the stock assessment in 2005 (Methot and Stewart, 2005).

Assessment Summary

Methot and Stewart (2005) used data through 2004 and a revised assessment model to update the coastwide assessment of canary rockfish. Primary changes included:

- Addition of the 2004 trawl survey and catch data through 2004
- Recalculation of all historical fishery catch and size/age composition data
- Extend model time series back to 1916
- Include new calibration of ageing method
- Convert from age-based selectivity to size-based selectivity

- Implement the assessment in the ADMB-coded Stock Synthesis 2 using length-based selectivities

This update to the canary rockfish rebuilding analysis incorporates additional changes made as a result of the SSC review of the canary rockfish assessment, Sept. 27-30, 2005; Seattle, WA. After examining several issues that had not been specifically examined in the assessment (trawl survey catchability, recruitment variability, and juvenile recruitment survey) the SSC recommended no changes to the base model. However, the SSC concluded that the parametric variance around a single base model underestimated the overall uncertainty in the canary rockfish assessment. After re-examining some of the sensitivity analyses included in the assessment, the SSC concluded that an alternative configuration of the male-female selectivity parameters was as plausible as the base model. The two model scenarios are labeled here as Diff (base) and NoDiff (alternate).

NoDiff - The 2002 assessment model had been configured to allow for a difference in the age-selectivity for older females relative to males. Because females grow larger than males and because the model was being shifted to length-selectivity, this pre-STAR model configuration did not allow for a difference in length-selectivity between larger females and males.

Diff – Alternative model configurations considered during the STAR panel meeting disclosed that allowing for a differential selectivity for larger sized female canary rockfish provided a modestly significant improvement in the fit to the overall data set. This difference is allowed in the 3 trawl fisheries (northern Cal, Oregon, and Washington) and the trawl survey and required that 8 additional model parameters be estimated. Because of the improved statistical fit, this model was adopted as the post-STAR base model and used as the basis for the rebuilding analysis.

Another change that occurred at the STAR panel was the extent of re-weighting of data variance on the basis of the model's goodness-of-fit to the data in preliminary model runs. The post-STAR Diff model had re-weighted all data elements, which resulted in some down-weighting of the trawl survey biomass index. In order to assure consistent performance between the Diff and NoDiff models, the post-SSC configurations continued to allow re-weighting of the age and length composition data, but not the trawl survey biomass index.

After considerable deliberation, the SSC concluded that the Diff base model and the NoDiff alternate model should both be included in the rebuilding analysis as equally probable scenarios and that the uncertainty within each configuration should also be represented in the rebuilding analysis. The maximum likelihood estimates for the two models are shown in Table 1. Other quantities necessary for the rebuilding analysis are shown in Tables 2 and 3.

Rebuilding Calculations

The rebuilding analysis was conducted using software developed by A. Punt (version 2.8a, April 2005). This software conducts stochastic simulations of future stock abundance and determines levels of future fishing mortality that are consistent with specified probabilities and time frames for rebuilding. The steps when conducting a rebuilding analysis are:

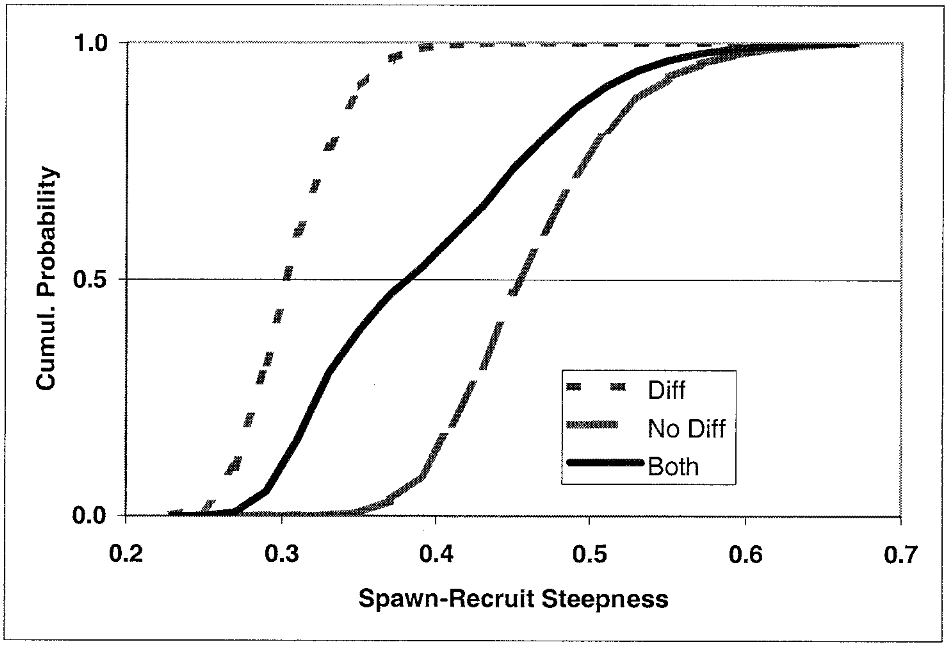
1. Estimation of the unfished level of abundance, B_0 (and hence the rebuilding target, $0.4B_0$);
2. Selection of a method to generate future recruitment;
3. Specification of the mean generation time;
4. Calculation of the minimum rebuilding time, $T_{min;}$
5. Calculation of the maximum possible rebuilding time, $T_{max;}$
6. Identification and analysis of alternative harvest strategies.

Estimation of B_0

The stock assessment was conducted using the Stock Synthesis 2 software (Methot, 2005). In this model, annual recruitments are defined as deviations from a long-term spawner-recruitment relationship. Thus, this relationship provides the required information about the central tendency of recruitments. A Beverton-Holt relationship was used in the assessment and trial model runs with a Ricker relationship produced nearly identical results. The modeled time series started in 1916, the year in which canary rockfish catch is first detected. This is earlier than the start year of 1941 used in the 2002 assessment. Although the cumulative catch prior to 1941 in the 2005 assessment is similar to the initial equilibrium catch level of 500 mt per annum used in the 2002 assessment, the difference in start year has an effect on the B_0 estimate because of the low spawner-recruitment steepness. With the initial equilibrium catch approach, the R_0 level of recruitment is applied, even though the initial equilibrium catch is reducing the spawning biomass. This is a satisfactory assumption as long as the catch is not too high and the spawner-recruitment steepness is not low. With the long time series approach, the initial equilibrium catch is zero, so no approximation is necessary, and the estimated level of recruitment declines from R_0 as the annual catches reduce the spawning biomass. For canary rockfish, this contributes to a higher level for R_0 in the 2005 assessment than in the 2002 assessment.

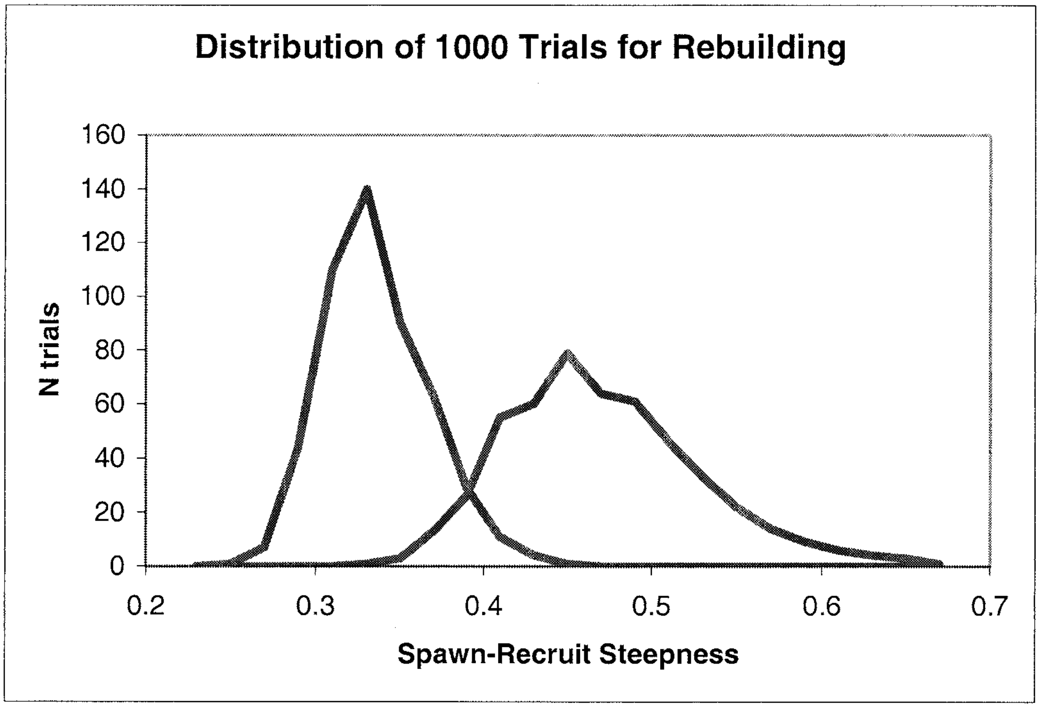
The uncertainty in the Diff model had been characterized both by the parametric estimate of variance for model outputs and by conducting a profile along a range of values for the spawner-recruitment steepness parameter. These alternative estimates of uncertainty were shown in the assessment document to be very similar, although low. The single maximum likelihood estimate from the Diff model (with an estimated steepness of 0.32) was used for the preliminary rebuilding analysis presented to the SSC in September 2005, and the upper 95% range (steepness = 0.38) was used in a rebuilding run to characterize uncertainty. In order to much more fully characterize the uncertainty, the following procedure was used:

1. Conduct a profile on the steepness parameter for the Diff model and for the NoDiff model (Table 4). Steepness values ranged from 0.23 to 0.67 with a step of 0.02 to create these profiles covering the range over which there was more than negligible probability. The NoDiff model fits better at a higher steepness values and over a broader range. The best-fitting NoDiff model fits best at a steepness of 0.45 and produces an ending biomass level that is approximately twice as high as the ending biomass in the Diff model.



While this procedure captures much more of the uncertainty in the model results than has been possible in most other assessments, it still is not a complete solution. A fuller solution is beyond the realistic capacity of our computing systems. It might include a larger set of alternative plausible model configurations, each with an objectively assigned probability, and a full MCMC investigation of the uncertainty regarding all parameters within each model configuration.

2. Re-scale the Diff and NoDiff probability distributions into discrete frequency distributions with N equal to 500 for each (because they were equally weighted in the SSC's conclusion). Note that the "Both" distribution shown above is for illustration only and is not used subsequently.



Generation of future recruitment

The parametric, spawner-recruitment method for forecasting future recruitments has several desirable features and alternatives such as re-sampling from observed recruits per spawner were not considered. Use of the parametric approach:

- Reproduces current low recruitment levels while spawning biomass remains low, thus mimics a recruits per spawner approach;
- Smoothly increases mean recruitment (and decreases recruits per spawner) towards the unfished level as spawning biomass increases, thus is fully consistent with the R_0 estimate;
- Parametric sampling from the lognormal distribution generates a smoother frequency distribution of future recruitments (in comparison to resampling from the model's time series of annual recruitment deviations) thus provides rebuilding calculations that are less sensitive to individual historical recruitment estimates.

The estimated spawner-recruitment relationship that tracks the central tendency of recruitment as the stock was fished down over the past few decades also provides a logical basis for estimating future recruitment levels as the stock rebuilds. The estimated steepness of the Beverton-Holt spawner-recruitment relationship was 0.329 in the base model and 0.45 in the alternate model (Table 4). The base model estimate indicates a very un-resilient stock, but the value is nearly identical to the estimate in the 2002 assessment (0.33). Other fish species often have steepness levels near 0.7 (Myers, 1999) and Dorn's (2000) meta-analysis of rockfish found a level of approximately 0.67, although canary was below the average. Some other west coast groundfish stocks (such as widow rockfish, bocaccio and yelloweye rockfish) have low estimated steepness levels.

These steepness estimates are conditioned upon the long-term trend in recruitment being due solely to changes in the abundance of spawners. If some of the recruitment downtrend for canary rockfish has been because of long-term shifts in the ocean climate, then it is possible that a future shift in the ocean climate will cause an upward shift in recruitment and future estimates of the spawner-recruitment steepness will be higher and representative of a longer-term environmental average. Until this happens, there is not sufficient contrast in the spawner-recruitment-climate data to separate the effects of long-term climate from the steepness of the spawner-recruitment relationship.

Capturing Uncertainty

The uncertainty in model structure and the uncertainty in steepness were propagated into the rebuilding analysis by the following procedure:

Create 1000 input vectors for the rebuilding program according to the frequency distribution shown above. There are 500 vectors from the Diff model and 500 from the NoDiff model. Each input vector corresponds to an assessment model run with either the Diff or NoDiff configuration and with a steepness value fixed at a value between 0.23 and 0.67, step 0.02. There are 11 unique Diff vectors that get included from 1 to 140 times according to their probability. There are 18 unique NoDiff vectors that get included from 1 to 79 times. Overall, the 19 unique vectors differ in steepness value, numbers at age in the base year (2004) for the rebuilding analysis and, to a lesser degree, in the estimated selectivity patterns for the fisheries.

The year-to-year variability of recruitment is also important for the rebuilding analysis. The lognormal standard deviation of recruitment used in the assessment is 0.4, and this level of variability is used in the forecasts of future recruitment. This is a lower level of recruitment variability than assumed for several other stocks, but the output level of recruitment variability in the canary assessment is lower still.

Run the rebuilding analysis program with 6000 iterations. During these 6000 iterations, the program will cycle through the 1000 input vectors 6 times. Run times were approximately 5 hours. This number of iterations was sufficient to produce smooth probability profiles in the final rebuilding output. More iterations probably would be needed where sigmaR is higher. In each iteration, the program simulates a random sequence of future recruitment deviations. The program accumulates and summarizes the results of the 6000 iterations, then produces estimates of B_{zero}, T_{min}, and other rebuilding parameters that includes uncertainty due to model configuration, parameter variability within model configuration (to the extent this is captured by the steepness profile), and variability in future recruitment sequences. This is substantially more inclusive of multiple sources of uncertainty than typical rebuilding analyses, including the preliminary canary rockfish rebuilding analysis which was based on a single Diff run (with steepness near 0.32) and included a steepness = 0.38 run only as a sensitivity analysis. The new analysis also produces a single average result, but this average integrates across the 3 sources of uncertainty, thus includes the possibility that canary rockfish productivity is much greater or lesser than the current "best" estimate.

In order to better understand the effect of the use of a distribution of steepness values, the new model was run using only the 500 Diff input vectors and with the harvest rate set equal to the current rebuilding rate (SPR=88.7%). This is simply for illustration and does not represent an evaluation because it is only including half of the total possible input possibilities. The median result is similar to the results from the preliminary rebuilding analysis but, as expected, the distribution is much broader so there is a greater probability of rebuilding even with use of just the Diff scenario:

Model	OY in 2007	Median Year to Rebuild	Pr(rebuild by 2076)	Pr(rebuild by 2076 with F=0)
H=0.32	28.4 mt	2119	0%	3.0%
Blend across h distribution	30.8 mt	2098	18.7%	40.8%

Generation Time

Generation time is calculated as the mean age of female spawners, weighted by age-specific spawn production in the absence of fishing mortality. The values used for these calculations are in Table 2. The updated estimate in the 2005 assessment is 23 years. This is 4 years longer than the estimate of 19 years in the 2002 assessment. The increased generation time is primarily due to a lower estimate of natural mortality for older female canary rockfish and partly due to improved estimates of weight-at-age.

Rebuilding Scenarios

In order to project the effect of the fishery on the rate of rebuilding, it is necessary to quantify the fishery's pattern of selectivity and effect on the spawning potential of the stock. The assessment in 2005 stratified the fishery into 10 sectors based on gear (trawl, non-trawl, recreational) and section of the coast. For the purpose of conducting the rebuilding analysis, the latitudinal strata were combined to produce an estimate of gender-specific body weight and age-selectivity for each of the 3 major gear types due to program limitations on number of fishery types in the rebuilding software. The Oregon trawl, Oregon-Washington non-trawl, and Oregon-Washington recreational fisheries were selected to represent these 3 major gear types because they had the greatest catch level in 2004. The resulting selectivity and weight at age are in Table 3.

The relative F for the 3 gear groups was set to 0.112 for trawl, 0.021 for nontrawl and 0.867 for recreational in order to achieve a 50:50 split of catch biomass between recreational and commercial and to preserve the trawl vs.nontrawl proportion observed in 2004. The 50:50 commercial:recreational split is based on the Council's selection of this allocation following the rebuilding analysis conducted in 2002. These proportions of F were obtained from the SS2 assessment model because the rebuilding software does not output the catch biomass for each gear type. It should be noted that future adjustments in the catch proportions may need to be made as the stock and OY rebuild to levels that are larger than the capacity of the recreational fishery.

In the assessment model (Methot and Stewart, 2005), it was determined that the fishery harvest rate for rebuilding corresponded to a SPR of 88.7%.

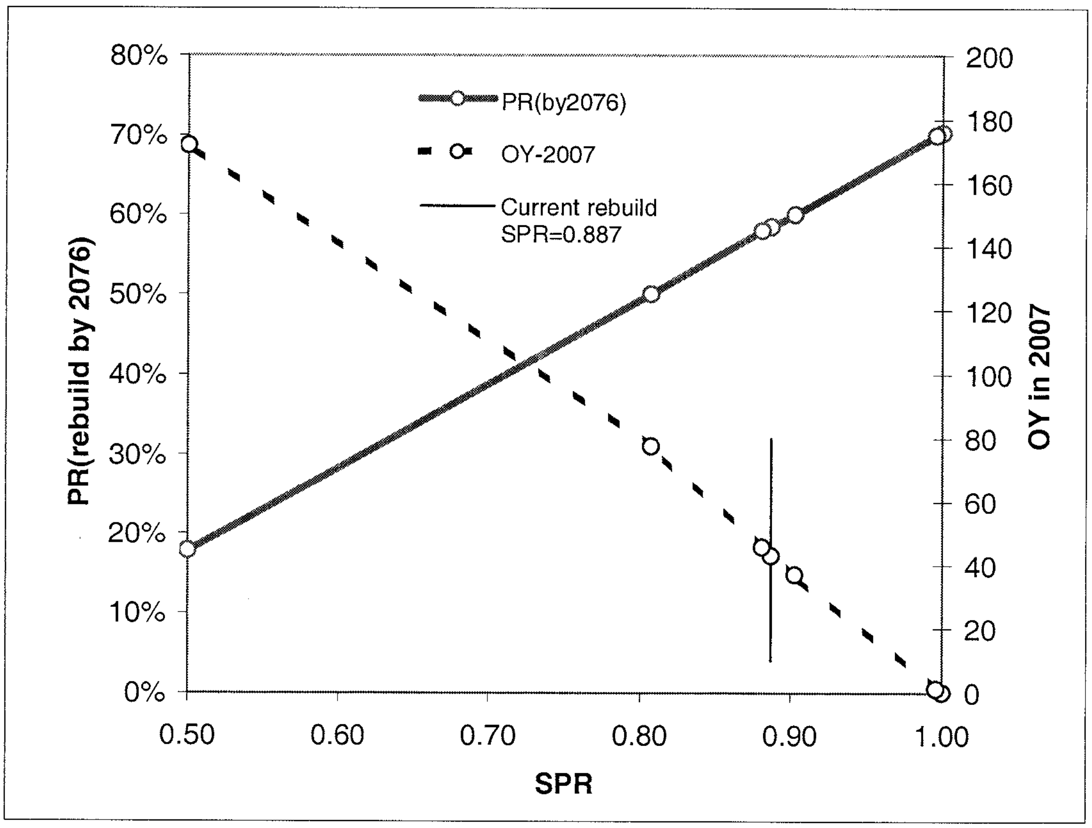
Runs 1 and 3: These two runs determine the probability of rebuilding by the current T_{target} (2074) and T_{max} (2076) if the current harvest rate is continued. In the assessment model (Methot and Stewart, 2005), it was determined that the fishery exploitation rate for rebuilding corresponded to a SPR of 88.7%. At this rate, the probability of rebuilding by the current T_{target} is 57.4% and the probability of rebuilding by the T_{max} is 58.5% as shown in the column labeled *Current.* These two probabilities were 50% and 60% respectively in the 2002 rebuilding analysis, so the probability of rebuilding by T_{target} has increased while the probability of rebuilding by T_{max} has decreased. The two probabilities move closer together in the current analysis because inclusion of more uncertainty causes the probability profile to flatten relative to the steep probability profile that occurred when the only uncertainty was in the future recruitment variability. Maintaining the current harvest rate would produce an average OY in 2007 of 43 mt, which is slightly lower than the current 47 mt OY. The OY in 2007 that would correspond to SPR=50% is 171mt, so the current OY is less than a third of the overfishing level. However the harvest rate corresponding to SPR=50% has only a 17.8% chance of rebuilding by 2076. Note that even if F=0, there is only a 70% chance of rebuilding by T_{max} because in the integrated analysis there is a small probability that the stock has very low productivity. Overall, changes in the SPR rate to achieve improvements in the probability of rebuilding above 50% would have a dramatic effect on the OY as shown in the Figure below:

Rebuilding runs conducted with the current T_{target} (2074).

RUN	2								1
	50%	60%	70%	80%	90%	Tmid	F=0	40-10 Rule	Current
Fishing rate	0.0298	0.0132	0	0	0	0.0173	0	0	
SPR RATE	0.816	0.914	1.000	1.000	1.000	0.889	0.000	0.000	0.887
OY in 2007	73.4	32.5	0	0	0	42.5	0	0	43.2
Prob to rebuild by T_{max} (2074)	50.0	59.9	68.4	68.4	68.4	57.5	68.4	36.6	57.4
Median year to rebuild	2074	2060	2053	2053	2053	2063	2053	2111	2063

Rebuilding runs conducted with the current T_{max} (2076).

RUN	4								3
	50%	60%	70%	80%	90%	Tmid	F=0	40-10 Rule	Current
Fishing rate	0.032	0.015	5E-04	0	0	0.019	0	0	
SPR RATE	80.7%	90.3%	99.6%	100%	100%	88.1%	100%		88.7%
OY in 2007 (mt)	77.6	37	1.3	0	0	45.7	0	0	43.2
Prob to rebuild by T_{max} (2076)	50.0%	59.9%	70.0%	70.3%	70.3%	58.0%	70.3%	37.6%	58.5%
Prob to rebuild by Ttarget (2074)									57.3%
Median year to rebuild	2076	2061	2053	2053	2053	2064	2053	2111	2063



Runs 2 and 4: Run 2 shows that increasing the harvest rate to a level that reduces SPR to 81.6% would create a probability of rebuilding by T_{target} (2074) equal to 50% and would produce an OY equal to 73.4 mt in 2007. Run 4 shows that decreasing the harvest rate to increase SPR to 90.3% would reduce the 2007 OY to 37 mt and increase the probability of rebuilding by T_{max} back to 60%. The movement of these two changes in opposite directions is caused by the shift from a low uncertainty rebuilding projection in 2002 that caused the 50% and 60% probabilities of rebuilding to occur close together in time (2074 and 2076), to an analysis that incorporates more of the uncertainty.

Runs 5 and 6: Recalculation of T_{min} and generation time with the current model (integrating over two scenarios and probability of steepness) produces the following results:

Model	T_{min}	Generation Time	T_{max}
2002	2057	19	2076
2005 – integrated	2048	23	2071

Run 5 - The current harvest rate would produce a 55.4% probability of rebuilding on or before the recalculated T_{max} (2071).

Run 6 - Reducing the harvest rate to produce a SPR of 93.5% would restore the 60% probability of rebuilding by T_{max} and would produce an OY of 24.1 mt in 2007.
By interpolation from values in the table below, a harvest rate with SPR equal to 87.8% would produce an OY of 47 mt in 2007 and would result in a probability of rebuilding on or before 2071 of 54.5%.

Rebuilding runs conducted with the recalculated T_{max} (2071).

RUN	6							5	
	50%	60%	70%	80%	90%	Tmid	F=0	Current	ABC
Fishing rate	0.0271	0.0097	0	0	0	0.0152	0.000		
SPR RATE	83.1%	93.5%	100.0%	100.0%	100.0%	90.1%		88.7%	50.0%
OY	66.8	24.1	0	0	0	37.4	0	43.2	171.8
Prob to rebuild by Tmax	50.0	60.0	66.0	66.0	66.0	56.8	66.0	55.4	17.8
Median time to rebuild	64	51	45.9	45.9	45.9	54.4	45.9	56.2	-1
Prob overfished after rebuild	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
Median time to rebuild (yrs)	2071.0	2058.0	2052.9	2052.9	2052.9	2061.4	2052.9	2063.2	
Probability above current spawning outptut in 100 years	100.0	100.0	100.0	100.0	100.0	100.0	100.0	100.0	96.7
Probability above current spawning outptut in 200 years	100.0	100.0	100.0	100.0	100.0	100.0	100.0	100.0	96.0
Probability below 0.01B0 in 100 years	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
Probability below 0.01B0 in 200 years	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.1
Lower 5th percentile, spawning output / target in Tmax	0.287	0.395	0.474	0.474	0.474	0.358	0.474	0.343	0.121
Median spawning output / target in Tmax	0.999	1.267	1.445	1.445	1.445	1.180	1.445	1.143	0.514
Upper 5th percentile, spawning output / target in Tmax	1.869	2.185	2.379	2.379	2.379	2.077	2.379	2.034	1.212

The table below summarizes the results of the rebuilding analyses requested by the SSC and GMT to evaluate the adequacy of progress in rebuilding and the degree of correction needed if any adjustment is considered necessary.

Run #	Prob (recovery)	By	Based on	OY in 2007
#1 (default)	Estimated: 57.4%	Current T_{target}(2074)	Current SPR (88.7%)	43.2 mt
#2 (T_{TARGET} with 50% prob)	50%	Current T_{target} (2074)	Estimated SPR (81.6%)	73.4 mt
#3 (#1 based on T_{MAX})	Estimated: 58.5%	Current T_{max} (2076)	Current SPR (88.7%)	43.2 mt
#4 (#2 based on T_{MAX})	P_0 (60%)	Current T_{max} (2076)	Estimated SPR: 90.3%	37.0 mt
#5 (#3 with re-estimated T_{MAX})	Estimated: 55.4%	Estimated T_{max}: 2071	Current SPR (88.7%)	43.2 mt
#6 (#4 with re-estimated T_{MAX})	P_0 (60%)	Estimated T_{max}: 2071	Estimated SPR (93.5%)	24.1 mt

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Table 1. Results of the stock assessment in 2005. These 2 configurations are the results of changes made during the September 2005 SSC review and are considered equally plausible.

		Base Configuration (Diff)					Alternate Configuration (No Diff)				
Year	Catch	Spbio	Recruit	TotBio	Age 3+ Bio	Catch/ 3+Bio	Spbio	Recruit	TotBio	Age 3+ Bio	Catch/ 3+Bio
Vir	0	34798	4728	93807	93315		33872	4357	88074	87621	NA
Equ	0	34798	4728	93807	93315	0.000	33872	4357	88074	87621	0.000
1916	474	34798	4728	93807	93315	0.005	33872	4357	88074	87621	0.005
1917	749	34574	4712	93307	92816	0.008	33634	4347	87583	87130	0.009
1918	794	34246	4689	92567	92077	0.009	33279	4333	86851	86399	0.009
1919	520	33909	4666	91817	91329	0.006	32917	4318	86108	85657	0.006
1920	543	33695	4650	91360	90874	0.006	32690	4309	85659	85209	0.006
1921	459	33482	4635	90903	90419	0.005	32463	4299	85210	84762	0.005
1922	415	33312	4623	90546	90063	0.005	32285	4292	84862	84415	0.005
1923	491	33170	4613	90244	89763	0.005	32136	4286	84572	84125	0.006
1924	457	33006	4601	89880	89401	0.005	31963	4278	84223	83777	0.005
1925	529	32864	4590	89560	89081	0.006	31816	4272	83920	83475	0.006
1926	726	32701	4578	89180	88703	0.008	31645	4265	83561	83117	0.009
1927	616	32466	4561	88624	88148	0.007	31396	4254	83029	82586	0.007
1928	627	32284	4548	88190	87715	0.007	31207	4246	82624	82181	0.008
1929	596	32105	4534	87758	87285	0.007	31023	4237	82224	81782	0.007
1930	709	31945	4522	87367	86895	0.008	30862	4230	81869	81428	0.009
1931	711	31745	4507	86879	86409	0.008	30659	4221	81420	80980	0.009
1932	547	31551	4493	86403	85934	0.006	30464	4212	80987	80548	0.007
1933	467	31429	4483	86096	85629	0.005	30350	4207	80726	80287	0.006
1934	450	31343	4477	85870	85404	0.005	30277	4204	80549	80111	0.006
1935	473	31265	4471	85661	85195	0.006	30214	4201	80392	79955	0.006
1936	460	31179	4464	85430	84965	0.005	30144	4198	80216	79779	0.006
1937	433	31099	4458	85211	84747	0.005	30082	4195	80056	79619	0.005
1938	370	31029	4453	85018	84554	0.004	30034	4193	79923	79487	0.005
1939	337	30984	4449	84884	84421	0.004	30013	4192	79852	79415	0.004
1940	422	30950	4447	84778	84315	0.005	30005	4191	79810	79374	0.005
1941	476	30882	4441	84587	84124	0.006	29961	4189	79685	79249	0.006
1942	413	30793	4434	84345	83883	0.005	29895	4186	79510	79074	0.005
1943	1244	30737	4430	84162	83701	0.015	29863	4185	79395	78959	0.016
1944	1964	30382	4402	83185	82725	0.024	29495	4167	78484	78049	0.025
1945	4141	29762	4353	81563	81106	0.051	28828	4135	76928	76495	0.054
1946	2755	28396	4241	77924	77474	0.036	27327	4059	73350	72922	0.038
1947	1816	27571	4171	75773	75331	0.024	26431	4011	71260	70837	0.026
1948	1541	27127	4133	74622	74187	0.021	25960	3985	70171	69753	0.022
1949	1583	26828	4107	73787	73356	0.022	25649	3967	69400	68985	0.023
1950	1959	26541	4082	72942	72515	0.027	25352	3950	68623	68211	0.029
1951	1936	26134	4045	71754	71330	0.027	24925	3925	67512	67101	0.029
1952	1902	25738	3219	70586	70194	0.027	24516	3278	66435	66049	0.029
1953	1753	25367	3217	69472	69110	0.025	24137	3269	65421	65059	0.027
1954	1949	25041	3263	68527	68190	0.029	23816	3307	64583	64241	0.030

1955	1961	24648	3360	67391	67049	0.029	23427	3394	63565	63219	0.031
1956	1998	24251	3521	66206	65854	0.030	23041	3544	62520	62164	0.032
1957	2576	23833	3761	64944	64574	0.040	22640	3770	61419	61047	0.042
1958	2619	23192	4059	63093	62699	0.042	22001	4055	59749	59354	0.044
1959	2452	22522	4354	61199	60775	0.040	21346	4331	58053	57631	0.043
1960	2479	21903	4387	59479	59035	0.042	20760	4348	56544	56101	0.044
1961	2160	21254	3901	57760	57323	0.038	20155	3883	55041	54606	0.040
1962	2207	20715	3238	56411	56014	0.039	19679	3249	53909	53514	0.041
1963	2071	20160	2734	55118	54778	0.038	19191	2764	52827	52486	0.039
1964	1485	19663	2496	54081	53789	0.028	18767	2534	51989	51694	0.029
1965	1756	19438	2558	53693	53424	0.033	18629	2592	51788	51514	0.034
1966	3616	19178	2969	53061	52782	0.069	18442	2986	51332	51049	0.071
1967	1954	18296	3559	50623	50305	0.039	17558	3528	49062	48744	0.040
1968	2327	18081	3350	49741	49398	0.047	17395	3308	48342	48001	0.048
1969	1559	17741	2644	48394	48065	0.032	17094	2649	47158	46831	0.033
1970	1524	17686	2505	47724	47431	0.032	17105	2521	46647	46355	0.033
1971	1521	17577	3011	47085	46801	0.032	17065	3028	46158	45873	0.033
1972	1604	17394	3868	46464	46135	0.035	16952	3809	45672	45345	0.035
1973	2482	17110	3599	45716	45351	0.055	16730	3571	45052	44689	0.056
1974	1863	16445	3649	44108	43723	0.043	16092	3657	43565	43182	0.043
1975	1862	16047	3335	43108	42742	0.044	15737	3345	42676	42309	0.044
1976	1460	15658	2347	42147	41826	0.035	15385	2372	41813	41490	0.035
1977	2048	15426	3056	41692	41390	0.049	15200	3102	41445	41139	0.050
1978	3074	15001	2487	40729	40455	0.076	14797	2518	40556	40279	0.076
1979	3461	14200	1244	38809	38577	0.090	13980	1303	38703	38466	0.090
1980	4132	13320	2651	36623	36401	0.114	13065	2741	36580	36352	0.114
1981	3372	12255	2526	33818	33593	0.100	11972	2670	33827	33592	0.100
1982	5374	11504	1273	31705	31484	0.171	11212	1377	31763	31530	0.170
1983	4858	9993	2162	27677	27471	0.177	9655	2312	27782	27562	0.176
1984	2396	8673	2725	24249	24033	0.100	8310	3027	24412	24176	0.099
1985	2731	8336	890	23110	22912	0.119	7992	1031	23339	23121	0.118
1986	2244	7848	1444	21587	21414	0.105	7529	1640	21896	21702	0.103
1987	3147	7495	1368	20504	20374	0.154	7210	1653	20914	20763	0.152
1988	2767	6723	1699	18558	18401	0.150	6471	2093	19085	18898	0.146
1989	3270	6088	1303	16899	16747	0.195	5876	1716	17553	17364	0.188
1990	2751	5220	1129	14713	14571	0.189	5055	1543	15507	15322	0.180
1991	3170	4562	1293	12998	12869	0.246	4460	1941	13957	13776	0.230
1992	2822	3701	655	10867	10761	0.262	3675	1044	12000	11844	0.238
1993	2187	2975	897	9065	8967	0.244	3041	1562	10407	10250	0.213
1994	1205	2482	1057	7853	7762	0.155	2646	1938	9439	9279	0.130
1995	1190	2409	547	7468	7382	0.161	2658	1040	9316	9159	0.130
1996	1531	2318	374	7000	6933	0.221	2668	745	9136	9010	0.170
1997	1441	2060	366	6132	6087	0.237	2531	728	8597	8510	0.169
1998	1513	1781	824	5313	5258	0.288	2395	1737	8164	8050	0.188
1999	856	1443	276	4338	4287	0.200	2212	605	7566	7460	0.115
2000	181	1319	196	3933	3889	0.046	2252	462	7533	7439	0.024
2001	123	1442	327	4146	4118	0.030	2544	799	8128	8063	0.015
2002	104	1580	380	4400	4368	0.024	2865	966	8773	8695	0.012
2003	48	1717	407	4640	4601	0.010	3187	1053	9387	9289	0.005

2004	38	1862	436	4890	4847	0.008	3518	1134	9985	9875	0.004
2005	N/A	1995	466	5112	5066		3829	1182	·10534	10417	

Table 2. Age-specific natural mortality and female fecundity. Numbers at age (thousands) in 2000 are for the Tmin calculation and numbers at age in 2004 are the basis for projections. These values are from the base model reviewed by the STAR in September 2005. The integrated rebuilding analysis uses 38 (2 models and a range of steepness levels) unique init N vectors to represent alternative outcomes.

	Females				Males		
Age	Fecundity	M	Init N	Init N Tmin	M	Init N	Init N (Tmin)
0	0.00004	0.06	196.31	88.65	0.06	196.31	88.65
1	0.00004	0.06	172.86	120.26	0.06	172.86	120.26
2	0.00004	0.06	152.33	335.91	0.06	152.33	335.91
3	0.00016	0.06	123.56	140.12	0.06	123.56	140.12
4	0.00184	0.06	69.68	136.47	0.06	69.66	136.33
5	0.01202	0.06	93.96	184.11	0.06	93.82	183.10
6	0.05066	0.06	258.78	318.14	0.06	258.06	314.19
7	0.14742	0.064	105.08	230.15	0.06	105.02	226.13
8	0.31891	0.068	98.16	136.29	0.06	98.60	133.17
9	0.55367	0.072	127.00	203.28	0.06	128.65	196.47
10	0.82297	0.077	212.96	127.29	0.06	217.84	121.03
11	1.09879	0.081	150.98	103.58	0.06	155.90	96.17
12	1.36261	0.085	87.95	96.39	0.06	91.49	86.89
13	1.60522	0.089	129.37	57.86	0.06	134.80	50.71
14	1.82361	0.093	80.01	47.42	0.06	83.11	40.75
15	2.018	0.093	64.61	23.21	0.06	66.20	19.74
16	2.19001	0.093	59.89	56.85	0.06	59.98	48.43
17	2.34176	0.093	35.93	33.63	0.06	35.11	29.07
18	2.47539	0.093	29.54	14.41	0.06	28.29	12.78
19	2.59291	0.093	14.49	20.23	0.06	13.74	18.51
20	2.69616	0.093	35.57	14.85	0.06	33.77	14.01
21	2.78678	0.093	21.07	4.96	0.06	20.30	4.79
22	2.86625	0.093	9.04	7.16	0.06	8.94	7.04
23	2.93589	0.093	12.71	6.27	0.06	12.96	6.23
24	2.99684	0.093	9.33	3.46	0.06	9.82	3.45
25	3.05017	0.093	3.12	3.63	0.06	3.36	3.62
26	3.09678	0.093	4.51	2.98	0.06	4.94	2.96
27	3.1375	0.093	3.95	2.25	0.06	4.38	2.21
28	3.17306	0.093	2.18	1.87	0.06	2.43	1.81
29	3.20408	0.093	2.29	1.13	0.06	2.55	1.08
30	3.23114	0.093	1.88	0.75	0.06	2.08	0.70
31	3.25473	0.093	1.42	0.64	0.06	1.56	0.58
32	3.27529	0.093	1.18	0.67	0.06	1.27	0.59
33	3.2932	0.093	0.72	0.60	0.06	0.76	0.52
34	3.30881	0.093	0.47	0.43	0.06	0.49	0.36
35	3.32239	0.093	0.40	0.33	0.06	0.41	0.27
36	3.33422	0.093	0.42	0.28	0.06	0.42	0.22
37	3.34452	0.093	0.38	0.27	0.06	0.37	0.21
38	3.35348	0.093	0.27	0.28	0.06	0.26	0.22
39	3.36128	0.093	0.21	0.31	0.06	0.19	0.23
40	3.36806	0.093	2.25	2.43	0.06	2.06	2.03

Table 3. Age, gender, and fleet-specific body weight and selectivity. Fleet 1 is trawl, fleet 2 in non-trawl, and fleet 3 is recreational. These values are from the best-fitting Base model; steepness specific values are used in the blended rebuilding analysis and do not differ noticeably for these quantities.

	Fleet 1 (F)		Fleet 2 (F)		Fleet 3 (F)		Fleet 1 (M)		Fleet 2 (M)		Fleet 3 (M)	
Age	Weight	Selectivity	Weight	Selectivity	Weight	Selectivity	Weight	Selectivity	Weight	Selectivity	Weight	Selectivity
0	0.037	0	0.037	0	0.037	0	0.037	0	0.037	0	0.037	0
1	0.037	0	0.037	0	0.037	0	0.037	0	0.037	0	0.037	0
2	0.053	0	0.05	0	0.062	0.001	0.059	0	0.056	0	0.068	0.001
3	0.166	0.001	0.155	0.002	0.176	0.041	0.182	0.001	0.169	0.002	0.189	0.057
4	0.353	0.005	0.326	0.014	0.309	0.328	0.373	0.006	0.344	0.017	0.322	0.394
5	0.577	0.025	0.536	0.058	0.437	0.78	0.584	0.033	0.544	0.065	0.45	0.845
6	0.792	0.096	0.748	0.159	0.572	0.972	0.78	0.117	0.737	0.166	0.584	1
7	0.986	0.233	0.947	0.321	0.714	0.879	0.953	0.276	0.914	0.317	0.723	0.893
8	1.166	0.405	1.137	0.505	0.854	0.691	1.108	0.474	1.077	0.484	0.858	0.714
9	1.339	0.56	1.321	0.67	0.997	0.513	1.25	0.66	1.23	0.634	0.989	0.552
10	1.51	0.672	1.502	0.794	1.157	0.377	1.382	0.801	1.372	0.75	1.122	0.427
11	1.679	0.742	1.679	0.877	1.345	0.281	1.506	0.893	1.504	0.834	1.262	0.335
12	1.843	0.78	1.849	0.93	1.558	0.217	1.62	0.949	1.624	0.89	1.406	0.27
13	2.001	0.799	2.012	0.961	1.776	0.177	1.724	0.979	1.732	0.928	1.545	0.225
14	2.148	0.807	2.164	0.978	1.982	0.151	1.817	0.993	1.829	0.952	1.672	0.195
15	2.285	0.809	2.306	0.988	2.166	0.134	1.9	0.999	1.914	0.968	1.783	0.173
16	2.41	0.807	2.437	0.993	2.328	0.123	1.973	1	1.988	0.978	1.878	0.159
17	2.523	0.804	2.556	0.996	2.469	0.116	2.036	0.998	2.053	0.985	1.958	0.148
18	2.626	0.8	2.663	0.998	2.593	0.111	2.091	0.996	2.109	0.989	2.026	0.141
19	2.718	0.795	2.759	0.999	2.702	0.107	2.138	0.993	2.157	0.992	2.083	0.135
20	2.801	0.791	2.845	0.999	2.797	0.105	2.178	0.989	2.198	0.994	2.132	0.131
21	2.875	0.786	2.921	1	2.88	0.103	2.212	0.986	2.233	0.995	2.172	0.127
22	2.941	0.782	2.988	1	2.953	0.102	2.241	0.983	2.263	0.996	2.206	0.125
23	2.999	0.778	3.047	1	3.016	0.101	2.266	0.981	2.288	0.997	2.235	0.123
24	3.051	0.775	3.1	1	3.072	0.1	2.287	0.979	2.31	0.998	2.259	0.121
25	3.097	0.772	3.146	1	3.121	0.099	2.305	0.977	2.328	0.998	2.28	0.12

26	3.137	0.769	3.186	1	3.163	0.099	2.32	0.975	2.343	0.998	2.297	0.119
27	3.172	0.766	3.221	1	3.2	0.098	2.332	0.974	2.356	0.999	2.311	0.118
28	3.203	0.764	3.252	1	3.232	0.098	2.343	0.973	2.367	0.999	2.324	0.117
29	3.23	0.762	3.279	1	3.261	0.098	2.352	0.972	2.376	0.999	2.334	0.117
30	3.254	0.76	3.303	1	3.285	0.097	2.36	0.971	2.384	0.999	2.342	0.116
31	3.275	0.759	3.324	1	3.307	0.097	2.366	0.97	2.39	0.999	2.35	0.116
32	3.293	0.757	3.342	1	3.325	0.097	2.371	0.97	2.396	0.999	2.356	0.116
33	3.309	0.756	3.357	1	3.342	0.097	2.376	0.969	2.401	0.999	2.361	0.115
34	3.323	0.755	3.371	1	3.356	0.097	2.38	0.969	2.404	0.999	2.365	0.115
35	3.335	0.754	3.383	1	3.368	0.097	2.383	0.968	2.408	0.999	2.369	0.115
36	3.345	0.753	3.394	1	3.379	0.097	2.386	0.968	2.41	0.999	2.372	0.115
37	3.355	0.753	3.403	1	3.388	0.097	2.388	0.968	2.413	0.999	2.374	0.115
38	3.363	0.752	3.41	1	3.396	0.097	2.39	0.968	2.415	0.999	2.376	0.115
39	3.37	0.752	3.417	1	3.403	0.096	2.392	0.967	2.416	0.999	2.378	0.115
40	3.376	0.751	3.423	1	3.41	0.096	2.393	0.967	2.418	0.999	2.38	0.115

Table 4. Probability distributions based on steepness profiles for the base and alternate model configurations.

	Steepness	Prob	Bzero	B2005	B2005/ Bzero	Rzero
Diff	0.23	0.000	38363	1075	0.028	5593
	0.25	0.001	37429	1235	0.033	5357
	0.27	0.007	36609	1406	0.038	5162
	0.29	0.044	35913	1590	0.044	4994
	0.31	0.110	35312	1788	0.051	4850
	0.33	0.140	34784	2001	0.058	4725
	0.35	0.090	34309	2238	0.065	4622
	0.37	0.063	33894	2474	0.073	4519
	0.39	0.029	33514	2734	0.082	4434
	0.41	0.011	33169	3010	0.091	4359
	0.43	0.004	32854	3302	0.101	4292
	0.45	0.001	32564	3610	0.111	4232
	0.47	0.000	32299	3933	0.122	4179
NoDiff	0.31	0.000	37551	1728	0.046	4988
	0.33	0.001	36854	1975	0.054	4861
	0.35	0.003	36231	2240	0.062	4749
	0.37	0.013	35654	2527	0.071	4653
	0.39	0.026	35160	2826	0.080	4563
	0.41	0.055	34680	3151	0.091	4487
	0.43	0.060	34268	3478	0.102	4416
	0.45	0.079	33863	3839	0.113	4355
	0.47	0.064	33496	4182	0.125	4303
	0.49	0.061	33171	4582	0.138	4249
	0.51	0.046	32866	4974	0.151	4203
	0.53	0.033	32585	5376	0.165	4162
	0.55	0.022	32324	5786	0.179	4124
	0.57	0.014	32082	6203	0.193	4090
	0.59	0.009	31857	6624	0.208	4059
	0.61	0.006	31647	7046	0.223	4031
	0.63	0.004	31451	7469	0.237	4005
	0.65	0.003	31268	7889	0.252	3981
	0.67	0.001	31097	8306	0.267	3959
Means						
Diff	0.336		34703	2089	0.060	4710
NoDiff	0.471		33607	4263	0.128	4320
Both	0.403		34155	3176	0.094	4515
MPD						
Diff	0.329		34798	1995	0.057	4728
NoDiff	0.451		33826	3844	0.114	4355

Table 5. Projection Table. Note that decades of 2030-2060 are compressed.

	Catch				Spawning Biomass					Pr(Rebuilt)				
	Run-4		Run-2	Run-6		Run-4		Run-2	Run-6		Run-4		Run-2	Run-6
Year	P=0.6 by 2076	Current	P=0.5 by 2074	P=0.6 by 2071	F=0	P=0.6 by 2076	Current	P=0.5 by 2074	P=0.6 by 2071	F=0	P=0.6 by 2076	Current	P=0.5 by 2074	P=0.6 by 2071
2007	37.0	43.2	73.4	24.1	3091	3091	3091	3091	3091	0.000	0.000	0.000	0.000	0.000
2008	38.1	44.5	75.0	24.8	3240	3227	3225	3215	3232	0.000	0.000	0.000	0.000	0.000
2009	38.6	45.1	75.8	25.3	3368	3341	3336	3314	3350	0.000	0.000	0.000	0.000	0.000
2010	39.8	46.4	77.6	26.0	3484	3440	3433	3398	3455	0.000	0.000	0.000	0.000	0.000
2011	41.7	48.6	81.0	27.3	3601	3539	3529	3479	3560	0.000	0.000	0.000	0.000	0.000
2012	43.9	51.1	85.0	28.8	3723	3641	3627	3561	3669	0.001	0.000	0.000	0.000	0.001
2013	46.5	54.1	89.7	30.6	3827	3723	3706	3623	3759	0.004	0.001	0.001	0.001	0.002
2014	48.6	56.5	93.3	32.0	3946	3819	3798	3698	3863	0.006	0.004	0.004	0.002	0.005
2015	50.6	58.7	96.7	33.3	4078	3926	3901	3783	3977	0.009	0.006	0.006	0.004	0.007
2016	52.5	61.0	100.1	34.7	4220	4043	4014	3875	4104	0.013	0.009	0.008	0.006	0.011
2017	54.2	62.9	102.8	35.9	4379	4175	4142	3985	4245	0.017	0.012	0.012	0.009	0.014
2018	56.0	64.9	105.7	37.1	4561	4327	4289	4108	4408	0.021	0.016	0.016	0.012	0.018
2019	58.0	67.2	109.1	38.5	4745	4482	4438	4231	4573	0.029	0.020	0.019	0.015	0.023
2020	59.8	69.2	111.9	39.8	4941	4639	4590	4364	4743	0.036	0.026	0.024	0.018	0.030
2021	61.5	71.2	114.7	40.9	5124	4792	4739	4490	4906	0.047	0.033	0.030	0.022	0.036
2022	63.3	73.1	117.5	42.2	5319	4960	4903	4629	5082	0.059	0.040	0.038	0.027	0.046
2023	65.3	75.5	120.9	43.6	5528	5129	5064	4763	5265	0.068	0.049	0.045	0.033	0.058
2024	67.3	77.7	123.8	45.0	5735	5298	5227	4898	5447	0.082	0.059	0.056	0.039	0.065
2025	69.3	79.9	127.1	46.4	5951	5474	5397	5038	5636	0.098	0.068	0.064	0.047	0.077
2026	71.7	82.6	130.9	48.1	6153	5642	5559	5175	5817	0.118	0.079	0.073	0.054	0.091
2027	73.5	84.7	133.7	49.4	6349	5795	5704	5294	5981	0.134	0.092	0.086	0.061	0.108
2028	75.9	87.4	137.6	51.1	6567	5968	5872	5430	6171	0.154	0.107	0.100	0.069	0.123
2029	79.0	90.9	142.5	53.2	6765	6129	6027	5559	6343	0.173	0.123	0.115	0.078	0.138
2030	80.6	92.7	145.1	54.3	6999	6309	6199	5695	6542	0.192	0.137	0.129	0.090	0.156
2040	105.8	120.9	183.6	72.2	9635	8388	8190	7300	8810	0.356	0.288	0.275	0.217	0.314
2050	134.3	153.0	227.6	92.3	12796	10822	10512	9123	11467	0.472	0.408	0.395	0.330	0.428

2060	162.1	183.9	269.6	112.2	16096	13335	12913	11013	14246	0.567	0.490	0.477	0.412	0.515
2061	165.2	187.4	274.0	114.4	16430	13583	13141	11187	14528	0.575	0.499	0.485	0.418	0.524
2062	167.8	190.3	278.5	116.2	16768	13826	13378	11387	14808	0.582	0.505	0.491	0.424	0.531
2063	170.2	192.8	281.7	117.8	17088	14113	13644	11556	15088	0.590	0.511	0.498	0.432	0.539
2064	173.5	196.6	287.1	120.3	17413	14329	13872	11737	15341	0.600	0.517	$\boxed{0.506}$	0.440	0.546
2065	176.5	199.9	291.4	122.5	17702	14581	14099	11935	15613	0.609	0.526	0.512	0.445	0.556
2066	179.5	203.8	297.0	124.6	18068	14861	14362	12156	15926	0.618	0.533	0.518	0.453	0.563
2067	182.5	206.8	301.4	126.4	18421	15170	14662	12385	16232	0.627	0.539	0.526	0.459	0.570
2068	185.3	210.0	305.9	128.5	18779	15397	14880	12554	16527	0.636	0.549	0.533	0.465	0.578
2069	187.6	212.7	309.1	130.3	19103	15611	15091	12744	16750	0.643	0.555	0.540	0.470	0.585
2070	190.1	215.4	313.2	132.0	19445	15945	15391	12929	17125	0.652	0.562	0.548	0.477	0.592
2071	192.5	218.1	315.8	133.6	19738	16190	15604	13106	17366	0.660	0.569	0.554	0.484	$\boxed{0.600}$
2072	194.9	221.1	320.8	135.4	20095	16425	15858	13342	17618	0.670	0.574	0.559	0.490	0.607
2073	197.7	224.2	324.5	137.3	20390	16633	16071	13503	17873	0.676	0.582	0.567	0.496	0.613
2074	200.3	227.1	328.9	139.1	20736	16897	16304	13655	18129	0.684	0.589	0.574	$\boxed{0.500}$	0.620
2075	203.5	230.2	332.2	141.2	20951	17133	16507	13832	18400	0.693	0.594	0.580	0.505	0.627
2076	205.2	232.9	337.5	142.6	21277	17331	16727	14019	18625	0.703	$\boxed{0.599}$	0.585	0.510	0.635
2077	207.9	235.6	341.1	144.5	21565	17553	16932	14233	18899	0.714	0.606	0.591	0.515	0.642
2078	210.7	238.4	345.6	146.4	21866	17805	17177	14384	19139	0.723	0.611	0.596	0.519	0.646
2079	213.8	242.1	349.9	148.5	22144	18038	17405	14558	19415	0.732	0.617	$\boxed{0.602}$	0.524	0.653
2080	216.3	244.9	353.8	150.4	22436	18270	17626	14742	19656	0.740	0.624	0.608	0.530	0.661

Table 6. Input file for the updated rebuilding analysis. Note that these inputs for fishery selectivity and weight-at-age, numbers-at-age in 2000 and 2004, and the steepness value are superceded by values read from the MCMC.prj file.

```
#Title
Canary
# Number of sexes
2
# Age range to consider (minimum age; maximum age)
0	40
# Number of fleets
3
# First year of projection
2004
# Year declared overfished
2000
# Is the maximum age a plus-group (1=Yes;2=No)
1
# Generate future recruitments using historical recruitments (1) historical
recruits/spawner (2) or a stock-recruitment (3)
3
# Constant fishing mortality (1) or constant Catch (2) projections
1
# Fishing mortality based on SPR (1) or actual rate (2)
1
# Pre-specify the year of recovery (or -1) to ignore
-1
# Fecundity-at-age
#
3.80E-05	3.80E-05	3.80E-05	0.000162861	0.00184254	0.0120233
	0.0506613	0.147419	0.318907	0.553672	0.822968
	1.09879	1.36261	1.60522	1.82361	2.018	2.19001
	2.34176	2.47539	2.59291	2.69616	2.78678
	2.86625	2.93589	2.99684	3.05017	3.09678	3.1375
	3.17306	3.20408	3.23114	3.25473	3.27529	3.2932
	3.30881	3.32239	3.33422	3.34452	3.35348
	3.36128	3.36806
# Age specific information (Females then males) weight selectivity
# female wt and selex fleet 1=trawl
0.037	0.037	0.053	0.166	0.353	0.577	0.792	0.986	1.166	1.339	1.51	1.679
	1.843	2.001	2.148	2.285	2.41	2.523	2.626	2.718	2.801	2.875	2.941
	2.999	3.051	3.097	3.137	3.172	3.203	3.23	3.254	3.275	3.293	3.309
	3.323	3.335	3.345	3.355	3.363	3.37	3.376
0	0	0	0.0006	0.0046	0.0254	0.0955	0.2333	0.4052	0.5603	0.6722	0.7417
	0.7803	0.7994	0.8073	0.809	0.8073	0.804	0.7998	0.7954	0.7909	0.7865	0.7824
```

```
        0.7785 0.775  0.7718 0.7689 0.7664 0.7641 0.7621 0.7603 0.7587 0.7574 0.7562
        0.7551 0.7542 0.7534 0.7527 0.7521 0.7516 0.7511
# female wt and selex fleet 2=nontrawl
0.037   0.037  0.05   0.155  0.326  0.536  0.748  0.947  1.137  1.321  1.502  1.679
        1.849  2.012  2.164  2.306  2.437  2.556  2.663  2.759  2.845  2.921  2.988
        3.047  3.1    3.146  3.186  3.221  3.252  3.279  3.303  3.324  3.342  3.357
        3.371  3.383  3.394  3.403  3.41   3.417  3.423
0       0      0.0001 0.0018 0.0139 0.0577 0.1593 0.3209 0.5053 0.6697 0.7938 0.8775
        0.9297 0.9606 0.9782 0.988  0.9934 0.9964 0.998  0.9989 0.9994 0.9997 0.9998
        0.9999 1      1      1      1      1      1      1      1      1      1
        1      1      1      1      1      1      1
# female wt and selex fleet 3=recreational
0.037   0.037  0.062  0.176  0.309  0.437  0.572  0.714  0.854  0.997  1.157  1.345
        1.558  1.776  1.982  2.166  2.328  2.469  2.593  2.702  2.797  2.88   2.953
        3.016  3.072  3.121  3.163  3.2    3.232  3.261  3.285  3.307  3.325  3.342
        3.356  3.368  3.379  3.388  3.396  3.403  3.41
0.0003  0.0003 0.0008 0.0409 0.3284 0.7803 0.9718 0.8794 0.6905 0.5131 0.3765 0.2808
        0.2174 0.1767 0.1507 0.1341 0.1232 0.1159 0.1109 0.1074 0.1049 0.1031 0.1017
        0.1006 0.0998 0.0991 0.0986 0.0982 0.0979 0.0976 0.0974 0.0972 0.097  0.0969
        0.0968 0.0967 0.0966 0.0965 0.0965 0.0964 0.0964
# male wt and selex fleet 1=trawl
0.037   0.037  0.059  0.182  0.373  0.584  0.78   0.953  1.108  1.25   1.382  1.506
        1.62   1.724  1.817  1.9    1.973  2.036  2.091  2.138  2.178  2.212  2.241
        2.266  2.287  2.305  2.32   2.332  2.343  2.352  2.36   2.366  2.371  2.376
        2.38   2.383  2.386  2.388  2.39   2.392  2.393
0       0      0      0.0008 0.0062 0.0332 0.1173 0.2758 0.4743 0.6597 0.8006 0.8934
        0.9486 0.9785 0.9932 0.999  1      0.9984 0.9957 0.9925 0.9892 0.9862 0.9834
        0.9809 0.9788 0.9769 0.9753 0.9739 0.9727 0.9717 0.9709 0.9702 0.9696 0.9691
        0.9686 0.9683 0.968  0.9677 0.9675 0.9673 0.9672
# male wt and selex fleet 2=nontrawl
0.037   0.037  0.056  0.169  0.344  0.544  0.737  0.914  1.077  1.23   1.372  1.504
        1.624  1.732  1.829  1.914  1.988  2.053  2.109  2.157  2.198  2.233  2.263
        2.288  2.31   2.328  2.343  2.356  2.367  2.376  2.384  2.39   2.396  2.401
        2.404  2.408  2.41   2.413  2.415  2.416  2.418
0       0      0.0001 0.0023 0.0172 0.0651 0.1663 0.3171 0.4843 0.634  0.7505 0.8337
        0.8903 0.9276 0.952  0.9677 0.9779 0.9846 0.989  0.9919 0.994  0.9954 0.9964
        0.9971 0.9976 0.998  0.9983 0.9985 0.9987 0.9988 0.999  0.999  0.9991 0.9992
        0.9992 0.9993 0.9993 0.9993 0.9993 0.9994 0.9994
# male wt and selex fleet 3=recreational
0.037   0.037  0.068  0.189  0.322  0.45   0.584  0.723  0.858  0.989  1.122  1.262
        1.406  1.545  1.672  1.783  1.878  1.958  2.026  2.083  2.132  2.172  2.206
        2.235  2.259  2.28   2.297  2.311  2.324  2.334  2.342  2.35   2.356  2.361
        2.365  2.369  2.372  2.374  2.376  2.378  2.38
0.0003  0.0003 0.001  0.0566 0.3936 0.8454 1      0.8932 0.7136 0.5522 0.4269 0.335
        0.2699 0.2251 0.1945 0.1734 0.1587 0.1482 0.1406 0.1349 0.1307 0.1274 0.1248
```

0.1228 0.1212 0.12 0.1189 0.1181 0.1174 0.1168 0.1164 0.116 0.1157 0.1154
0.1152 0.115 0.1149 0.1147 0.1146 0.1145 0.1145
M and initial age-structure for 2004
female
0.06 0.06 0.06 0.06 0.06 0.06 0.06 0.0641414 0.0682827
0.0724241 0.0765654 0.0807068 0.0848481 0.0889895
0.0931308 0.0931308 0.0931308 0.0931308 0.0931308
0.0931308 0.0931308 0.0931308 0.0931308 0.0931308
0.0931308 0.0931308 0.0931308 0.0931308 0.0931308
0.0931308 0.0931308 0.0931308 0.0931308 0.0931308
0.0931308 0.0931308 0.0931308 0.0931308 0.0931308
0.0931308 0.0931308
196.309 172.862 152.333 123.561 69.6801 93.9562
258.776 105.084 98.161 127.003 212.959 150.977
87.9514 129.371 80.0138 64.6072 59.8895
35.9335 29.5418 14.4934 35.5668 21.0718
9.04251 12.7051 9.334 3.11781 4.50744 3.95273
2.18302 2.28984 1.87866 1.41981 1.17918
0.715485 0.472064 0.403646 0.424542 0.381926
0.273987 0.2054 2.25308
male
0.06 0.06 0.06 0.06 0.06 0.06 0.06 0.06 0.06 0.06 0.06 0.06
0.06 0.06 0.06 0.06 0.06 0.06 0.06 0.06 0.06 0.06 0.06
0.06 0.06 0.06 0.06 0.06 0.06 0.06 0.06 0.06 0.06 0.06
0.06 0.06 0.06 0.06 0.06 0.06 0.06
196.309 172.862 152.333 123.561 69.6593 93.8179
258.058 105.017 98.6002 128.654 217.841
155.895 91.4869 134.795 83.1082 66.1958
59.9837 35.1084 28.2924 13.7383 33.7682
20.2994 8.93796 12.9585 9.81795 3.36164
4.94088 4.37515 2.42662 2.54572 2.07895
1.55518 1.27287 0.758189 0.489321 0.407954
0.417722 0.365907 0.255851 0.187343 2.05869
Initial age-structure female then male for year 2000 (Ydeclared)
88.6505 120.258 335.905 140.122 136.467 184.105
318.135 230.151 136.288 203.284 127.289
103.577 96.3896 57.8577 47.4205 23.2091
56.8455 33.6257 14.4112 20.2264 14.8462
4.95519 7.15896 6.27433 3.46345 3.63135
2.97817 2.25003 1.86817 1.13325 0.747538
0.639076 0.67205 0.604503 0.433607 0.325026
0.278582 0.269905 0.284131 0.305275 2.42644
88.6505 120.258 335.905 140.12 136.328 183.102
314.187 226.133 133.165 196.473 121.027
96.1679 86.8863 50.7059 40.7535 19.7435
48.4326 29.066 12.7799 18.5069 14.0079 4.79234

7.03892 6.22943 3.45345 3.62153 2.95653
2.21107 1.80929 1.0775 0.695287 0.579594 0.593405
0.51975 0.363393 0.266072 0.223315 0.212382
0.219973 0.23307 2.03463

Year for Tmin Age-structure
2000
Number of simulations
6000
recruitment and biomass
Number of historical assessment years
90
Historical data
year recruitment spawner in B0 in R project in R/S project

1915	4760	34921	1	0	0
1916	4760	34921	0	0	0
1917	4744	34698	0	0	0
1918	4720	34370	0	0	0
1919	4696	34034	0	0	0
1920	4680	33820	0	0	0
1921	4664	33606	0	0	0
1922	4651	33437	0	0	0
1923	4641	33294	0	0	0
1924	4628	33130	0	0	0
1925	4617	32988	0	0	0
1926	4605	32824	0	0	0
1927	4587	32590	0	0	0
1928	4573	32407	0	0	0
1929	4559	32228	0	0	0
1930	4547	32066	0	0	0
1931	4531	31865	0	0	0
1932	4516	31671	0	0	0
1933	4506	31547	0	0	0
1934	4499	31459	0	0	0
1935	4493	31380	0	0	0
1936	4486	31291	0	0	0
1937	4479	31209	0	0	0
1938	4473	31138	0	0	0
1939	4469	31090	0	0	0
1940	4467	31053	0	0	0
1941	4461	30982	0	0	0
1942	4454	30891	0	0	0
1943	4449	30832	0	0	0
1944	4420	30476	0	0	0
1945	4369	29856	0	0	0
1946	4253	28492	0	0	0
1947	4181	27668	0	0	0

1948	4142	27223	0	0	0
1949	4115	26922	0	0	0
1950	4088	26634	0	0	0
1951	4051	26226	0	0	0
1952	3213	25829	0	0	0
1953	3211	25456	0	0	0
1954	3259	25128	0	0	0
1955	3356	24732	0	0	0
1956	3519	24333	0	0	0
1957	3760	23911	0	0	0
1958	4061	23266	0	0	0
1959	4359	22592	0	0	0
1960	4393	21968	0	0	0
1961	3904	21314	0	0	0
1962	3237	20768	0	0	0
1963	2732	20207	0	0	0
1964	2493	19704	0	0	0
1965	2556	19472	0	0	0
1966	2969	19206	0	0	0
1967	3563	18322	0	0	0
1968	3353	18103	0	0	0
1969	2642	17760	0	0	0
1970	2503	17700	0	0	0
1971	3009	17587	0	0	0
1972	3871	17401	0	0	0
1973	3600	17113	0	0	0
1974	3646	16446	0	0	0
1975	3343	16046	0	0	0
1976	2339	15655	0	0	0
1977	3052	15420	0	0	0
1978	2494	14993	0	0	0
1979	1236	14192	0	0	0
1980	2636	13313	0	0	0
1981	2527	12248	0	0	0
1982	1268	11498	0	0	0
1983	2135	9989	0	0	0
1984	2722	8670	0	0	0
1985	876	8332	0	0	0
1986	1426	7843	0	0	0
1987	1350	7488	0	0	0
1988	1667	6715	0	0	0
1989	1276	6078	0	0	0
1990	1097	5209	0	0	0
1991	1245	4547	0	0	0
1992	626	3684	0	0	0
1993	846	2954	0	0	0

1994	990	2456	0	0	0
1995	509	2377	0	0	0
1996	348	2280	0	0	0
1997	336	2013	0	0	0
1998	757	1725	0	0	0
1999	255	1376	0	0	0
2000	177	1239	0	0	0
2001	296	1350	0	0	0
2002	344	1475	0	0	0
2003	367	1597	0	0	0
2004	393	1730	0	0	0

Number of years with pre-specified catches
3
catches for years with pre-specified catches
2004 38
2005 47
2006 47
Number of future recruitments to override
0
Process for overiding (-1 for average otherwise index in data list)
Which probability to product detailed results for (1=0.5; 2=0.6; etc.)
2
Steepness sigma-R Auto-correlation
0.321245 0.4 0
Target SPR rate (FMSY Proxy)
0.5
Target SPR information: Use (1=Yes) and power
0 20
Discount rate (for cumulative catch)
0.1
Truncate the series when 0.4B0 is reached (1=Yes)
0
Set F to FMSY once 0.4B0 is reached (1=Yes)
0
Percentage of FMSY which defines Ftarget
0.9
Maximum possible F for projection (-1 to set to FMSY)
2
Conduct MacCall transition policy (1=Yes)
0
Defintion of recovery (1=now only;2=now or before)
2
Results for rec probs by Tmax (1) or 0.5 prob for various Ttargets (2)
1
Definition of the "40-10" rule
10 40

```
# Produce the risk-reward plots (1=Yes)
0
# Calculate coefficients of variation (1=Yes)
0
# Number of replicates to use
1
# Random number seed
-89102
# Conduct projections for multiple starting values (0=No;else yes)
1
# File with multiple parameter vectors
MCMC.PRJ
# Number of parameter vectors
1000
# User-specific projection (1=Yes); Output replaced (1->6)
1	9	0	0.5
# Catches and Fs (Year; 1/2/3 (F or C or SPR); value); Final row is -1
2007	3	.887
-1	-1	-1
# Split of Fs (2004	0.27	0.05	2.1)
2004	.112	.021	.867
-1	1	1	1
# Time varying weight-at-age (1=Yes;0=No)
0
# File with time series of weight-at-age data
HakWght.Csv
```

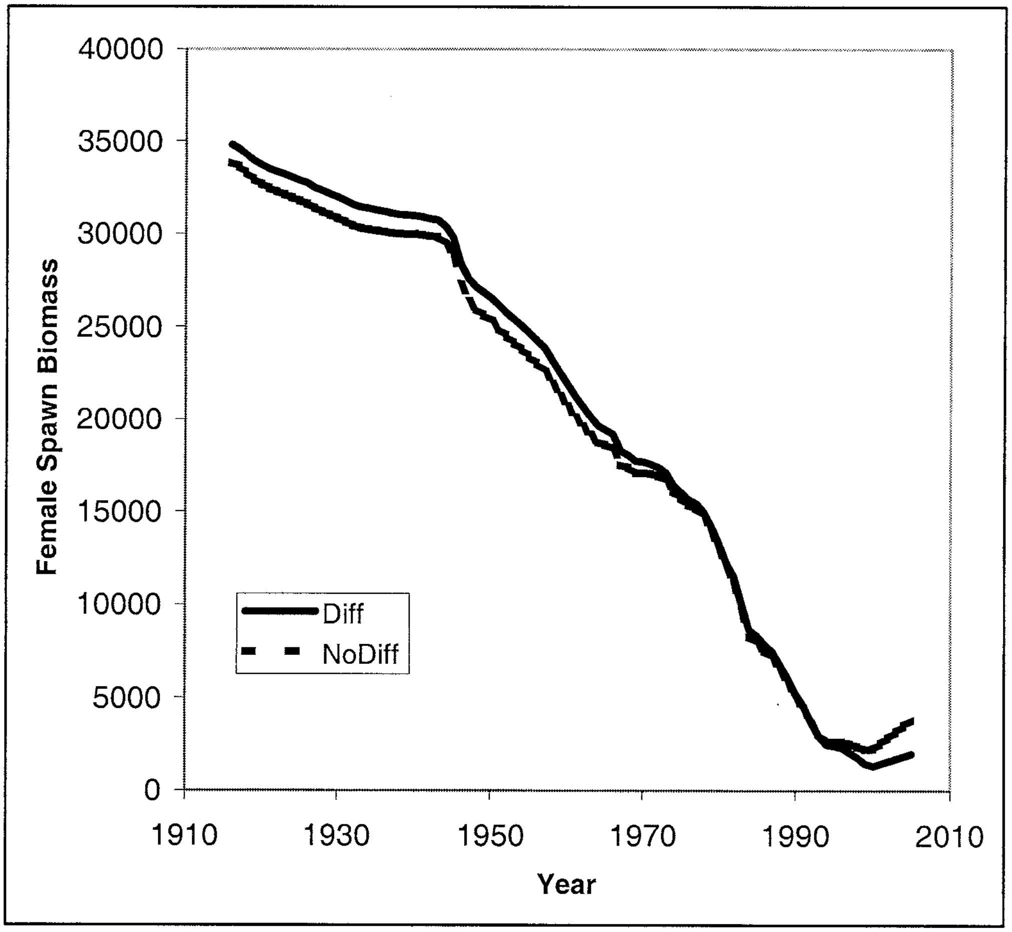

Figure 1. Estimated time series of spawning stock biomass from base model (Diff) and alternative model (NoDiff).

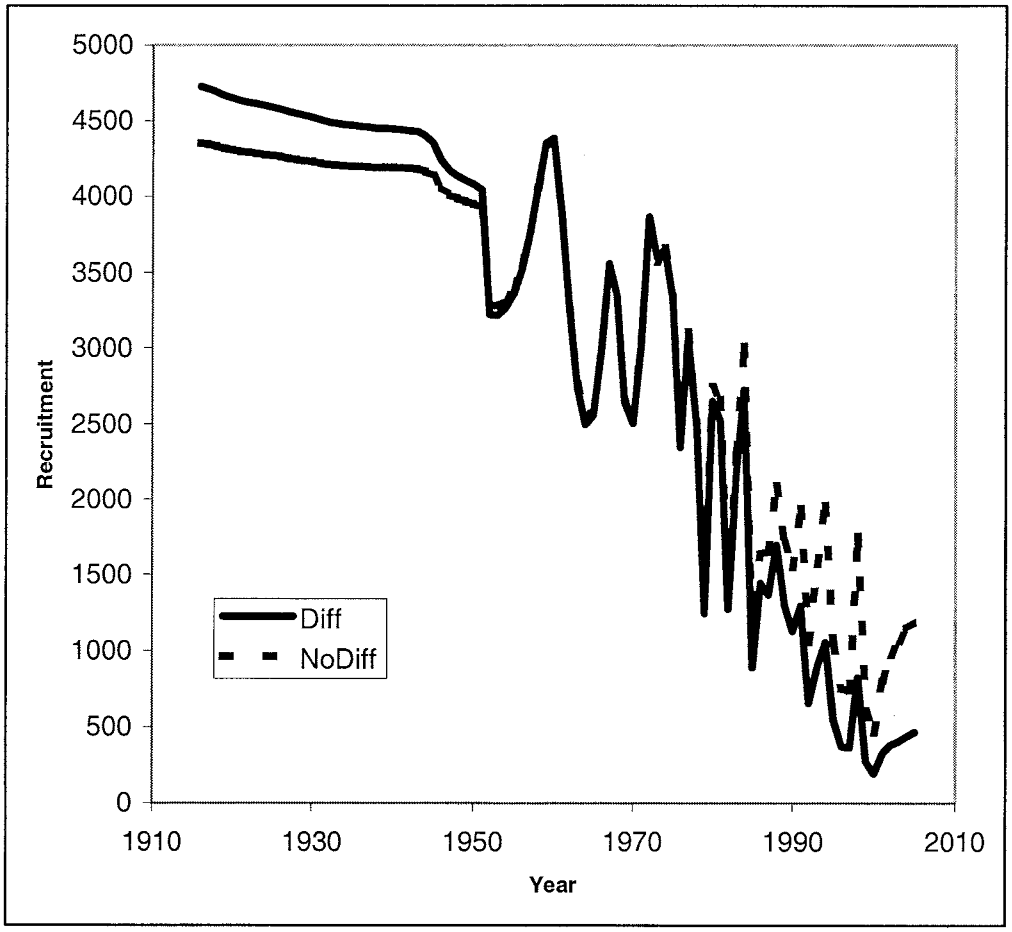

Figure 2. Estimated time series of recruitment from base model (Diff) and alternative model (NoDiff).

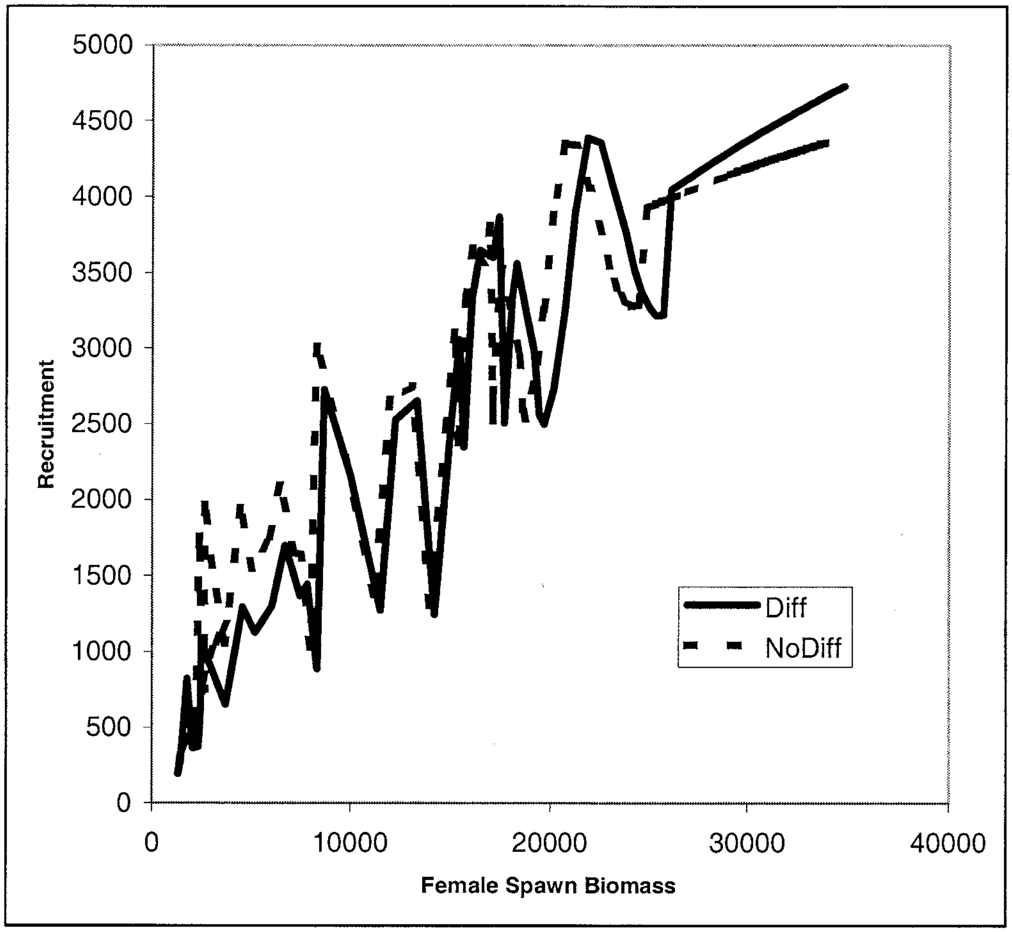

Figure 3. Spawner-recruitment relationship.

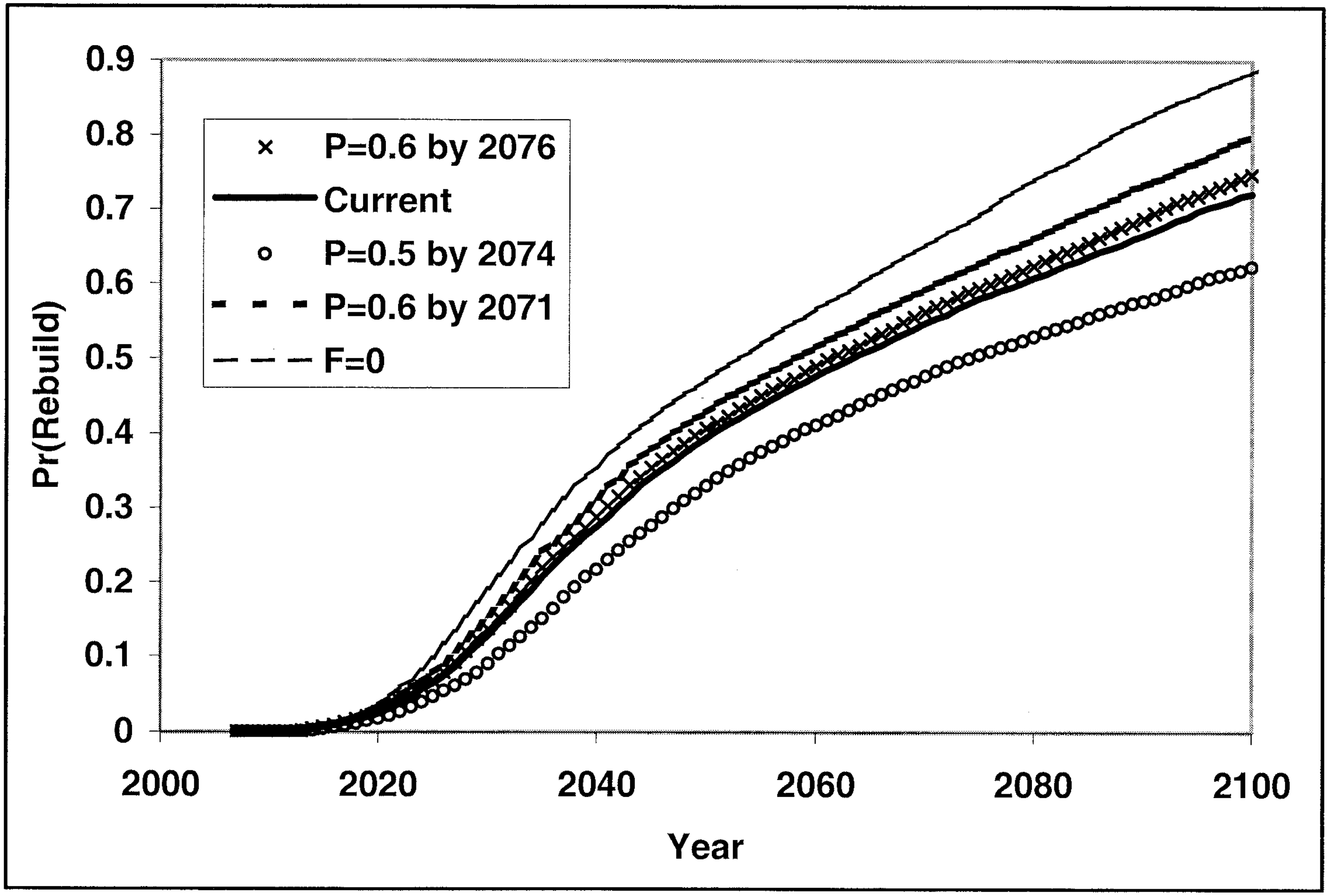

Figure 4. Alternative rebuilding scenarios.

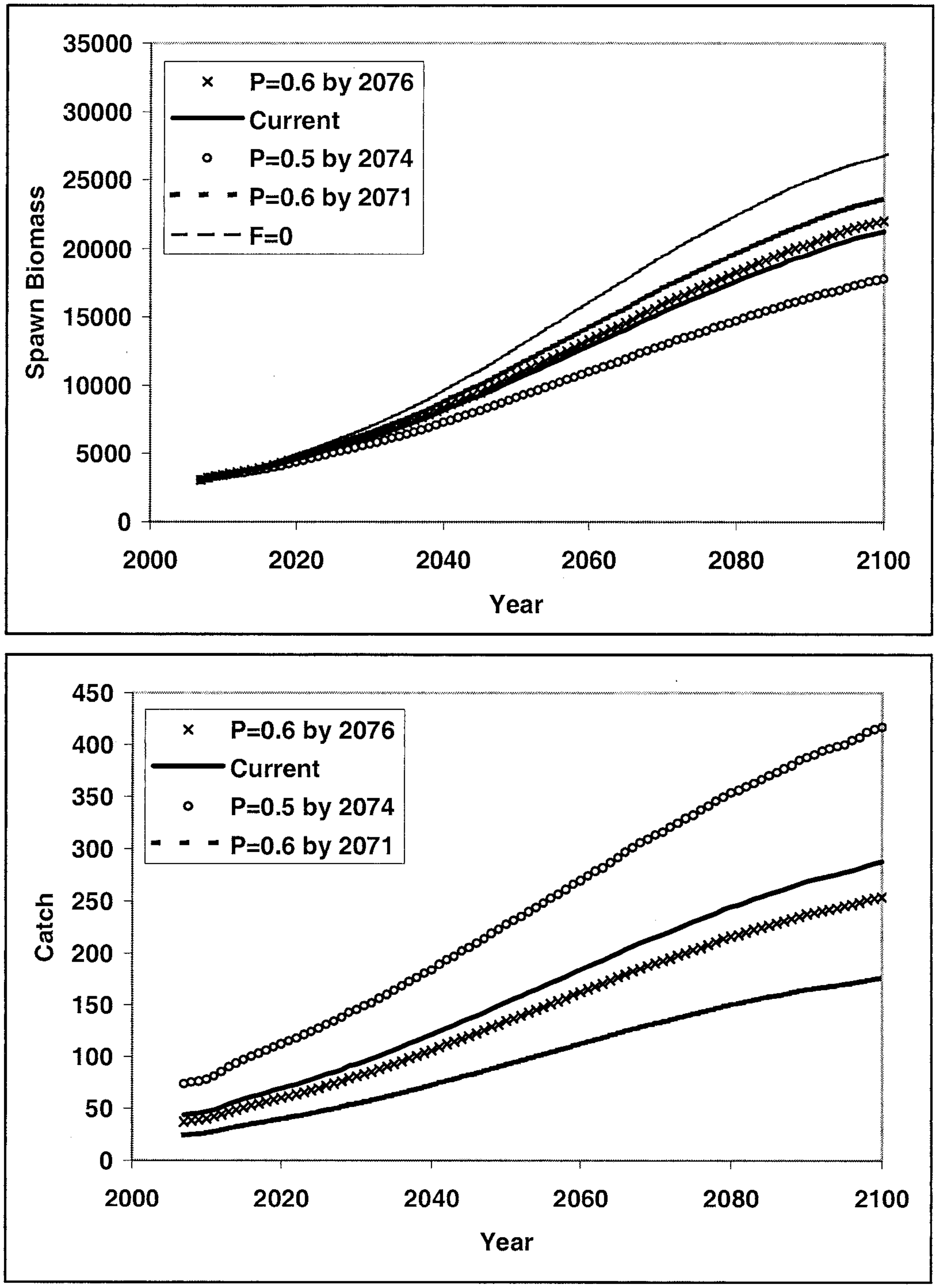

Figure 5. Catch and spawning biomass for F=0 and 4 alternative harvest strategies.

Agenda Item H.2.a
Supplemental Attachment 5
November 2005

Status of the U.S. canary rockfish resource in 2005

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Revised Aug 31, 2005 Post-STAR review

Revised Oct 25, 2005 Post-SSC review

Table of Contents

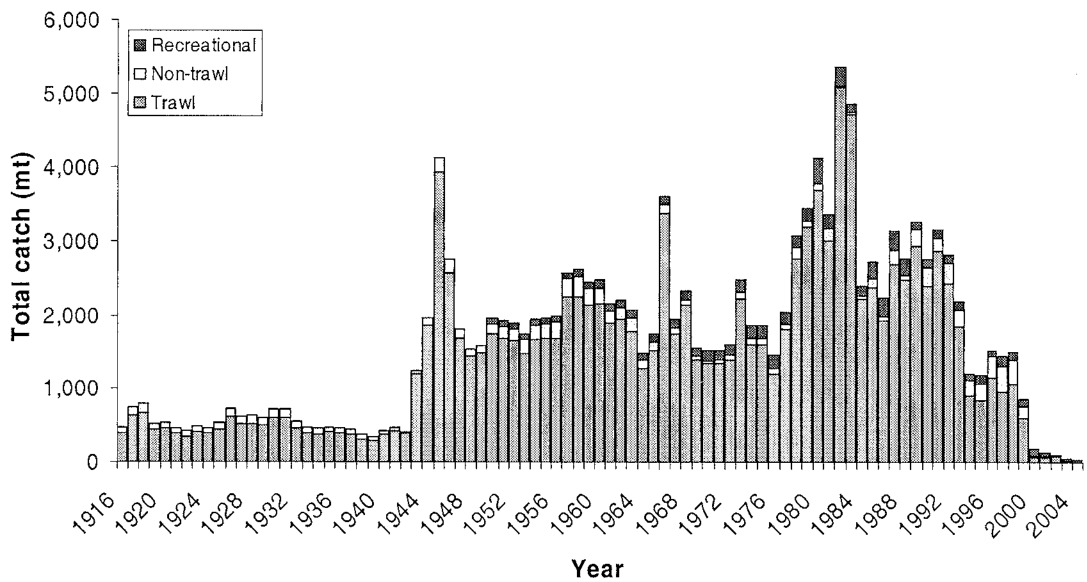
Executive Summary

Stock

This assessment reports the status of the canary rockfish (*Sebastes pinniger*) resource off the coast of the United States from southern California to the U.S.-Canadian border using data through 2004.

Catches

Catch of canary rockfish is first reported in 1916 in California. Since that time, annual catch ranged from 37.5 mt in 2004 to 5,374 in 1982 and totaled almost 150,000 mt over the time-series. Total catches since 1999 have been dramatically reduced relative to previous years in an attempt to rebuild a stock declared overfished in 2000 on the basis of the 1999 assessment. Canary rockfish catches have been primarily from the trawl fleets, on average comprising 85% of the annual catches, with the Oregon fleet removing as much as 3,864 mt in 1982. Historically just 10% of the catches have come from non-trawl commercial fisheries, although this proportion reached 24% and 350 mt in 1997. Recreational removals have averaged just 6% of the catches but have become relatively more important as commercial landings have been substantially reduced in recent years; recreational catches reached 60% of the total with 29 mt caught in 2003.



Catch history by major source, 1916-2004.

Recent commercial fishery catches (mt) by fleet.

Year	Southern California trawl	Northern California trawl	Oregon trawl*	Washington trawl*	Southern California non-trawl	Northern California non-trawl	Oregon-Washington non-trawl
1995	32.54	106.46	544.21	153.76	53.94	60.59	116.36
1996	102.23	116.13	744.34	184.91	84.90	51.48	164.04
1997	32.37	142.41	577.41	204.76	29.83	74.89	248.11
1998	9.52	149.46	712.26	201.23	23.42	56.84	245.13
1999	7.44	97.20	350.41	143.49	8.47	28.29	120.48
2000	1.71	10.92	29.78	28.96	2.52	5.53	7.98
2001	1.32	9.55	29.02	21.80	1.60	4.96	9.62
2002	0.36	14.48	33.51	35.45	0.02	0.08	2.62
2003	0.23	0.40	6.86	6.91	0.00	0.08	4.48
2004	0.80	2.55	13.52	8.04	0.02	0.08	4.89

* Includes at-sea whiting catches.

Data and Assessment

This assessment used the Stock Synthesis 2 model which is an integrated length-age structured model. This assessment includes catch, length- and age-frequency data from 10 fishing fleets, including trawl, non-trawl and recreational sectors. The National Marine Fisheries Service (NMFS) triennial bottom trawl survey biomass index is included to provide direct information on trends in stock abundance.

Several alternative model configurations were investigated in order to best understand the patterns and information in the canary rockfish data. These included specification of age vs. length-based selectivity, incorporating changes in ageing criteria and re-estimating growth parameters to reflect these changes, allowing female selectivity to differ from male selectivity, and other factors. A model configuration with female length-selectivity set equal to male length-selectivity was presented to the STAR panel in August as the proposed base model. This differed from the 2002 assessment that used age-based selectivity and allowed a male-female difference, but was considered a preferred configuration due to the preponderance of length data and the difference in maximum size between males and females. During the STAR panel review, it was found that allowing female length-selectivity to differ from male length-selectivity provided a somewhat better statistical fit to the fishery age and length composition data and this configuration was selected at that time as the base model, documented in the Aug 31, 2005 version of the assessment document, and used for the first draft of the rebuilding analysis in September 2005.

At the SSC review of the canary rockfish assessment (Sept. 27-30, 2005; Seattle, WA) several issues that had not been specifically examined in the assessment (trawl survey catchability, recruitment variability, and juvenile recruitment survey) were considered. The results are summarized in Appendix A to this assessment report. The SSC recommended no major changes to the base model. However, they concluded that the parametric variance around a single base model underestimated the overall uncertainty in the canary rockfish assessment. After re-examining some of the sensitivity analyses included in the assessment, the SSC concluded that the alternative configuration of the male-female selectivity parameters was plausible to include. The two model scenarios are labeled here as Base (Diff configuration – with female length-selectivity allowed to differ from male length-selectivity) and Alternate (NoDiff configuration - with no difference allowed). After considerable deliberation, the SSC concluded that the Base and Alternate models were equally likely and they supported a statistically based blend of the two models as the basis for the rebuilding analysis. This final version of the canary rockfish 2005 assessment has been revised to include the alternate model and to document the results used in the rebuilding analysis. The rebuilding analysis is configured to incorporate 3 sources of uncertainty: two model configurations, probability profile on the spawner-recruitment steepness for each model configuration, and the annual variability in future recruitments.

Unresolved Problems and Major Uncertainties

Parameter uncertainty is explicitly captured in the asymptotic confidence intervals reported throughout this assessment for key parameters and management quantities. These intervals reflect the uncertainty in the model fit to the data sources included in the assessment, but do not include uncertainty associated with alternative model configurations, weighting of data sources (a combination of input sample sizes and relative weighting of likelihood components). Specifically, there appears to be conflicting information between the length- and age-frequency data regarding the degree of stock decline, making the model results sensitive to the relative weighting of each. This issue is explored in the assessment, but cannot be fully resolved at this time. The final model configuration includes a base model and an alternate model that differs only in the degree of flexibility in some selectivity curves, yet results is a difference in the estimated current stock abundance. The relationship between the degree of dome in the selectivity curves and the increase in female natural mortality with age remains a source of uncertainty, as it has been in previous assessments for both canary rockfish and yellowtail rockfish. We have used an approach to this problem similar to recent assessments, but there is little data available to resolve this issue and it will remain an area for further exploration in future assessments.

Regional Management Concerns

This assessment has addressed the spatial aspects of the coast-wide population through separation of data sources/fleets where possible and consideration of residual patterns that may be a result of inherent stock structure. Previous assessments concluded that separate models for northern and southern stocks produce very similar results to coast-wide analyses for canary rockfish (Methot and Piner, 2002), and we find no compelling cause to divide this assessment into separate spatial areas. As noted in the research recommendations, the STAT team does support investigation of spatial patterns in canary rockfish aggregations and movement toward an assessment that includes the portion of the canary rockfish stock that resides in Canadian waters.

Reference Points

Unfished spawning stock biomass was estimated to be 34,798 mt in the Base model and 33,872 mt in the Alternate model configuration. The blended estimate across the steepness probability distributions and the two models is 34,155 mt. The target stock size (SB40%) is therefore 13,662 mt. Maximum sustained yield (MSY) was estimated in the assessment model to occur at a spawning stock biomass of 15,584 mt (base) to 13,418 mt (alternate) and produce a MSY catch of 822 mt (base) and 1,168 mt in the Alternate. The estimate of generation time is 22.8 years, an increase from the 2002 estimate of 19 years due to the decrease in the estimate of the natural mortality rate for old female canary rockfish from 0.12 to 0.09.

Summary of canary rockfish reference points.

Quantity	Model = DIFF		Model = NODIFF	
	Estimate	~95% Confidence interval	Estimate	~95% Confidence interval
Unfished spawning stock biomass (SB_0, mt)	34,798	32,067-37,529	33,872	30,938-36,806
Unfished summary (age 3+) biomass (mt)	93,315	NA	87,621	NA
Unfished recruitment (R_0, thousands)	4,728	4,326-5,167	4,357	3,982-4,766
Spawning stock biomass at MSY (SB_{msy})	15,584	13,817-17,351	13,418	11,270-15,566
Basis for SB_{msy}	Estimated	NA	Estimated	NA
Recruitment-Spawner steepness	0.329	0.271 – 0.387	0.449	0.349 – 0.550
SPR_{msy}	72.9%	NA	58.1%	NA
Basis for SPR_{msy}	Estimated	NA	Estimated	NA
Exploitation rate corresponding to SPR_{msy}	0.020	NA	0.033	NA
MSY (mt)	822	598-1,046	1,168	905-1,430

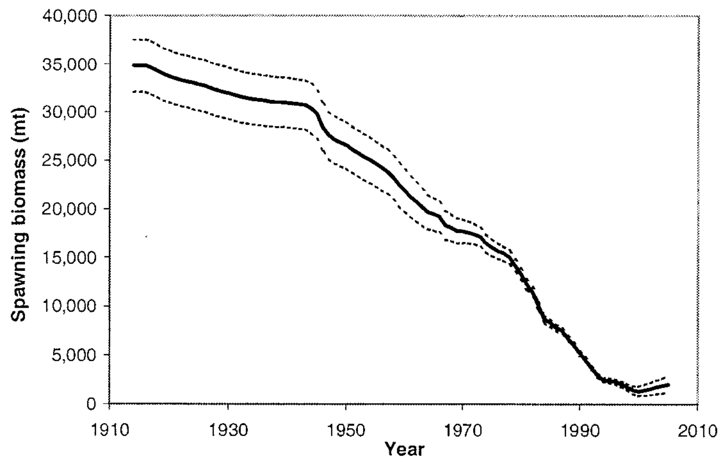
Summary of recent trends in canary rockfish abundance and exploitation levels; all values reported at the beginning of the year

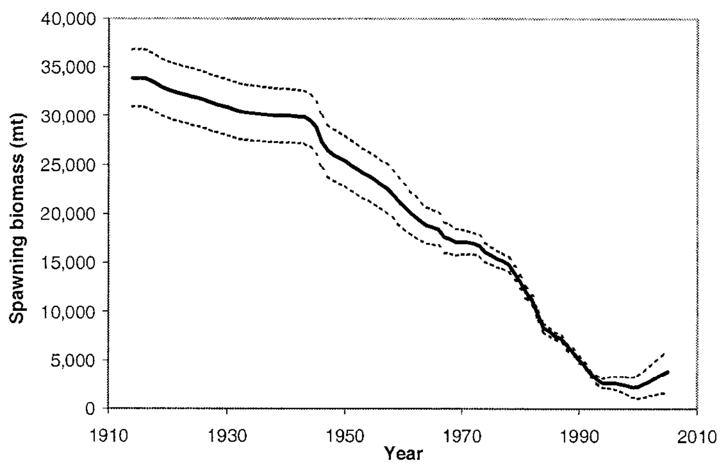
	1995	1996	1997	1998	1999	2000	2001	2002	2003	2004	2005
Total catch (mt)	1,190	1,531	1,441	1,513	856	181	123	104	48	38	NA
Landed catch (mt)	1,020	1,298	1,230	1,285	731	141	86	66.5	38.5	22.0	NA
ABC (mt)	1,250*	1,250*	1,220*	1,045*	1,045*	287	228	228	272	256	270
OY	850*	850*	1,000*	1,045*	857*	200	93	93	44	47.3	46.8
Base Model = DIFF											
SPR	0.160	0.114	0.104	0.081	0.130	0.518	0.642	0.705	0.840	0.885	NA
Age 3+ biomass (mt)	7,382	6,933	6,087	5,258	4,287	3,889	4,118	4,368	4,601	4,847	5,066
Spawning biomass (mt)	2,409	2,318	2,060	1,781	1,443	1,319	1,442	1,580	1,717	1,862	1,995
~95% interval	2,177-2,641	2,057-2,579	1,760-2,359	1,433-2,129	1,037-1,850	847-1,791	901-1,983	966-2,195	1,027-2,406	1,100-2,625	1,163-2,827
Recruitment (1000s)	547	374	366	824	276	196	327	380	407	436	466
~95% interval	315-949	204-686	188-710	466-1458	131-585	89-427	138-776	148-978	158-1,051	169-1,127	184-1,182
Depletion	0.069	0.067	0.059	0.051	0.041	0.038	0.041	0.045	0.049	0.054	0.057
~95% interval	NA	NA	NA	NA	NA	NA	NA	NA	NA	0.030-0.077	0.032-0.083
Alternate = NODIFF											
SPR	0.188	0.142	0.144	0.127	0.228	0.687	0.780	0.819	0.913	0.937	NA
Age 3+ biomass (mt)	9,159	9,010	8,510	8,050	7,460	7,439	8,063	8,695	9,289	9,875	10,417
Spawning biomass (mt)	2,658	2,668	2,531	2,395	2,212	2,252	2,544	2,865	3,187	3,518	3,829
~95% interval	2,093-3,222	2,015-3,321	1,772-3,290	1,512-3,278	1,188-3,236	1,069-3,435	1,183-3,905	1,311-4,418	1,435-4,940	1,570-5,467	1,690-5,969
Recruitment (1000s)	1,040	745	728	1,737	605	462	799	966	1,053	1,134	1,182
~95% interval	530-2,039	362-1,531	331-1,601	876-3,448	255-1,439	190-1,125	303-2,106	342-2,728	376-2,949	408-3,152	438-3,190
Depletion	0.078	0.079	0.075	0.071	0.065	0.066	0.075	0.085	0.094	0.104	0.113
~95% interval	NA	NA	NA	NA	NA	NA	NA	NA	NA	0.042-0.165	0.046-0.181

* Covers U.S. Vancouver and Columbia INPFC areas only.

Stock Biomass

Canary rockfish were relatively lightly exploited until the early 1940's, when catches increased and a decline in biomass began. The rate of decline in spawning biomass accelerated during the late 1970s, and finally stabilized in the late 1990s in response to management measures. The canary rockfish spawning stock biomass reached an estimated low in 2000, but has been increasing since that time. The estimated relative depletion level in 2005 is 5.7% in the base model and 11.4% in the alternate model. The 95% confidence interval is based upon the model's analytical estimate of the variance near the converged solution in the base model configuration. The rebuilding analysis incorporates a fuller range of uncertainty by including both models and the estimated probability distribution of an important parameter, spawner-recruitment steepness, for each model.

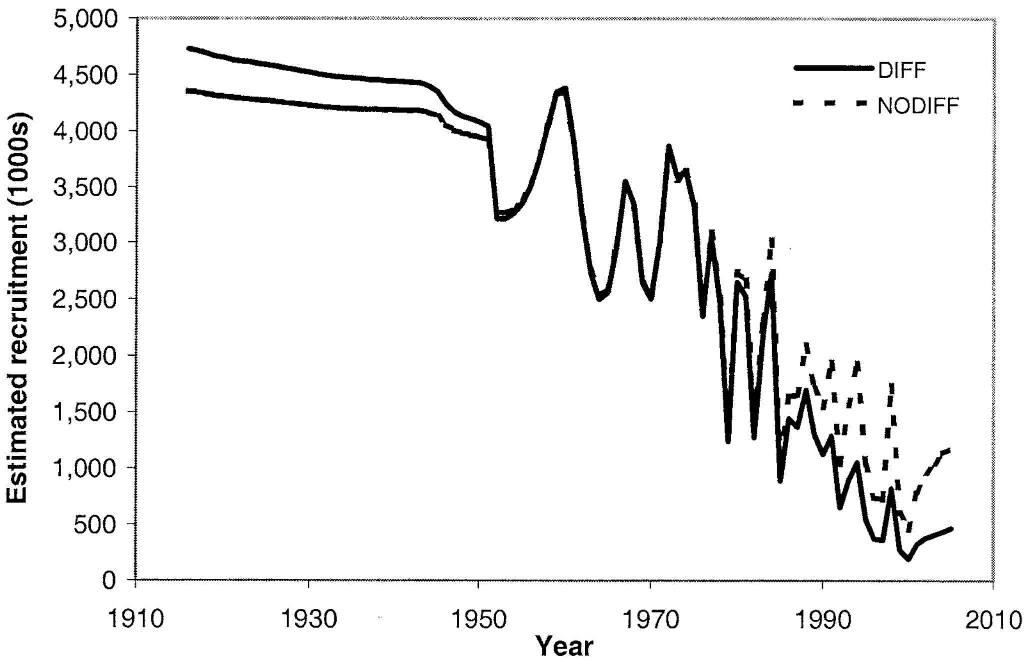




Estimated spawning biomass time-series with approximate asymptotic 95% confidence interval for the base-Diff (left) and alternate-NoDiff (right) models.

Recruitment

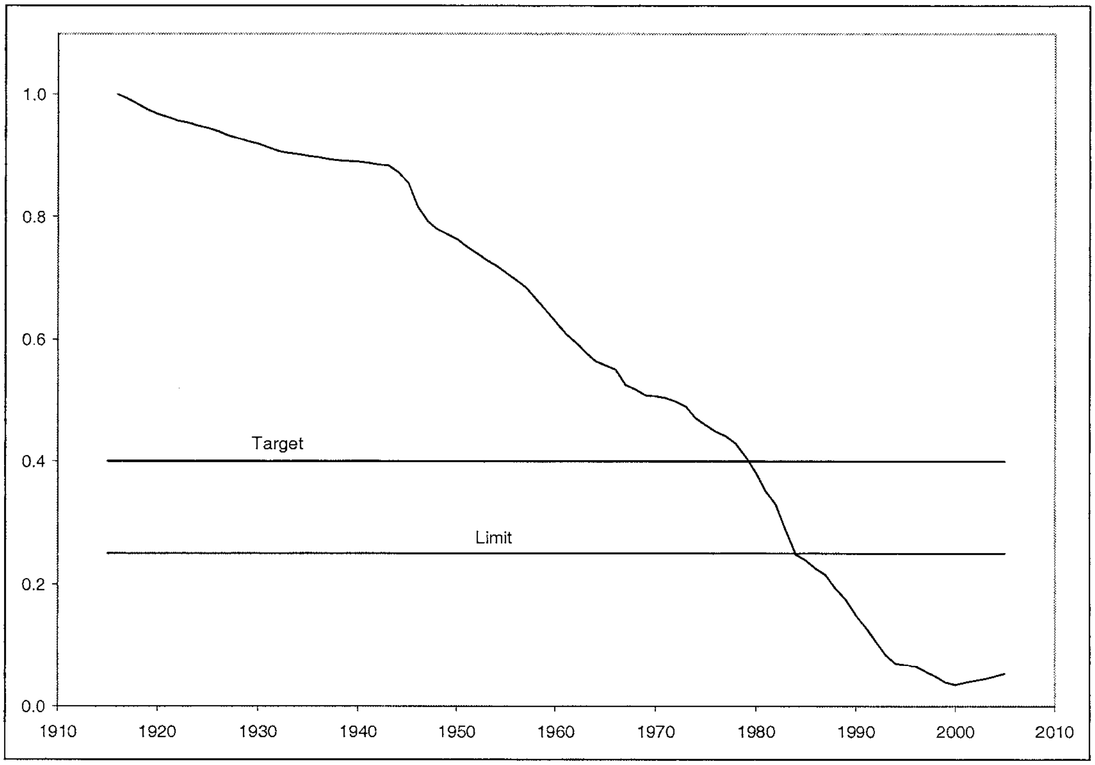
Canary rockfish recruitment has shown a steady decline over the last 50 years, closely tracking the decline in spawning stock biomass. Recent recruitments have generally been low, with 1998 producing the largest estimated recruitment in the last decade. However, there is little information in the available data to inform the assessment model about recruitments subsequent to about 2001, so these estimates largely reflect the stock-recruitment function and will likely be updated in future assessments.



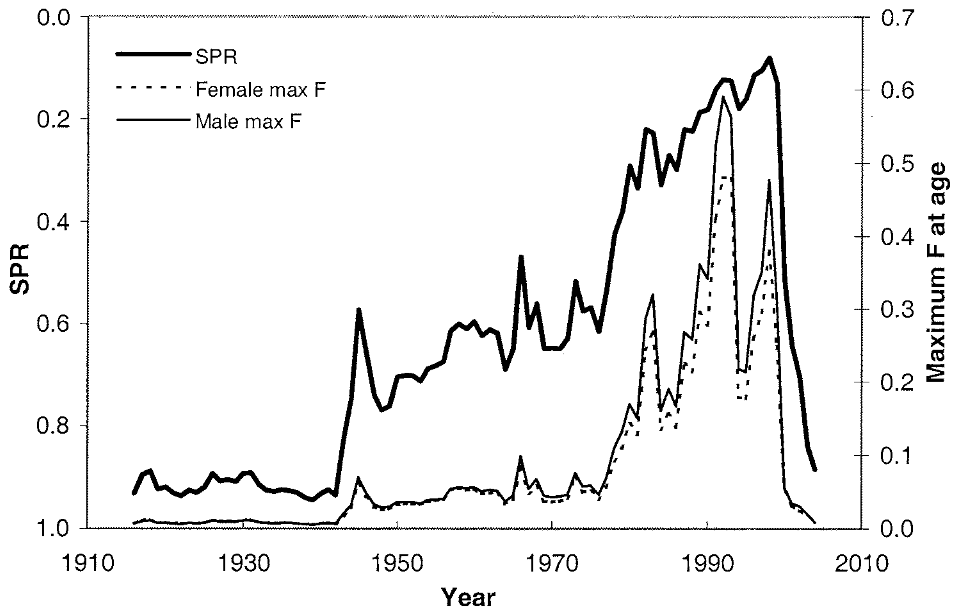
Time series of estimated canary rockfish recruitments.

Exploitation Status

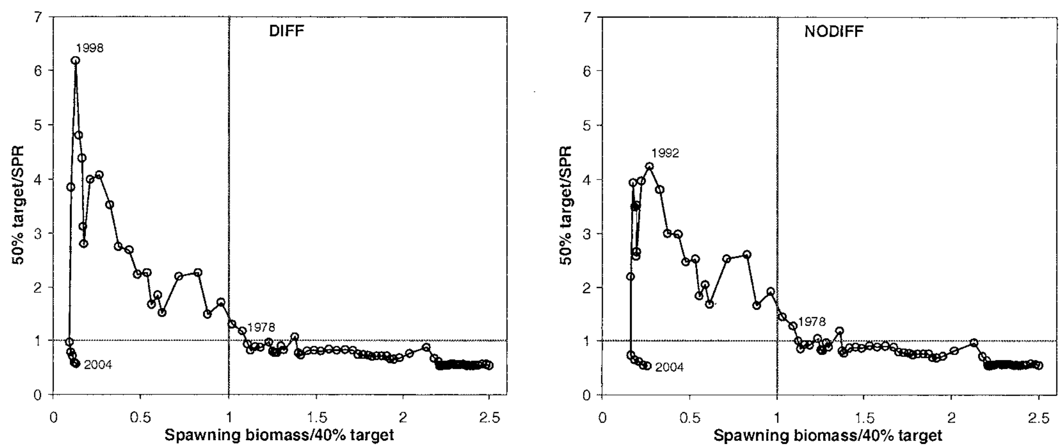
The abundance of the canary rockfish stock was estimated to have dropped below the SB40% management target in the late 1970s and the overfished threshold in the mid-1980s. In hindsight, the spawning stock biomass passed through the B_{msy} level in about 1980, at which time the annual catch was more than double the current estimate of the MSY level. The stock remains depleted, although the spawning stock biomass appears to be increasing. Harvest rates in excess of the current F-target for rockfish of SPR50% is estimated to have begun in the late 1970s and persisted through 1999. Recent management actions appear to have curtailed the rate of removal such that overfishing has not occurred since 1999, and recent SPR values are in excess of 90%.



Time series of depletion level as estimated in the Base model.



Time series of estimated spawning potential ratio (SPR) and maximum age- and sex-specific exploitation rate (labeled F here). Values of SPR below 0.5 reflect harvests in excess of the current F_{MSY} proxy. Only the base model result is shown.



Phase plot of estimated fishing intensity vs. stock abundance. Fishing intensity is the 50% target SPR divided by the annual SPR level. Stock abundance is annual spawner abundance divided by the 40% rebuilding target.

Management Performance

Total catches have decreased dramatically in response to reductions in trip limits and spatial closures driven by the overfished status of canary rockfish declared in 1999 and the corresponding drop in ABC and OY levels. In recent years the total mortality has been near the OY but well below the ABC. Since the overfished determination in 1999, the total 5-year catch (493 mt) has been only 3% above the total OY for 2000-2004. The current annual catch (~45 mt) is only 1% of the peak catch that occurred in the early 1980's.

Forecasts and Rebuilding Projections

The forecast reported here is taken from the rebuilding analysis. The total catch in 2005 and 2006 is set equal to the established OY for these years. The exploitation rate for 2007 and beyond is based upon an SPR of 88.7%, which approximates the harvest level in the current rebuilding plan. Uncertainty in the rebuilding forecast is based upon inclusion of a base and alternate model with 50% probability each, a probability profile of spawner-recruitment steepness for each model, and random variability in recruitment deviations (sigmaR=0.40) for each rebuilding simulation. The final result blends across this uncertainty, so incorporates the probability that the current stock abundance and the future stock probability will differ from the "best" estimates represented by the base model and the alternate model. These forecasts predict slow and steady increases in abundance and catch. The following table shows the projection of expected canary rockfish catch, spawning biomass and depletion. Calculations are based on the blended base and alternate models as estimated in the rebuilding analysis with status quo exploitation rate.

Year	Total catch (mt)	Spawning biomass (mt)	Depletion
2005	46.8	2743	0.081
2006	47.1	2930	0.087
2007	43.2	3091	0.091
2008	44.5	3225	0.095
2009	45.1	3335	0.099
2010	46.4	3432	0.101
2011	48.6	3528	0.104
2012	51.1	3627	0.106
2013	54.1	3706	0.108
2014	56.5	3798	0.111
2015	58.7	3901	0.114
2016	61.0	4014	0.117

Decision table

A decision table approach is not taken here because of the established rebuilding plan for canary rockfish.

Research and Data Needs

A number of research topics would substantially improve the ability of this assessment to reliably and precisely model canary rockfish population dynamics in the future and provide better monitoring of progress toward rebuilding:

1. Expanded Assessment Region: Given the high occurrence of canary rockfish close to the US-Canada border, we recommend a joint US-Canada assessment in the future.

2. Pre-recruit surveys: Although the central California midwater trawl juvenile rockfish survey was not included in the current assessment, we recommend further work to evaluate its applicability, especially because of recent efforts to expand the geographic scope of this type of survey.
3. Many assessments are deriving historical catch by applying various ratios to the total rockfish catch prior to the period when most species were delineated. A comprehensive historical catch reconstruction for all rockfish species is needed, to compile a best estimated catch series that accounts for all the catch and makes sense for the entire group.
4. Habitat relationships: The historical and current relationship between canary rockfish distribution and habitat features should be investigated to provide more precise estimates of abundance from the surveys, and to guide survey augmentations that could better track rebuilding. This assessment's description of spatial patterns in occurrence of large and small canary rockfish is a start on this investigation. Such studies could also assist determining the possibility of dome-shaped selectivity.
5. Rarity of old females: Given the premise of this and past assessments regarding the difference between age distributions of male and female canary rockfish, efforts should be undertaken that address this issue, including: (1) habitat-specific studies of the distribution of older male and female canary; (2) laboratory-based programs to rigorously evaluate the physiology of the two sexes. Current field studies to investigate occurrence of larger/older females can contribute information also, but comparison to the occurrence of older males will be difficult due to the reduction in occurrence of older males due to the long history of exploitation.
6. Meta-population model: The spatial patterns show patchiness in the occurrence of large vs. small canary; reduced occurrence of large/old canary south of San Francisco; and concentrations of canary rockfish near the US-Canada border. The feasibility of a meta-population model that has linked regional sub-populations should be explored as a more accurate characterization of the coast-wide population's structure.
7. Enhancements in the assessment model are needed to better address the statistical weighting of data from multiple, spatially distinct fishing fleets and the estimation of time-varying selectivity by these fleets.

SCIENTIFIC AND STATISTICAL REPORT ON STOCK ASSESSMENTS AND REBUILDING ANALYSES FOR 2007-2008 GROUNDFISH FISHERIES

Stock assessments for Petrale sole, lingcod, and canary rockfish were carried over to the September wrap-up Stock Assessment Review (STAR) Panel, which also reviewed rebuilding analyses for the seven overfished species. The September STAR Panel consisted of six members of the Scientific and Statistical Committee (SSC) groundfish subcommittee, one stock assessment scientist from the Southwest Fisheries Science Center (SWFSC) and one committee of independent experts reviewer. Revised stock assessments for all three species were reviewed and approved by the STAR Panel. The STAR Panel report was presented to the SSC by Dr. Martin Dorn, who chaired the STAR Panel.

Petrale Sole

The northern petrale sole stock assessment, originally scheduled for review at the April STAR Panel, was withdrawn because age composition data for recent years arrived during the review. Final review of both northern and southern petrale stock assessments were deferred to the September wrap-up STAR Panel.

The SSC reviewed the revised stock assessment and STAR Panel reports for both southern and northern petrale stocks (Agenda Item H.2.a, Attachment 2). The Stock Assessment Team (STAT) identified a number of issues with the northern stock concerning the modeling of multiple fisheries with dome-shaped selectivity patterns using sex-specific age data from different agencies. The model performed erratically and the complexity of the model made it difficult to interpret the results. To resolve these issues, the STAR Panel recommended that a radically simplified model, with all fisheries having the same asymptotic selectivity and with the sexes combined, be used. The simple model fit the data almost as well as the more complex model, giving very similar biomass trends.

Model results indicate that both stocks were above the overfishing threshold; Petrale sole in the north was estimated to be at 34% of unfished spawning biomass in 2005, and at 29% of unfished spawning biomass in the south. Biomass trends were quantitatively similar in both areas and the SSC recommends that a single coastwide assessment be considered in future stock assessments if issues with data patchiness can be resolved.

The current stock assessment presents a very different picture of stock trends over time in the north compared to the previous assessment. For example, in the 1999 stock assessment, spawning stock biomass in 1998, was estimated to be 39% of B_0, while the current assessment now estimates that the 1998 spawning biomass was 12% of B_0. The reason for these differences is unclear, but the SSC notes that there were many changes to the model and the catch data that may account for these results. The stock appears to have recovered from this very low level of abundance despite a long period of relatively stable catches.

The SSC endorses the STAR Panel conclusions that this assessment represents the best available science and can form the basis for Council decision-making.

Lingcod

Lingcod was first reviewed at the August STAR Panel meeting but was not approved largely because of uncertainty concerning the strength of the 1999 and 2000 year classes that were strongly influencing the perception of stock recovery. The STAT examined the evidence for these strong year classes and presented their findings at the September STAR Panel meeting.

The STAR panel found that the commercial age composition in 2001 and 2004, and the survey biomass estimates in 2001 and 2004 provided some support for above average year classes in 1999 and 2000, but the magnitude of these increases was uncertain. Data from the recreational fishery did not provide support for above average 1999 and 2000 year classes. However, sensitivity runs in which year class strength for 1999 and 2000 was set to the long term mean still showed the Lingcod-North (LCN) stock rebuilding, a result of the much higher productivity of lingcod compared to other groundfish stocks, and because of the substantial catch reductions in the northern area in recent years. In contrast, the southern stock has been rebuilding more slowly due to smaller reductions in catches and lower recruitment in recent years.

Estimated spawning stock biomass is 87% of unfished for the northern component of the stock and 24% of unfished for the southern component. The coastwide spawning stock biomass is estimated to be 64% of unfished biomass in 2005. Since the Council currently manages lingcod as a single coastwide stock, the stock is considered rebuilt. However, the SSC notes that the large disparity in spawning biomass between the north and south components, combined with different biological parameters suggest that there is some basis for managing lingcod on a regional basis.

The SSC endorses the STAR Panel conclusions that this stock assessment represents the best available science and can form the basis for Council decision making.

Canary Rockfish

At its September meeting, the SSC raised several technical issues with the canary rockfish assessment, and recommended that the canary assessment be revisited by the September STAR Panel. Specifically, the SSC requested that the STAT address the following four issues:
1. Survey catchability (q) was unusually high.
2. Assumed variability in the spawner-recruit relationship was low compared to other rockfish.
3. More complete documentation should be provided.
4. Inclusion of the Santa Cruz juvenile rockfish survey data should be considered.

The STAT complied with these requests and presented their findings at the September STAR Panel meeting. Comparing the survey q for canary with values estimated for other rockfish, it was determined that the q estimated for canary was larger than that estimated in other 2005 shelf rockfish assessments. Although the relatively high q estimate may be inconsistent with what is known of canary habitat (they are found in areas of high relief and complex substrate), this did not constitute sufficient evidence to reject the assessment. The SSC recommends further investigation of this matter in the next canary assessment.

The STAR Panel also noted that recruitment variability (sigma r) used in this and the previous canary stock assessment was the lowest of any rockfish, although there are other rockfish at or near the value used for canary (fixed at 0.4). However, the value of sigma r output by the assessment model was even lower (0.29), driven largely by the age data, which showed remarkable consistency over time, suggesting very stable recruitment. Furthermore, it was noted that age data are considered more reliable for canary than for most other rockfish.

The STAT also explored the effect of including the Santa Cruz juvenile survey data and the STAR Panel concluded that this could be influential depending on how the survey data are modeled. Modeling as in the widow rockfish assessment resulted in higher recent recruitments and higher estimated spawner-recruit steepness, but there are technical issues with incorporating these kinds of data that were identified by the widow STAR Panel. In addition, it was noted that the juvenile survey is at the southern end of the range of canary and may not provide a good index of recruitment. The STAR Panel consensus was that exclusion of the juvenile survey data was not sufficient to reject the assessment.

The STAR Panel concluded that the variability around a single base model underestimated overall uncertainty. The STAT recommended, and the STAR Panel concurred, that an alternate model be run in which male and female length-based selectivity was the same ("no-diff" model). Both the "no diff" and the original model accepted by the August STAR Panel ("diff") were considered equally likely. Profiles on steepness were conducted for the two models which were then blended with equal weighting to capture more of the statistical uncertainty. These results were carried forward into the rebuilding analysis.

The SSC endorses the STAR Panel conclusions that this stock assessment represents the best available science and can form the basis for Council decision making.

Rebuilding Analyses

Rebuilding analyses were reviewed for all overfished stocks according to guidelines and standards that were in effect when the rebuilding analyses were conducted. Currently it is uncertain how the recent court ruling on darkblotched rockfish will impact rebuilding targets, but it appears that current rebuilding targets and time frames may not be consistent with the court ruling. Nevertheless, the SSC reviewed the current rebuilding analyses for consistency with previously established guidelines and notes that these analyses still provide important guidance on stock recovery and effectiveness of Council management actions to recover overfished stocks.

There are seven overfished stocks for which rebuilding analyses were conducted. A rebuilding analysis was not conducted for lingcod because this stock is now estimated to be above the $B_{40\%}$ recovery target (coastwide spawning biomass is estimated to be 64% of unfished). The overfished stocks are: bocaccio, canary, cowcod, darkblotched, Pacific Ocean perch, widow, and yelloweye. Of these, canary, cowcod, darkblotched, POP, and widow are rebuilding ahead of schedule. Progress is barely adequate for bocaccio, while yelloweye rebuilding is behind schedule. The SSC notes that it will be increasingly difficult to evaluate progress toward rebuilding for yelloweye because this species is not sampled by the survey and there is no fishery data being generated.

Six runs were requested of each STAT to evaluate rebuilding. These runs and the results for each overfished species are presented in the STAR Panel report, Rebuilding Analyses for Overfished Groundfish Stocks (Agenda Item H.2.a, Attachment 8). Agenda Item H.3.a, Supplemental Attachment 2 also summarizes rebuilding progress for each of the overfished stocks. The SSC notes, however, that this table contains some errors and should be corrected according to the STAR Panel report before use by the Council. A corrected table is appended to this report.

The SSC reviewed the rebuilding analyses for each overfished stock and endorses the STAR Panel conclusion that these rebuilding analyses represent the best available science and can provide the basis for evaluating progress towards rebuilding given the guidelines that were in effect at the time the analyses were conducted. The SSC notes that the rebuilding tool developed and used in the current rebuilding projections can be used to evaluate other management alternatives and targets.

PFMC
11/01/05

Summary of Stock Status Updates for Overfished Groundfish Species in the PFMC Area 1/

Species	Status Change	Target Rebuilding Year in the FMP	Previous Rebuilding Parameters			Updated Rebuilding Parameters				Comments/Implications
			Tmin	**Tmax**	**Pmax**	**Tmin**	**Tmax**	**Pmax 2/**	**Ptarget 3/**	
Lingcod	Rebuilt	2009	2004 N 2005 S	2009	60%	NA	NA	NA	NA	Coastwide biomass estimated to be B64%
POP	No signif. change	2026	2014	2042	70%	2015	2043	78.9%	59.7%	
Darkblotched	Much better	2030	2011	2044	>90%	2009.5	2033	97.2%	96.2%	
Yelloweye	Worse	2058	2027	2071	92%	2036	2080	0.3%	0%	Reduce harvest rate to get to ∃50% Pmax
Canary	Slightly better	2074	2057	2076	60%	2048	2071	55.4%	57.4%	FMP amendment required 4/
Widow	Much better	2038	2026	2042	60%	2013	2033	94.0%	96.3%	FMP amendment required 4/
Cowcod	Better	2090	2062	2099	60%	2035	2074	75.0%	82.0%	FMP amendment required 4/
Bocaccio	No signif. change	2023 5/	2018	2032	70%	2018	2032	67.8%	24.0%	FMP amendment required 4/

1/ Assuming the SSC endorses and the Council approves the 2005 assessments and rebuilding analyses for these species.

2/ Probability of rebuilding under the re-estimated Tmax assuming no change in harvest rate.

3/ Probability of rebuilding by the target year in the FMP assuming no change in harvest rate.

4/ Implied action is to change the target rebuilding year according to the tenets of the Pacific Coast Groundfish FMP. For canary, widow, and cowcod, this is because the target year in the FMP is outside the range of the re-estimated Tmin to Tmax. For bocaccio, the target year was originally mis-specified (see footnote #5).

5/ The target year was incorrectly specified as 2023. The actual year in accordance with the Council-specified harvest rate and Pmax should have been 2027.

Agenda Item H.2.c
Supplemental GAP Report
November 2005

GROUNDFISH ADVISORY SUBPANEL STATEMENT ON STOCK ASSESSMENTS AND REBUILDING ANALYSES FOR 2007-2008 GROUNDFISH FISHERIES

The Groundfish Advisory Subpanel (GAP) understands that rebuilding plans which include periods of greater duration than T_{min} must be justified based on fishing community needs. This implies drawing a balance between conservation and community needs. The GAP is frustrated by the lack of direction on the following: the criteria for evaluating an appropriate balance, the specification of minimum community needs, and measures of adverse effects on communities, such as measures of effects on the recreational fishery.

In order to provide direction on establishing such a balance, the Council should consider recommending points of reference for minimum community needs. For example, the fishery was declared a disaster in the year 2000. A reference point for minimum community needs should be no lower than would be reflected by the fishing season and regulations in that year.

PFMC
11/01/05

STOCK ASSESSMENTS AND REBUILDING ANALYSES FOR 2007-2008 GROUNDFISH FISHERIES

The Council process for setting groundfish harvest levels and other specifications depends on periodic assessments of the status of groundfish stocks and a report from an established assessment review body or, in the Council parlance, a Stock Assessment Review (STAR) Panel. The Scientific and Statistical Committee (SSC) reviews new assessments and STAR Panel reports, as well as new rebuilding analyses for depleted groundfish species, and recommends the data and analyses that should be used to set groundfish harvest levels and other specifications for the following biennial management period (see Agenda Item H.3).

At its September meeting, the Council adopted new stock assessments for English sole, starry flounder, gopher rockfish, cowcod, California scorpionfish, darkblotched rockfish, Pacific ocean perch, cabezon (California only), sablefish, Dover sole, shortspine thornyhead, longspine thornyhead, widow rockfish, bocaccio, blackgill rockfish, kelp greenling (Oregon only), yelloweye rockfish, and yellowtail rockfish (Agenda Item H.2.a, Attachment 1—**CD copy of assessments**). On the advice of the SSC and/or the respective STAR Panels, the Council deferred adoption of new assessments for petrale sole, canary rockfish, and lingcod pending further review at the September 26-30 STAR Panel and November SSC meetings. The September STAR Panel did approve these assessments (see Agenda Item H.2.a, Attachment 2, Supplemental Attachment 4, and Attachment 6) and the SSC will consider recommending these assessments for management use at this meeting.

New rebuilding analyses for bocaccio, canary rockfish, cowcod, darkblotched rockfish, Pacific ocean perch, widow rockfish, and yelloweye rockfish were also reviewed at the September STAR Panel (Agenda Item H.2.a, Attachments 8 through 15). The September STAR Panel did approve these rebuilding analyses (see Agenda Item H.2.a, Attachment 8) and the SSC will consider recommending these analyses for management use at this meeting. A lingcod rebuilding analysis was not prepared since the STAR Panel-approved assessment (Agenda Item H.2.a, Attachment 7) indicated the stock has rebuilt to above its target biomass.

The Council should consider the new assessments and STAR Panel reports, as well as the advice of the SSC, other advisory bodies, and the public before adopting the new stock assessments and rebuilding analyses for use in 2007-2008 groundfish management.

Council Action:

1. **Approve New Stock Assessments for Petrale Sole, Canary Rockfish, and Lingcod for 2007-2008 Groundfish Fisheries.**
2. **Approve New Rebuilding Analyses for Bocaccio, Canary Rockfish, Cowcod, Darkblotched Rockfish, Pacific Ocean Perch, Widow Rockfish, and Yelloweye Rockfish for 2007-2008 Groundfish Fisheries.**

Reference Materials:

1. Agenda Item H.2.a, Attachment 1: ***CD copy of assessments***, STAR Panel reports, and rebuilding analyses.
2. Agenda Item H.2.a, Attachment 2: Petrale Sole, STAR Panel Report.
3. Agenda Item H.2.a, Attachment 3: Executive summary of "Stock Assessment of Petrale Sole, 2004".
4. Agenda Item H.2.a, Supplemental Attachment 4: Canary Rockfish, STAR Panel Report.
5. Agenda Item H.2.a, Supplemental Attachment 5: Executive summary of "Status of the U.S. canary rockfish resource in 2005".
6. Agenda Item H.2.a, Attachment 6: Lingcod, STAR Panel Report.
7. Agenda Item H.2.a, Attachment 7: Executive summary of "Assessment of Lingcod (Ophiodon elongatus) for the Pacific Fishery Management Council in 2005".
8. Agenda Item H.2.a, Attachment 8: Rebuilding Analyses for Overfished Groundfish Stocks, STAR Panel Report.
9. Agenda Item H.2.a, Attachment 9: Bocaccio Rebuilding Analysis for 2005.
10 Agenda Item H.2.a, Attachment 10: Updated Rebuilding Analysis for Canary Rockfish Based on Stock Assessment in 2005.
11. Agenda Item H.2.a, Attachment 11: Cowcod Rebuilding Analysis 2005: Analysis of the Progress Towards Rebuilding in the Southern California Bight.
12. Agenda Item H.2.a, Attachment 12: Update of Darkblotched Rockfish (*Sebastes crameri*) Rebuilding Analyses.
13. Agenda Item H.2.a, Attachment 13: Rebuilding Update for Pacific Ocean Perch.
14. Agenda Item H.2.a, Attachment 14: Rebuilding Analysis for Widow Rockfish in 2005.
15. Agenda Item H.2.a, Attachment 15: Rebuilding Analysis for Yelloweye Rockfish for 2005.

Agenda Order:

a. Agenda Item Overview — John DeVore
b. SSC Report — Kevin Hill
c. Reports and Comments of Advisory Bodies
d. Public Comment
e. **Council Action:** Approve Remaining Stock Assessments and Rebuilding Analyses for 2007-2008 Groundfish Fisheries

PFMC
10/18/05

PACIFIC FISHERY MANAGEMENT COUNCIL AND NATIONAL MARINE FISHERIES SERVICE SCHEDULE AND PROCESS FOR DEVELOPING 2007-2008 GROUNDFISH HARVEST SPECIFICATIONS AND MANAGEMENT MEASURES[1]

September 9, 2005	Council staff files Notice of Intent (NOI) in the *Federal Register* to prepare either an Environmental Assessment (EA) or Environmental Impact Statement (EIS).
August 29 - September 2, 2005	The Groundfish Management Team (GMT), Council staff, and Northwest Region (NWR) staff meet in Portland, Oregon to draft a recommended schedule, process, and work plan for developing 2007-2008 groundfish harvest specifications and management measures.
September 19-23, 2005	The Council and advisory bodies meet in Portland, Oregon to adopt: 1. New stock assessments. 2. A schedule, process, and work plan for developing 2007-2008 groundfish harvest specifications and management measures. 3. Rebuilding revision rules.
October 11-14, 2005	The GMT, Council staff, and NWR staff meet in Seattle, Washington to review new stock assessments and rebuilding analyses and draft a recommended range of 2007-2008 groundfish harvest specifications acceptable biological catch (ABC) and optimum yields (OYs) and preliminary management measures.
October 31 - November 4, 2005	The Council and advisory bodies meet in San Diego, California to adopt: 1. New stock assessments and rebuilding analyses. 2. Updated observer data and proposed methodologies to model bycatch in trawl and fixed gear fisheries. 3. A range of preliminary 2007-2008 harvest specifications (ABCs and OYs), and if possible, preferred OYs for some stocks and complexes. 4. Adopt, or give guidance on, a preliminary range of management measures, including initial allocations.
November 7, 2005- January 10, 2006	The GMT, Council staff, NWR staff, and agency staff develop: 1. Impact analyses of proposed management measure alternatives. 2. A preliminary draft Environmental Impact Statement (DEIS) document.
November 14-15, 2005	The Allocation Committee meets to decide commercial-recreational allocation alternatives not decided at the November Council meeting.

[1] Reflecting Council guidance at the September 2005 meeting.

November 16, 2005-March 31, 2006	Opportunity for state and tribal agencies to hold constituent meetings to obtain input on final ABC and OYs refinement of the range of management measures.
January 9-10, 2006	The GMT, Council staff, and NWR staff meet to further develop impact analyses of management measure alternatives.
Three days TBD during mid-January through early February, 2006	The Allocation Committee, GMT, Council staff, and NWR staff meet to refine management measure alternatives and further develop impact analyses.
February, 2006	Whiting Stock Assessment Review (STAR) Panel meets to review a new whiting assessment.
March 6-10, 2006	Council and advisory bodies meet in Seattle, Washington to adopt whiting harvest specifications and management measures for 2006.
March 15, 2006	Council staff or NWR staff release alternatives analysis (and other key components of a preliminary DEIS document) for April briefing book.
April 3-7, 2006	Council and advisory bodies meet to: 1. Adopt final 2007-2008 harvest specifications (ABC and OYs). 2. Adopt a range of refined management measures and, if possible, a tentative preferred alternative of management measures.
April 17-21, 2006	The GMT, Council staff, and NWR staff meet in Portland, Oregon to analyze the management measures adopted at the April Council meeting and to refine a preliminary DEIS document for public review and presentation at the June Council meeting.
April 21, 2006- June 11, 2005	Opportunity for state and tribal agencies to hold constituent meetings to obtain input on a final preferred alternative of management measures.
May 24, 2006	Council staff or NWR staff delivers the preliminary DEIS document for the June briefing book and distributes a pre-submission review copy to NMFS Headquarters (HQ).
June 11-16, 2006	Council and advisory bodies meet at the Crowne Plaza Hotel in Foster City, California to: 1. Take final action on the 2007-2008 groundfish management measures. 2. Determine National Environmental Policy Act (NEPA) document status as EA or EIS. 3. Discuss January-February, 2007 fishery regulations in the context of EA or EIS decision.

The regulatory process after the final Council decision depends on the category of NEPA regulatory document (EA or EIS) and the degree of completeness of the draft NEPA document in the June briefing book. The following schedule presumes an EIS document, a highly refined analysis at the June briefing book stage that also contains a preferred alternative, and no substantial deviation from that preferred alternative at the June Council meeting. Absent these conditions, an EIS schedule would be delayed one to two months and result in the regulations not being in place until about March 1.

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July 17, 2006	DEIS received by NMFS HQ.
July 20, 2006	NWR sends draft proposed rule package to regional General Counsel (GC).
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July 31, 2006	NWR transmits proposed rule to HQ.
August 30, 2006	Proposed rule is published; 30-day public comment period on proposed rule begins.
September 11, 2006	45-day public comment period on DEIS ends.
September 29, 2006	30-day public comment period on proposed rule ends. FEIS sent to HQ.
October 2, 2006	FEIS received by NMFS HQ. NWR meets with regional GC to plan response to comments on proposed rule.
October 6, 2006	FEIS submitted to EPA.
October 12, 2006	NWR sends final rule package to regional GC.
October 13, 2006	EPA publishes NOA; 30-day cooling off period begins.
October 18, 2006	Regional GC returns final rule package to NWR.
October 30, 2006	NWR transmits final rule package to HQ.
November 12, 2006	30-day cooling off period on FEIS ends.
November 13, 2006	ROD signed no earlier than this date.
November 29, 2006	Final rule published; 30-day APA cooling off period begins.
December 29, 2006	APA cooling off period ends.
January 1, 2007	Groundfish fishery begins under adopted specifications and management measures.

Summary of Stock Status Updates for Overfished Groundfish Species in the PFMC Area 1/

Species	Status Change	Target Rebuilding Year in the FMP	Previous Rebuilding Parameters			Updated Rebuilding Parameters				Comments/Implications
			Tmin	Tmax	Pmax	Tmin	Tmax	Pmax 2/	Ptarget 3/	
Lingcod	Rebuilt	2009	2004 N 2005 S	2009	60%	NA	NA	NA	NA	Coastwide biomass estimated to be B64%
POP	No signif. change	2026	2014	2043	70%	2015	2048	78.2%	59.7%	
Darkblotched	Much better	2030	2011	2044	>90%	2009.5	2033	97.2%	96.2%	
Yelloweye	Worse	2058	2027	2071	92%	2036	2080	0.3%	0%	Reduce harvest rate to get to ≥50% Pmax
Canary	Slightly better	2074	2057	2076	60%	2048	2071	55.4%	57.4%	FMP amendment required 4/
Widow	Much better	2038	2026	2042	60%	2013	2027	94.0%	93.6%	FMP amendment required 4/
Cowcod	Better	2090	2062	2095	60%	2035	2074	75.0%	81.0%	FMP amendment required 4/
Bocaccio	No change	2023 5/	2018	2032	70%	2018	2032	70.0%	24.0%	FMP amendment required 4/

1/ Assuming the SSC endorses and the Council approves the 2005 assessments and rebuilding analyses for these species.

2/ Probability of rebuilding under the re-estimated Tmax assuming no change in harvest rate.

3/ Probability of rebuilding by the target year in the FMP assuming no change in harvest rate.

4/ Implied action is to change the target rebuilding year according to the tenets of the Pacific Coast Groundfish FMP. For canary, widow, and cowcod, this is because the target year in the FMP is outside the range of the re-estimated Tmin to Tmax. For bocaccio, the target year was originally mis-specified (see footnote #5).

5/ The target year was incorrectly specified as 2023. The actual year in accordance with the Council-specified harvest rate and Pmax should have been 2027.

Agenda Item H.3.a
Supplemental Attachment 3
November 2005

PACIFIC FISHERY MANAGEMENT COUNCIL AND NATIONAL MARINE FISHERIES SERVICE SCHEDULE AND PROCESS FOR DEVELOPING 2007-2008 GROUNDFISH HARVEST SPECIFICATIONS AND MANAGEMENT MEASURES[1]

September 9, 2005	Council staff files Notice of Intent (NOI) in the *Federal Register* to prepare either an Environmental Assessment (EA) or Environmental Impact Statement (EIS).
August 29 - September 2, 2005	The Groundfish Management Team (GMT), Council staff, and Northwest Region (NWR) staff meet in Portland, Oregon to draft a recommended schedule, process, and work plan for developing 2007-2008 groundfish harvest specifications and management measures.
September 19-23, 2005	The Council and advisory bodies meet in Portland, Oregon to adopt: 1. New stock assessments. 2. A schedule, process, and work plan for developing 2007-2008 groundfish harvest specifications and management measures. 3. Rebuilding revision rules.
October 11-14, 2005	The GMT, Council staff, and NWR staff meet in Seattle, Washington to review new stock assessments and rebuilding analyses and draft a recommended range of 2007-2008 groundfish harvest specifications acceptable biological catch (ABC) and optimum yields (OYs) and preliminary management measures.
October 31 - November 4, 2005	The Council and advisory bodies meet in San Diego, California to adopt: 1. New stock assessments and rebuilding analyses. 2. Updated observer data and proposed methodologies to model bycatch in trawl and fixed gear fisheries. 3. A range of preliminary 2007-2008 harvest specifications (ABCs and OYs), and if possible, preferred OYs for some stocks and complexes. 4. Adopt, or give guidance on, a preliminary range of management measures, including initial allocations. **5. Adopt schedule for development and adoption of 2007-2008 harvest specifications and management measures and Amendment 16-4 to the FMP (7 revised rebuilding plans)**
November 7, 2005- January 10, 2006	The GMT, Council staff, NWR staff, and agency staff develop: 1. Impact analyses of proposed management measure alternatives. 2. A preliminary draft Environmental Impact Statement (DEIS) document.

[1] Reflecting Council guidance at the September 2005 meeting.

November 14-15, 2005	The Allocation Committee meets to decide commercial-recreational allocation alternatives not decided at the November Council meeting.
November 16, 2005-March 31, 2006	Opportunity for state and tribal agencies to hold constituent meetings to obtain input on final ABC and OYs refinement of the range of management measures.
January 9-10, 2006	The GMT, Council staff, and NWR staff meet to further develop impact analyses of management measure alternatives.
Three days TBD during mid-January through early February, 2006	The Allocation Committee, GMT, Council staff, and NWR staff meet to refine management measure alternatives and further develop impact analyses.
February, 2006	Whiting Stock Assessment Review (STAR) Panel meets to review a new whiting assessment.
March 6-10, 2006	Council and advisory bodies meet in Seattle, Washington to adopt whiting harvest specifications and management measures for 2006.
March 15, 2006	Council staff or NWR staff release alternatives analysis (and other key components of a preliminary DEIS document) for April briefing book.
April 3-7, 2006	Council and advisory bodies meet to: 1. Adopt final 2007-2008 harvest specifications (ABC and OYs). 2. Adopt a range of refined management measures and, if possible, a tentative preferred alternative of management measures. **3. Adopt preliminary Amendment 16-4 (7 revised rebuilding plans) FMP amendatory language.**
April 17-21, 2006	The GMT, Council staff, and NWR staff meet in Portland, Oregon to analyze the management measures adopted at the April Council meeting and to refine a preliminary DEIS document for public review and presentation at the June Council meeting.
April 21, 2006-June 11, 2005	Opportunity for state and tribal agencies to hold constituent meetings to obtain input on a final preferred alternative of management measures.
May 24, 2006	Council staff or NWR staff delivers the preliminary DEIS document for the June briefing book and distributes a pre-submission review copy to NMFS Headquarters (HQ).

June 11-16, 2006	Council and advisory bodies meet at the Crowne Plaza Hotel in Foster City, California to: 1. Take final action on the 2007-2008 groundfish management measures. **2. Take final action on Amendment 16-4 (7 revised rebuilding plans) to the FMP** 3. Determine National Environmental Policy Act (NEPA) document status as EA or EIS. 4. Discuss January-February, 2007 fishery regulations in the context of EA or EIS decision.

The regulatory process after the final Council decision depends on the category of NEPA regulatory document (EA or EIS) and the degree of completeness of the draft NEPA document in the June briefing book. The following schedule presumes an EIS document, a highly refined analysis at the June briefing book stage that also contains a preferred alternative, and no substantial deviation from that preferred alternative at the June Council meeting. Absent these conditions, an EIS schedule would be delayed one to two months and result in the regulations not being in place until about March 1.

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July 17, 2006	DEIS received by NMFS HQ.
July 21, 2006	DEIS submitted to EPA.
July 24, 2006	Regional GC returns draft proposed rule package to NWR.
July 28, 2006	EPA publishes NOA, 45-day public comment period on DEIS begins.
July 31, 2006	NWR transmits proposed rule to HQ.
August 22, 2006	**Council staff transmits Amendment 16-4 to NMFS.**
August 29, 2006	**Notice of Availability for Amendment 16-4 publishes.**
August 30, 2006	Proposed rule is published; 30-day public comment period on proposed rule begins.
September 11, 2006	45-day public comment period on DEIS ends.
September 29, 2006	30-day public comment period on proposed rule ends. FEIS sent to HQ.
October 2, 2006	FEIS received by NMFS HQ. NWR meets with regional GC to plan response to comments on proposed rule.
October 6, 2006	FEIS submitted to EPA.

October 12, 2006	NWR sends final rule package to regional GC.
October 13, 2006	EPA publishes NOA; 30-day cooling off period begins.
October 20, 2006	Regional GC returns final rule package to NWR.
October 30, 2006	NWR transmits final rule package to HQ.
November 12, 2006	30-day cooling off period on FEIS ends.
November 13, 2006	ROD signed no earlier than this date.
November 27, 2006	**NOAA final decision on approval/disapproval of Amendment 16-4 to the FMP**
November 29, 2006	Final rule published; 30-day APA cooling off period begins.
December 29, 2006	APA cooling off period ends.
January 1, 2007	Groundfish fishery begins under adopted specifications and management measures.

UNITED STATES DISTRICT COURT
NORTHERN DISTRICT OF CALIFORNIA
SAN FRANCISCO DIVISION

NATURAL RESOURCES DEFENSE COUNCIL, INC., and OCEANA, INC., Plaintiffs, v. NATIONAL MARINE FISHERIES SERVICE, et al., Defendants. WESTCOAST SEAFOOD PROCESSORS ASSOCIATION, et al., Defendant-Intervenors.	CASE NO. C 02-1650 CRB **DECLARATION OF D. ROBERT LOHN IN SUPPORT OF FEDERAL DEFENDANTS' OPPOSITION TO MOTION FOR ORDER ON REMEDY**

I, D. Robert Lohn, declare as follows:

1. I am the Regional Administrator of the Northwest Region of the National Marine Fisheries Service (NMFS), an agency within the National Oceanic and Atmospheric Administration (NOAA) of the Department of Commerce, a position I have held since October 2001. Prior to coming to NMFS, I have, over the past decade, held various positions in the Pacific Northwest. From 1987 to 1994 I served as the General Counsel to the Northwest Power Planning Council, now known as the Northwest Power and Conservation Council. After that I managed the fish and wildlife division of the Bonneville Power Administration from 1994 to 1999. Most recently, before coming to NMFS, I held the position of Director of the Fish and Wildlife Division for the Northwest Power and Conservation Council.

2. As Regional Administrator, I have been delegated the authority to approve (with the concurrence of NOAA's Assistant Administrator for Fisheries), and implement fishery management plans and amendments for Pacific Coast groundfish developed by the Pacific

Fishery Management Council (Council) pursuant to the Magnuson-Stevens Fishery Conservation and Management Act (Magnuson-Stevens Act). I, or my designee, am a voting member of the Council. NMFS and the Council share responsibilities under the Magnuson-Stevens Act for managing the Pacific Coast groundfish fishery and other federally managed fisheries off Washington, Oregon, and California. In particular, the Council develops and recommends fishery management plans (FMPs), FMP amendments, and regulations to NMFS for approval and implementation. Both Council staff and agency staff, particularly the NMFS NWR's Sustainable Fisheries Division that I oversee, are responsible for drafting documents such as fishery management plan amendments, and implementing regulations; documents required by the National Environmental Policy Act (NEPA); and documents required by other applicable federal statutes such as the Regulatory Flexibility Act. The agency also compiles data for use by the Council, provides guidance on regulatory requirements, and reviews and comments on the Council's regulatory proposals.

3. NMFS intends to implement the 2007-2008 specifications (including the overall harvest levels and optimum yield (OY) for the various species) and management measures (specific regulatory measures designed to keep the total harvest within the OYs) for the Pacific Coast groundfish fishery so that they are based on rebuilding plans for all overfished species that are consistent with the 9th Circuit Court of Appeals decision in <u>Natural Resources Defense Council v. National Marine Fisheries Service</u>, No. 03-16842 (D.C. No. CV-02-01650-CRB)(9th Cir., August 24, 2005)(NRDC v. NMFS). Consistent with the decision, it is the agency's intent that all rebuilding periods will be as short as possible, taking into account the status and biology of the overfished stocks, the needs of fishing communities, and the interaction of the overfished stocks within the marine ecosystem.

4. During the process of reconsidering and revising the rebuilding plans, it is both necessary and important for NMFS to work through the process established in the Magnuson-Stevens Act. Significantly, the Council includes representatives of the various fishing interests along the entire Pacific coast of the United States; representatives of the states of Washington, Oregon and California (who coordinate the development of associated fishery management regulations within state waters. The state of Alaska is also represented but for Pacific groundfish there is no need to coordinate Federal and Alaska regulations); Federal representatives (NMFS, U.S. Department of Fish and Wildlife, U.S. Department of State, and U.S. Coast Guard); and a representative of the Indian tribes with Federally recognized fishing rights off the Pacific coast. (There are four Indian tribes who participate in Pacific groundfish fisheries.) Also, significantly, the deliberations of the Council are open to the public, and include extensive opportunity for public comment. Coordinating with the states through the Council process is particularly important; the states manage the groundfish fishery in state waters, and manage and develop many of the data programs NMFS and the Council use in management (such as fish tickets, logbooks, and port sampling).

5. The Council has five meetings per year to address fishing resource, habitat, industry, community and tribal issues associated with groundfish, salmon, halibut, highly migratory species like tuna, coastal pelagic species like sardines, and marine sanctuaries. The Council has several advisory panels that provide advice on specific aspects of management, including the Groundfish Management Team (GMT), the Science and Statistical Committee (SSC), and the Groundfish Advisory Subpanel (GAP). The Council has its next regularly scheduled meeting next week, October 30 - November 4, 2005, in San Diego, CA (agenda attached as Exhibit 1). For groundfish, the Council has begun developing the 2007-2008 specifications and management measures, in an extensive biennial management public process that is required by the Pacific Coast Groundfish Fishery Management Plan (FMP)(schedule attached as Exhibit 2).

6. The biennial management process was recently implemented through Amendment 17 to the groundfish FMP. The Council adopted Amendment 17 at its November 2002 meeting and NMFS approved it on August 20, 2003; the final rule implementing regulations was published September 4, 2003 (68 FR 52519), with an effective date of October 6, 2003. Under this biennial cycle, management measures are implemented for a two year period. Separate harvest specifications for each species are established for each year of the two-year management period. The development cycle for harvest specifications requires extensive technical preparation and review, as well as extensive Council consideration and opportunity for public comment. The adoption of new harvest specifications takes place over roughly a 14-month period using three Council meetings (November, April, and June). This provides more time for the Council and NMFS to develop the measures based on the most recent stock assessments and advice from the GMT, SSC, and GAP. It also provides significant opportunity for public comment.

7. Each stock assessment process typically involves development of a stock assessment, an independent review of the stock assessment by NOAA and academic scientists, and for rebuilding species, updates of the associated rebuilding analysis. The Council decision to adopt a stock assessment is based on a review of the advice of its SSC who provide an additional scientific review of these analyses, the recommendations of other Council committees such as the GMT and GAP, and public comment. Once adopted, the stock assessment and associated rebuilding analysis form the basis for OY determinations. For example, the new Darkblotched Assessment was completed in June 2005 after incorporating May 2005 comments from independent reviewers, which included nongovernment reviewers from the Center of Independent Experts. After the Darkblotched Assessment was completed, the associated rebuilding analysis was then completed in October 2005.

8. The three meeting Council process and the associated NMFS regulatory processes take 14 months to complete. At its November meeting, the Council decides on preliminary ranges of harvest levels and management measures (e.g. bimonthly, trip limits, area closures, allocations, seasons, recreational bag limits, etc.) for over 80 groundfish species

harvested by different gear types within four major fishing sectors-- each of which contain several subsectors. At its April meeting, the Council decides on final harvest levels, and refines management measures, the impacts of which will then be further analyzed. At its June meeting, the Council decides on final management measures. The Council's June decisions are presented to NMFS in the form of a draft NEPA document (EA or EIS). The draft NEPA document and associated references includes information that compares various management alternatives and detailed analyses of their effects on groundfish resources, fishing industry sectors and sub-sectors, and on fishing communities. NMFS then publishes the proposed specifications and management measures in the Federal Register and provides the public with additional opportunity to comment. Following the close of the comment period on the proposed rule, NMFS completes the decisionmaking process and publishes a final rule in the Federal Register in November.

9. The major conservation theme underlying this process is the rebuilding of eight overfished species, including darkblotched rockfish. At the beginning of each year, a "Bycatch Scorecard" is developed to provide the amount of each overfished species each subsector is likely to harvest. At each Council meeting during the fishing year, current harvest estimates of all species are reviewed to determine whether management measures need adjustment to prevent the fishing from exceeding OYs for any species while allowing the fishery to harvest as much of the healthy stocks as possible. The September 2005 Bycatch Scorecard exemplifies the inter-relatedness of these species with the various sectors and subsectors of the industry (Scorecard attached as Exhibit 3). It also demonstrates that measures to protect one rebuilding species need to account for the effects on other rebuilding species. The January 2006 Scorecard is now under development and among other things will be based on estimates of 2005 harvests including and estimated darkblotched harvest of 163.6 metric tons (mt.) , the 23 new stock assessments adopted by the Council, and projections for harvest and mortalities associated with the planned 2006 management regime, including revised 2006 projections of harvest/mortality for darkblotched rockfish. Very preliminary estimates suggest a

projected harvest/mortality in 2006 of darkblotched on the order of 170-190 mt. against a projected 2006 OY of 294 mt. These preliminary estimates are based on new observer data and a management regime that discourages targeting on darkblotched while simultaneously closing areas where darkblotched are more abundant.

10. At next week's meeting, I or my designee plan to discuss with the Council potential actions needed to make the FMP consistent with the 9th Circuit Court of Appeals decision in NRDC v. NMFS. Within these discussions, if not already suggested by another Council member, I or my designee, will recommend to the Council that it use this biennial process and adapt its 2007-2008 biennial process to include development of Amendment 16-4, which would amend all the current rebuilding language and plans in the FMP to make them consistent with the 9th Circuit decision in NRDC v. NMFS.. Amendments 16-1 to 16-3 established the FMP's current rebuilding plans and policies. Amendment 16-1 addressed National Standard 1 in the Magnuson-Stevens Act by establishing procedures for adopting and periodically reviewing rebuilding plans for overfished groundfish stocks. It also specifies what elements of rebuilding plans will be incorporated into the FMP and federal groundfish regulations. Amendments 16-2 and 16-3 implemented rebuilding plans, consistent with the framework established in Amendment 16-1, and set strategic rebuilding parameters to guide stock rebuilding for canary rockfish, darkblotched rockfish, lingcod, Pacific ocean perch, bocaccio, cowcod, widow rockfish, and yelloweye rockfish. By developing Amendment 16-4 in conjunction with this ongoing specification process, the result will be that the 2007-2008 specifications and management measures will be based on rebuilding timeframes for all the rebuilding species, not just for darkblotched, that are consistent with the 9th Circuit decision.

11. In addition, at next week's meeting, NMFS and the Council plan to consider the issue of reducing the darkblotched optimum yield (OY) for 2006. This consideration will be based on the most current stock assessment, completed fall 2005 and other current relevant information.

I declare under penalty of perjury that the foregoing is true and correct to the best of my knowledge, information and belief.

Executed this 28 day of October, 2005.

D. Robert Lohn

D. Robert Lohn

GROUNDFISH MANAGEMENT TEAM REPORT ON MANAGEMENT RECOMMENDATIONS FOR 2007-2008 GROUNDFISH FISHERIES—PART I

ABC/OY TABLES

The Groundfish Management Team (GMT) has compiled a table of preliminary acceptable biological catch (ABC) and optimum yield (OY) values for the 2007 and 2008 management cycle, based on the results of new stock assessments and rebuilding analyses (Tables 1 and 2). As there are many issues that will affect both the range of OY values that are evaluated, and potentially the range of ABC values that are evaluated, the GMT expects to make a number of revisions and clarifications to these tables over the next several days, based on guidance received today.

For species that are not overfished, and for which there is new information from this assessment cycle, the GMT has presented the Council with a single ABC based on the base model for most assessments, with OY alternatives that do not exceed that ABC, but may be lower based on the alternative states of nature included in the assessment decision tables. This is based on the assumption that alternative ABC values should not exceed the ABC values provided in base assessment models. If the Council would like to consider a wider range of alternative ABCs, based on alternative states of nature that may assume higher productivity than the base model (and consequently ABC values that are higher than the base model), the GMT requests that such guidance be provided.

Overfished Species

In previous management cycles, the GMT has provided low, medium and high OY alternatives that ranged around the probability of rebuilding by Tmax. The alternatives in Tables 1 and 2 represent a departure from that practice, and the rationale for the alternatives provided are included in Attachment 1. As a result of the recent 9th Circuit Court decision regarding darkblotched rockfish, the GMT has included catch levels of zero for all overfished rockfish species for the explicit purpose of facilitating a broader range of analyses in the event that status quo levels of harvest are not acceptable. For overfished species that are not constraining the fishery under the current management regime, the OY alternatives include the minimum catches at which these species would become constraining. These OYs are based on the scorecard SPR harvest rates projections (which are the low OY alternatives for bocaccio, cowcod, Pacific ocean perch, and widow rockfish). In other words, these are the estimated incidental catches that would occur given the constraints on all fisheries under the current management regime. Lower OYs for these species would require additional management measures, which would presumably constrain fisheries above and beyond current levels.

Identification of Fishing Communities

With regard to the analysis, the GMT is concerned that impacts to the fishing communities have not been defined. There are gear- and target species-specific fishing communities, which harvest some overfished stocks but not others as a result of the gear used, the range of the overfished stock, and/or the boundaries of the current Rockfish Conservation Areas (RCAs). Examples of these communities include: the longline dogfish fishery off Washington (which has bycatch of yelloweye rockfish, but has low catches of other overfished rockfish), the midwater trawl chilipepper fishery off California (which catches bocaccio but not darkblotched rockfish and has low catches of other overfished rockfish), and the summer petrale fishery off Oregon (which catches some canary but has extremely low catches of yelloweye and overfished slope stocks). The GMT is concerned that if a wide interpretation is taken relative to economic costs and benefits, some of these smaller fishing communities may be overlooked. The GMT plans to develop more comprehensive lists of these fishing communities to provide to the analysts following this meeting.

Kelp Greenling

The accepted kelp greenling assessment is geographically confined to Oregon. Due to the considerable uncertainty within the kelp greenling assessment, the GMT is not recommending setting an independent ABC/OY, but keeping kelp greenling within the "other fish" category. This species is currently managed under state regime. The state of Oregon manages kelp greenling using state harvest guidelines, length restrictions, and catch limits for both the recreational and commercial fisheries. Current Oregon catch levels fall below the OY suggested within the assessment, and any expansion beyond current catch levels is not anticipated to be considered by the state.

Gopher and Blackgill Rockfish

The GMT recommends that gopher rockfish remain as part of the minor nearshore rockfish south complex and blackgill rockfish remain as part of the minor slope rockfish south complex. Details on the contribution of each these species to their respective alternative OYs is provided in Attachment 1.

SCHEDULE AND PROCESS FOR 2007-2008

The GMT reviewed the revised schedule and process for 2007-2008 management (Agenda Item H.3.a Supplemental Attachment 3) and generally supports this revised schedule. However, the GMT requests that the Council consider changing the date of the GMT January 2006 meeting from January 9-10 to a date later in January or February. The current date does not allow enough time for the analyses and public meetings that are necessary for developing more refined 2007-2008 management alternatives that will be discussed at this GMT meeting. The GMT has identified three possible weeks for this meeting: January 23-27; February 6-10; February 13-17. The GMT recommends that the Council adopt a schedule that incorporates this change and provide guidance on which week is most appropriate.

GMT recommendations:

1. Adopt the range of ABCs and OYs contained in Attachment 1.
2. Provide guidance for considering a wider range of alternative ABCs or OYs, if appropriate.
3. Adopt schedule and process for developing 2007-2008 groundfish harvest specifications and management measures modified by GMT recommendations.

PFMC
11/01/05

TABLE 1. GMT-recommended alternatives for acceptable biological catches (ABCs) and total catch optimum yields (OYs) (mt) for **2007**. (Overfished stocks in CAPS).

Stock	No Action Alternative				2007 Action Alternatives						
	2005 ABC	2005 OY	2006 ABC	2006 OY	2007 ABC	Alt 1 OY	Alt 2 OY	Alt 3 OY	Alt 4 OY	Alt 5 oy	Council OY a/
Lingcod - coastwide	2,922	2,414	2,716	2,414	6,706	6,706	6,492				
Columbia and US-Vanc. areas		1,694		1,694		5,830	5,830				
Eureka, Monterey, and Conception areas		719		719		876	662				
N. of 42 (OR & WA)		1,801		1,801		5,960	5,960				
S. of 42 (CA)		612		612		746	532				
Pacific Cod	3,200	1,600	3,200	1,600	3,200	1,600					1,600
Pacific Whiting (Coastwide)	269,545	269,069	To be determined in March 2006		To be determined in March 2007						
Sablefish (Coastwide)	8,368	7,761	8,175	7,634	6,210	4,634	5,998				
N. of 36 (Monterey north)		7,486		7,363		4,470	5,785				
S. of 36 (Conception area)		275		271		164	213				
PACIFIC OCEAN PERCH	966	447	934	447	900	0	84	397	506	741	
Shortbelly Rockfish	13,900	13,900	13,900	13,900	13,900	13,900					13,900
WIDOW ROCKFISH	3,218	285	3,059	289	5,334	0	322	447	903	1,352	
CANARY ROCKFISH b/	270	47	279	47	172	0	24	43	67		
Chilipepper Rockfish	2,700	2,000	2,700	2,000	2,700	2,000					
BOCACCIO	566	307	549	309	602	0	147	216	314	425	
Splitnose Rockfish	615	461	615	461	615	461					461
Yellowtail Rockfish	3,896	3,896	3,681	3,681	4,585	4,585					4,585
Shortspine Thornyhead - coastwide					2,488						
Shortspine Thornyhead - N. of 34deg27'	1,055	999	1,077	1,018		1,232	1,642				
Shortspine Thornyhead - S. of 34deg27'						423	846				
Longspine Thornyhead - coastwide	2,851	2,656	2,851	2,656	3,953						3,953
Longspine Thornyhead - N. of 34deg27' c/		2,461		2,461		2,242	2,989				
Longspine Thornyhead - S. of 34deg27' c/		195		195		482	941				
COWCOD - S. of 36 (Conception area)	5	2.1	5	2.1	17	0	3	7	9	11	
COWCOD - Monterey area	19	2.1	19	2.1	19	0	3	7	9	11	
DARKBLOTCHED	269	269	294	294	456	0	130	219	317	456	
YELLOWEYE	54	26	55	27	47	0	12	17	21	24	
Nearshore Species											
Black Rockfish (WA)	540	540	540	540	540	540					540
Black Rockfish (OR-CA)	753	753	736	736	725	725					725
Minor Rockfish North	3,680	2,250	3,680	2,250	3,680	2,250	2,128	2,128			2,250
Nearshore Species		122		122		122	142	162			
Shelf Species		968		968		968					968
Slope Species		1,160		1,160		1,160					1,160
Remaining Rockfish North	1,612	1,216	1,612	1,216	Remaining rockfish ABCs are already incorporated into their respective minor rockfish complexes. The GMT is evaluating the most appropriate way to document harvest levels within the ABC.						
Bocaccio	318	239	318	239							
Chilipepper - Eureka	32	32	32	32							
Redstripe	576	432	576	432							
Sharpchin	307	230	307	230							
Silvergrey	38	29	38	29							
Splitnose	242	182	242	182							
Yellowmouth	99	74	99	74							
Other Rockfish North	2,068	1,034	2,068	1,034							
Minor Rockfish South	3,412	1,968	3,412	1,968	3,403	1,642	1,753	1,855	1,898		
Nearshore Species		615		615		413	515	558	666		
Shelf Species		714		714		714	714	714	714		714
Slope Species		639		639		626	626	626	626		626
Remaining Rockfish South	854	689	854	689	Remaining rockfish ABCs are already incorporated into their respective minor rockfish complexes. The GMT is evaluating the most appropriate way to document harvest levels within the ABC.						
Bank	350	263	350	263							
Blackgill	343	305	343	305							
Sharpchin	45	34	45	34							
Yellowtail	116	87	116	87							
Other Rockfish South	2,558	1,279	2,558	1,279							
California scorpionfish						137	219				
Cabezon (off CA only)	103	69	108	69	94	69					
Dover Sole	8,522	7,476	8,589	7,564	28,522	28,522	16,500				
English Sole	3,100	3,100	3,100	3,100	6,773	6,773					6,773
Petrale Sole (coastwide)	2,762	2,762	2,762	2,762	2,917	2,039	2,917				
Columbia and US-Vanc. areas						818	1,289				
Eureka, Monterey, and Conception areas						1,221	1,628				
Arrowtooth Flounder	5,800	5,800	5,800	5,800	5,800	5,800					5,800
Starry Flounder						464	618				
Other Flatfish	6,781	4,909	6,781	4,909	6,731	4,884					4,909
Other Fish	14,600	7,300	14,600	7,300	14,600	7,300					7,300
Kelp Greenling HG (OR)						No Fed HG	fed HG = state HG				

a/ Council OY is the Council's preferred harvest alternative for 2007.

b/ The canary rockfish OY alternatives assume a 50:50 commercial:recreational catch share. 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. Therefore, a higher OY would result from a higher commercial catch share.

TABLE 2. GMT-recommended alternatives for acceptable biological catches (ABCs) and total catch optimum yields (OYs) (mt) for **2008**. (Overfished stocks in CAP

Stock	No Action Alternative				2008 Action Alternatives				
	2005 ABC	**2005 OY**	**2006 ABC**	**2006 OY**	**2008 ABC**	**Alt 1 OY**	**Alt 2 OY**	**Alt 3 OY**	**Alt 4 OY**
Lingcod - coastwide	2,922	2,414	2,716	2,414	5,853	5,853	5,683		
Columbia and US-Vanc. areas						5,025	5,025		
Eureka, Monterey, and Conception areas						828	658		
N. of 42 (OR & WA)						5,155	5,155		
S. of 42 (CA)						698	528		
Pacific Cod	3,200	1,600	3,200	1,600	3,200	1,600			
Pacific Whiting (Coastwide)	269,545	269,069	To be determined in March 2006		To be determined in March 2008				
Sablefish (Coastwide)	8,368	7,761	8,175	7,634	6,058	4,513	5,869		
N. of 36 (Monterey north)		7,486		7,363		4,353	5,661		
S. of 36 (Conception area)		275		271		160	208		
PACIFIC OCEAN PERCH	966	447	934	447	911	0	89	412	522
Shortbelly Rockfish	13,900	13,900	13,900	13,900	13,900	13,900			
WIDOW ROCKFISH	3,218	285	3,059	289	5,144	0	335	464	931
CANARY ROCKFISH b/	270	47	279	47	179	0	25	45	69
Chilipepper Rockfish	2,700	2,000	2,700	2,000	2,700	2,000			
BOCACCIO	566	307	549	309	618	0	150	219	316
Splitnose Rockfish	615	461	615	461	615	461			
Yellowtail Rockfish	3,896	3,896	3,681	3,681	4,510	4,510			
Shortspine Thornyhead - coastwide	1,055	999	1,077	1,018	2,463				
Shortspine Thornyhead - N. of 34deg27'						1,247	1,626		
Shortspine Thornyhead - S. of 34deg27'						419	837		
Longspine Thornyhead - coastwide	2,851	2,656	2,851	2,656	3,860				
Longspine Thornyhead - N. of 34deg27' c/		2,461		2,461		2198	2,989		
Longspine Thornyhead - S. of 34deg27' c/		195		195		470	941		
COWCOD - S. of 36 (Conception area)	5	2.1	5	2.1	17	0	4	7	9
COWCOD - N. of 36 (Monterey area)	19	2.1	19	2.1	19	0	4	7	9
DARKBLOTCHED	269	269	294	294	487	0	130	238	343
YELLOWEYE	54	26	55	27	47	0	12	17	21
Nearshore Species									
Black WA	540	540	540	540	540	540			
Black OR-CA	753	753	736	736	719	719			
Minor Rockfish North	3,680	2,250	3,680	2,250					
Nearshore Species		122		122		122	142	162	
Shelf Species		968		968	968	968			
Slope Species		1,160		1,160	1,160	1,160			
Remaining Rockfish North	1,612	1,216	1,612	1,216	Remaining Rockfish ABCs are already incorporated into their r complexes. The GMT is evaulating the most appropriate way t within the ABC.				
Bocaccio	318	239	318	239					
Chilipepper - Eureka	32	32	32	32					
Redstripe	576	432	576	432					
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Splitnose	242	182	242	182					
Yellowmouth	99	74	99	74					
Other Rockfish North	2,068	1,034	2,068	1,034					
Minor Rockfish South	3,412	1,968	3,412	1,968	3,403	1,855	1,898	2,006	
Nearshore Species		615		615		515	558	666	
Shelf Species		714		714		714	714	714	
Slope Species		639		639		626	626	626	
Remaining Rockfish South	854	689	854	689	Remaining Rockfish ABCs are already incorporated into their r complexes. The GMT is evaulating the most appropriate way t within the ABC.				
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Yellowtail	116	87	116	87					
Other Rockfish South	2,558	1,279	2,558	1,279					
California scorpionfish						137	219		
Cabezon (off CA only)	103	69	108	69	94	69			
Dover Sole	8,522	7,476	8,589	7,564	28,442	28,442	16,500		
English Sole	3,100	3,100	3,100	3,100	5,701	5,701			
Petrale Sole	2,762	2,762	2,762	2,762	2,919	1,405			
Columbia and US-Vanc. areas						1,405			
Eureka, Monterey, and Conception areas						1,083	1,444		
Arrowtooth Flounder	5,800	5,800	5,800	5,800	5,800	5,800			
Starry Flounder						590	786		
Other Flatfish	6,781	4,909	6,781	4,909	6,731	4,884			
Other Fish	14,600	7,300	14,600	7,300	14,600	7,300			
Kelp Greenling HG (OR)						No Fed HG	Fed HG = State HG		

a/ Council OY is the Council's preferred harvest alternative for 2008.

b/ The canary rockfish OY alternatives assume a 50:50 commercial:recreational catch share. The OY varies by the commercial:recreational catch share due to the f fishery takes smaller fish and therefore has a greater "per ton" impact than the commercial fishery. Therefore, a higher OY would result from a higher commercial ca

c/ The No Action alternative OYs for 2005 and 2006 were specified north and south of 36 deg. N latitude. The GMT recommends specifying longspine thornyhead C

The Basis for Recommended 2007-2008 Groundfish Optimum Yield (OY) Alternatives

Lingcod

Alt 1: Coastwide OY is the sum of the OY for the assessment areas north and south of 43° N lat. The north (Columbia and U.S.-Vancouver areas) and south (Conception, Monterey, and Eureka areas) OYs projected from the assessment. No 40-10 adjustment for the south OY. OYs north and south of 42° N lat. at the California-Oregon border were re-apportioned by deriving the percentage of the 2005-06 OY estimated for the area between 42 and 43° N lat. (107 mt/719 mt) to the estimated OY N of 43° N lat. in 2007 to determine an estimated 2007 OY for the area between 42 and 43° N lat. (130 mt). This was added to the estimated 2007 OY for north of 43° N lat. to determine an appropriate OY for north of 42° N lat. and subtracted from the 2007 OY for south of 43° N lat. to determine an appropriate OY for south of 42° N lat.

Alt 2: OYs, including re-apportioned OYs are determined the same way as in Alt 1, but the southern OY is adjusted using the 40-10 rule since the spawning biomass south of 43° N lat. is estimated to be less than B40% in 2007.

Pacific Cod

No recommended change from status quo since there was no new assessment. The OY is reduced by 50% from the ABC since this is an unassessed stock.

Pacific Whiting

No harvest specifications to be decided until March 2006 when a new assessment will be available.

Sablefish

All OY alternatives break out the coastwide OY north and south of 36° N latitude using status quo proportions. Alternative methods for apportioning the OY were not considered because the STAR Panel recommended calculating coastwide biomass without including Conception area survey data.

Al 1: OY with the 40-10 adjustment using the low stock/production model (h=0.26, Q=0.37).

Alt 2: OY with the 40-10 adjustment using the base model (h=0.34, Q=0.33).

Pacific Ocean Perch

Alt 1: Based on the fishing mortality (SPR=0.92) associated with the scorecard estimated catch for 2005 projected forward.

Alt 2: Conforms to the Council's rebuilding revision rule: re-estimated Pmax = 80%; SPR harvest rate = 69.6%.

Alt 3: OY estimated with a re-estimated Pmax of 70%, which is the original rebuilding probability when the rebuilding plan was adopted (P0).

Alt 4: OY under a re-estimated Pmax of 50%.

Shortbelly Rockfish

No change from status quo. The stock was last assessed in 1989 and is not exploited.

Widow Rockfish

Alt 1: Based on the fishing mortality associated with the scorecard estimated catch for 2005 projected forward.
Alt 2: Current SPR harvest rate (93.6%) applied to the exploitable biomass. Re-estimated Pmax = 94%.
Alt 3: Re-estimated Pmax = 80%, SPR harvest rate = 88.6%.
Alt 4: Re-estimated Pmax = 60%.

Canary Rockfish

All OY alternatives assume a 50:50 commercial:recreational catch share.

Alt 1: OY under a re-estimated Pmax of 60%, which is P0. SPR harvest rate = 93.5%.
Alt 2: Applies the SPR harvest rate of 88.7% from the rebuilding plan to the new estimated exploitable biomass.
Alt 3: OY under a re-estimated Pmax of 50% and SPR harvest rate of 83.1%.

Chilipepper Rockfish

No change from status quo. The stock is above B40% based on the 1998 assessment. The OY is reduced from the ABC as a bocaccio bycatch control mechanism.

Bocaccio

Alt 1: Based on the fishing mortality associated with the scorecard estimated catch for 2005, projected forward.
Alt 2: OY under the old Pmax of 80%.
Alt 3: Current SPR harvest rate (69.2%) applied to the exploitable biomass.
Alt 4: Re-estimated Pmax = 50%.

Splitnose Rockfish

No change from status quo. OY reduced from the ABC by 25% because the specifications are based on a data-moderate assessment in 1994.

Yellowtail Rockfish

ABC/OY from the base case model in the new assessment. OY = ABC because the stock is above the target of B40%.

Shortspine Thornyhead

The shortspine thornyhead ABC and OY alternatives use the base case model in the new assessment, which assume h = 0.6 and q = 1.0 with dome-shaped selectivity. The area OY apportionments are based on the model result indicating 66% of the current coastwide biomass occurs north of Pt. Conception and 34% south of Pt. Conception.

Alt 1: OY includes a precautionary reduction of the base case OY due to the SSC conclusion that the assessment is marginally sufficient to estimate resource status. There is a 25% reduction in the OY north of Pt. Conception and a 50% OY reduction south of Pt. Conception due to the compounding uncertainty associated with the short duration and density of survey data south of Pt. Conception.
Alt 2: OYs from the base case model without the precautionary reductions in alternative 1.

Longspine Thornyhead

The longspine thornyhead ABC and OY alternatives use the base case model in the new assessment. The area OY apportionments are based on the proportion of the biomass north and south of Point Conception, based on the most recent slope survey data.

Alt 1: OY includes a precautionary reduction of the base case OY because the stock assessment has the same data issues as the shortspine assessment. There is a 25% reduction in the OY north of Pt. Conception and a 50% OY reduction south of Pt. Conception.
Alt 2: OYs from the base case model without the precautionary reductions in alternative 1.

Cowcod

OY alternatives are derived from the new assessment of the stock south of 36° N latitude (Conception INPFC area). The same OY alternatives are recommended for the Monterey area north of 36° N latitude based on comparable catch histories in these two areas.

Alt 1: Re-estimated Pmax = 80%.
Alt 2: Re-estimated Pmax = 70%.
Alt 3: Re-estimated Pmax = 60% (= P0).
Alt 4: Re-estimated Pmax = 50%.

Darkblotched Rockfish

Alt 1: The specified OY in 2001.
Alt 2: Based on the fishing mortality (F=0.0216) associated with the scorecard estimated catch for 2005 projected forward.
Alt 3: Current harvest rate (F = 0.032) applied to the exploitable biomass. Pmax = 100%, SPR harvest rate = 100%.
Alt 4: Estimated 2007 ABC. Re-estimated Pmax = 97%.

Yelloweye Rockfish

Alt 1: OY under the current Pmax of 90%. SPR harvest rate = 82.1%.
Alt 2: Re-estimated SPR harvest rate (76.4%) applied to the exploitable biomass to maintain a Ptarget of 50%.
Alt 3: Re-estimated Pmax = 80%; estimated SPR harvest rate = 71.7%.
Alt 4: Re-estimated Pmax = 50%.

Black Rockfish – WA

No change from status quo. OY = ABC because the stock is above the target of B40%.

Black Rockfish – CA & OR

ABC/OY projected from the 2003 assessment. OY = ABC because the stock is above the target of B40%.

Minor Rockfish North

The Remaining Rockfish and Other Rockfish categories are removed from the table since these species are already accounted for in the Minor Rockfish North complex.

Nearshore Species

When black rockfish was originally removed from the northern minor nearshore rockfish OY, a ratio of black to blue rockfish catch was used to determine what proportion of that OY was attributable to black rockfish. However, due to the variability of blue rockfish catches, there is some concern that this ratio (92%:8% black to blue rockfish) under represents blue rockfish catch and therefore the resulting OY (without black rockfish). To account for this uncertainty (that is, a range of possible levels of black rockfish removal from the OY), three OY alternatives are presented.

Alt 1: Status quo OY.
Alt 2: Status quo OY + 20 mt.
Alt 3: Status quo OY + 40 mt.

Shelf Species

No change from status quo for the northern minor shelf species.

Slope Species

No change from status quo for the northern minor slope species.

Minor Rockfish South (Including Gopher Rockfish and Blackgill Rockfish)

The Remaining Rockfish and Other Rockfish categories are removed from the table since these species are already accounted for in the Minor Rockfish South complex.

The ABC for Minor Rockfish South is adjusted to account for the reassessment of blackgill rockfish and the new assessments for gopher rockfish and California scorpionfish in three ways. The status quo contribution of blackgill to the ABC (343 mt) was removed from the complex ABC and replaced with the new blackgill ABC/OY of 292 mt (based on the 2007-2008 average ABC/OY; 2007 = 294 mt, 2008 = 290 mt) for an overall reduction of 51 mt. The status quo contribution of gopher rockfish (97 mt) was removed and replaced with the new gopher ABC/OY of 302 mt (based on the 2007-2008 average ABC/OY; 2007 = 340 mt, 2008 = 264 mt) resulting in an overall increase of 205 mt. The status quo contribution for California scorpionfish (163 mt) was removed from the ABC as this species will now be managed under its own ABC/OY.

Nearshore Species (Including Gopher Rockfish)

The Council adopted a southern minor nearshore rockfish species OY for 2003 of 541 mt. This OY was based upon the Groundfish FMP policy for specifying OY for unassessed species using 50% of recent landings, and was recalculated from the 2001-2002 OY of 662 mt using updated estimates of recreational and commercial harvest. For the 2004 southern minor nearshore rockfish species OY, an adjustment was made to account for removal of black rockfish; however, this adjustment started with the 2002 OY of 662 mt and not the 2003 OY of 541 mt. The resulting OY of 615 mt was adopted by the Council for the 2004, and the 2005-2006 management cycles. For the 2007-08 management cycle, the Minor Nearshore Rockfish South OY is corrected with the black removal of 47 mt taken from the more up-to-date 2003 OY of 541 mt, resulting in a value of 494 mt.

This initial value for the southern minor nearshore rockfish species OY then is adjusted to account for the new California scorpionfish and gopher rockfish assessments. The current contribution for California scorpionfish of 81.5 mt (based upon 50% of recent landings during 1994-1999) is removed from the combined OY in all four alternatives because it will have its own OY. (The proposed California scorpionfish OYs are addressed later in this section.) Because gopher rockfish cannot be managed separately from other nearshore rockfish species without significantly increasing bycatch and because of uncertainty over the assessment due to poor data quality, gopher rockfish is recommended to not be removed from the southern minor nearshore rockfish species OY, but instead have a point of concern set at a level determined appropriate to the adopted OY. The resulting alternatives for the southern minor nearshore rockfish that incorporate changes for California scorpionfish and gopher provided below.

Alt 1: OY includes the current contribution for gopher rockfish (48.5 mt).

Alt 1: OY determined by removing the current contribution for gopher rockfish (48.5 mt) from the OY and then increasing the OY by 50% of the new gopher ABC/OY of 302 mt (based on the 2007-2008 average ABC/OY; 2007 = 340 mt, 2008 = 264 mt).

Alt 2: OY determined by removing the current contribution for gopher rockfish (48.5 mt) from the OY and then increasing the OY by 75% of the new gopher ABC/OY of 302 mt (based on the 2007-2008 average ABC/OY; 2007 = 340 mt, 2008 = 264 mt).

Alt 3: OY determined by removing the current contribution for gopher rockfish (48.5 mt) from the OY and then increasing the OY by the new gopher ABC/OY of 302 mt (based on the 2007-2008 average ABC/OY; 2007 = 340 mt, 2008 = 264 mt).

Shelf Species

No change from status quo for the southern minor shelf species.

Slope Species (Including Blackgill Rockfish)

The southern minor slope species OY is adjusted as follows in accordance with the new blackgill rockfish assessment. The status quo contribution of blackgill (305 mt) was removed from the complex and replaced with the new blackgill ABC/OY of 292 mt (based on the 2007-2008 average ABC/OY; 2007 = 294 mt, 2008 = 290 mt).

California Scorpionfish

The California scorpionfish assessment used a recreational catch data stream based upon Commercial Passenger Fishing Vessel (CPFV) logbook data expanded to total recreational catch using a proportion of CPFV to total recreational catch (based upon Marine Recreational Fisheries Statistics Survey catch history). The Council's Scientific and Statistical Committee approved this assessment, with the caveat that the ABC/OY from this assessment could only be related to recreational catch calculated in the same manner as this catch stream. CPFV logbook data, while valuable for stock assessment analyses, are not collected in as timely a manner as needed for inseason monitoring. Consequently, a method was derived with the assistance of the primary stock assessment author, Mark Maunder, to modify the ABC/OY from the assessment so that it could be tracked using California Recreational Fisheries Survey (CRFS) catch estimates. This method takes the recreational portion of the stock assessment ABC/OY, multiplies it by the CPFV proportion calculated from the MRFSS data, and then divides it using the proportion of CPFV catch observed in the 2004 CRFS data.

Both the original stock assessment ABC/OY and the modified stock assessment ABC/OY are provided as alternatives for California scorpionfish. Both alternatives are based upon the assessment model that includes sanitation district data. The first alternative provides the modified ABC/OY. The second alternative provides an ABC/OY of 219 mt based on an average of the 2007 and 2008 ABC/OYs from the stock assessment (2007 = 236 mt, 2008 = 202 mt).

Alt 1: This ABC/OY of 137 mt was derived using the recreational portion from the ABC/OY (based on the 2007-2008 average; 2007 = 222.2 mt, 2008 = 191.0 mt), multiplying it times 53%, dividing it by 88%, and then adding this modified recreational portion to the commercial portion of the ABC/OY (based on the 2007-2008 average; 2007 = 13.4 mt, 2008 = 11.5 mt).

Alt 2: The second alternative provides an ABC/OY of 219 mt based on an average of the 2007 and 2008 ABC/OYs from the stock assessment based upon the expanded CPFV logbook catch stream (2007 = 236 mt, 2008 = 202 mt).

Cabezon (off CA)

The ABC is recalculated based on the new assessment. The recommended ABC is the sum of the 2007-2008 average projected ABCs for the northern substock (71 mt) and southern substock (23 mt) calculated using the proxy F50% harvest rate. The status quo OY is recommended since the sum of the average OYs for the northern and southern substocks under the California default 60-20 rule approximates this value.

Dover Sole

ABC determined using the F40% proxy harvest rate (13,572 mt in the south and 14,950 mt in the north). OY = ABC since the stock is above the B40% target.

English Sole

ABC determined using the F40% proxy harvest rate. OY = ABC since the stock is above the B40% target.

Petrale Sole

ABC = sum of the north ABC of 1,397 mt and the south ABC/OY of 1,628 mt. OY is reduced from the ABC using the 40-10 reduction.

Arrowtooth Flounder

No change from status quo. ABC/OY based on the 1994 assessment.

Starry Flounder

ABC values for Starry flounder will be provided by the stock assessment author before the close of this meeting. Two OY alternatives are provided.

Alt 1: Based on the combined area OYs from the base model in the stock assessment.
Alt 2: Based on a 25% reduction of the combined area OYs from the base model in the stock assessment as a result of the 25% reduction for data poor stocks.

Other Flatfish

Recommend removal of the contribution from starry flounder. No other change from status quo recommended.

Other Fish (Including Kelp Greenling)

No change from status quo recommended for the Other Fish complex, other than considering a kelp greenling harvest guideline (instead of an OY due to uncertainty around the assessment.

Alt 1: No federal kelp greenling harvest guideline.
Alt 2: Federal kelp greenling harvest guideline equals the state kelp greenling harvest guideline.

GROUNDFISH ADVISORY SUBPANEL REPORT ON MANAGEMENT RECOMMENDATIONS FOR 2007-2008 GROUNDFISH FISHERIES – PART 1

The Groundfish Advisory Subpanel (GAP) reviewed the proposed alternatives for 2007-2008 acceptable biological catches (ABCs) / optimum yields (OYs) for the groundfish fishery and has the following comments.

In general, the GAP has concerns that the Groundfish Management Team (GMT) has not been consistent in their proposal of low and high OY alternatives. In some cases higher OY alternatives could be proposed to provide a more complete range for analysis. The GAP believes that the full range of options should be available for analysis and would like to see this done on a more consistent basis. In addition, the GAP recommends that all proposed alternatives have a justifiable scientific basis and are not the result of litigation threats.

The GAP recommends supporting the range of alternative ABCs and OYs presented in Table 1: GMT Recommended alternatives with the following exceptions:

1. Sablefish: The range of options should include an ABC/OY alternative of 6,775 mt. The survey stock biomass has doubled during the last six years- demonstrating a more productive stock then current interpretations suggest.
2. Petrale: The range should incorporate an OY alternative of 4,212 mt. This is based on strong recruitment observed in the latest survey which was not incorporated into the latest assessment.
3. Widow: The range should incorporate an OY alternative of 4,415 mt.
4. Short spine: The range should incorporate an OY alternative of 3,158 mt.

All of these recommendations are based on numbers from decision tables using various high catch models from each respective stock assessment.

The GAP has serious concerns regarding management of Widow rockfish as an “overfished” species subjet to a rebuilding plan and associated restrictions when the latest science demonstrates that the stock was in fact never in an overfished condition.

Lastly, the GAP strongly recommends that the Council identify a plan for collecting and incorporating economic data to help better support the proposed ABCs and OYs. This plan should include the identification of resources to accomplish this task as well as a determination of what data should be collected and what mechanism the Council will use in considering this data as they make their decisions.

PFMC
11/01/05

SCIENTIFIC AND STATISTICAL COMMITTEE REPORT ON MANAGEMENT RECOMMENDATIONS FOR 2007-2008 GROUNDFISH FISHERIES

The Scientific and Statistical Committee (SSC) heard a report from Mr. John DeVore and Dr. John Field summarizing the Groundfish Management Team (GMT) recommendations for 2007-2008 groundfish optimum yield (OY) alternatives. It is apparent that the recent court ruling on darkblotched rockfish has created uncertainty regarding how to set OY's for species requiring rebuilding, and consequently what the constraints on other species will be due to bycatch.

The SSC discussed the following specific issues of concern with the GMT:

1) Four new assessments are now available for species currently managed as part of species complex groups. The SSC discussed the merits of developing separate OY's for these species, as opposed to continuing to manage them within their respective complexes. The SSC sees merit in managing starry flounder under an OY separate from the flatfish complex, in consideration of protecting other potentially weak species in the complex. The SSC notes that, given the management considerations voiced by the GMT, it is reasonable to continue to manage blackgill, gopher, and kelp greenling within complexes.

2) With regard to Petrale sole, the SSC discussed the apparent paradox that the OY recommended for the southern area increased, despite a new assessment that indicates a relatively more depleted stock. It appears that the reason for the higher OY in the south in the short term is due to a transient and uncertain recruitment pulse. For the purpose of establishing a separate OY for the southern area, the SSC notes that using the 25% precautionary catch reduction as specified in the groundfish fishery management plan may be appropriate.

3) With regard to Dover sole, the SSC discussed the relatively large increase in OY, and considered the merits of analyzing an alternative lower OY option. The SSC notes that the estimate of maximum sustainable yield from the assessment (16,500 mt) may provide a logical alternative OY that could be sustainable in the long term.

PFMC
11/1/05

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Agenda Item H.3.d
Public comment
November 2005

October 28, 2005

Mr. Don Hansen, Chairman
Pacific Fisheries Management Council
7700 NE Ambassador Place, Suite 200
Portland OR, 97220

Agenda Item H.3.d Groundfish Management Recommendations for 2007-2008

Dear Mr. Chairman and Council Members:

It has been several years since Oregon Salmon Trollers have been allowed to retain incidental harvest of Ling Cod. ODFW and PFMC staff have indicated that Ling Cod are now off the overfished list and will be available for increased harvest in the near future.

At this time the Oregon Salmon Commission request's the PFMC consider a retention of Ling Cod in Oregon's traditional Salmon Troll fishery under Agenda Item H.3.d., Management Recommendations for 2007-2008 Groundfish Fisheries..

Any and all attention you might provide this request would be most appreciated.

Thank-you

Darus Peake
Chairman Oregon Salmon Commission
P.O. Box 983
Lincoln City, Oregon 97367 0983

MANAGEMENT RECOMMENDATIONS FOR 2007-2008 GROUNDFISH FISHERIES—PART I

At this meeting, the initial development of management recommendations for 2007-2008 Groundfish fisheries has been divided into two parts (see Attachment 1 for the complete management process schedule). The tasks under this agenda item (Part I of management recommendations) are to adopt for public review and analysis (1) 2007-2008 acceptable biological catches (ABCs); (2) a range of optimum yields (OYs): and if possible, (3) preferred OYs for some stocks and stock complexes. The ABC and OY levels are to be adopted as two, single-year sets: one for the 2007 fishing year and one for the 2008 fishing year. Guidance on a preliminary range of 2007-2008 management measures (Part II) will occur under Agenda Item H.12.

To aid the Council in setting management specifications, new stock assessments and rebuilding analyses (Agenda Item H.2.a, Attachments 1, 3, 5, 7, and 9) were considered by the Groundfish Management Team (GMT) at their October meeting to develop a recommended range of 2007-2008 harvest levels, which will be presented in Agenda Item H.3.c, Supplemental GMT Report. The Council should consider the advice of the GMT, other Council advisory bodies, and the general public before adopting ABCs and a range of OYs for public review and analysis. The Council is also tasked with adopting preferred OYs for as many fishery management plan stocks and stock complexes as possible to facilitate a better focus on 2007-2008 management measures under Agenda Item H.12.

Council Action:

1. Adopt preliminary ABCs and a range of OYs.
2. If possible, adopt preferred OYs for some stocks and stock complexes.

Reference Materials:

1. Agenda Item H.3.a, Attachment 1: Pacific Fishery Management Council and National Marine Fisheries Service Schedule and Process for Developing 2007-2008 Groundfish Harvest Specifications and Management Measures

Agenda Order:

a. Agenda Item Overview — John DeVore
b. Report of the GMT — Susan Ashcraft
c. Reports and Comments of Advisory Bodies
d. Public Comment
e. **Council Action:** Adopt a Range of Preliminary ABC's and OY's, and if Possible, Preferred OY's for some Stocks and Stock Complexes

PFMC
10/14/05

Agenda Item H.4.b
Supplemental GMT Report
November 2005

GROUNDFISH MANAGEMENT TEAM REPORT ON CONSIDERATION OF INSEASON ADJUSTMENTS IN 2005 AND 2006 GROUNDFISH FISHERIES

The Groundfish Management Team (GMT) reviewed several inseason management issues for the remainder of 2005 and for 2006. Management issues for 2005 include higher than anticipated catch of petrale sole and conforming recreational management measures. Management issues for 2006 are as follows: adjustments to the sablefish daily-trip-limit (DTL) fishery, adjustments to the limited entry trawl fishery, adjustments to fixed gear shelf rockfish limits, adjustments to the canary rockfish reserve for the limited entry trawl fishery, adjustments to the black rockfish limits for the limited entry open access fixed gear fisheries, adjustments to Rockfish Conservation Area (RCA) boundaries, and adjustments to recreational management measures. It is the GMT's goal to begin 2006 with conservative enough management measures to avoid drastic harvest reductions and/or closures in the later part of the year. Because of timing issues, there is a possibility that the 2007 – 2008 Biennial Specifications and Management Measures may not be effective on January 1, 2007. Should this occur, conservative management measures for January and February of 2006 would facilitate any harvest reductions that may be necessary in 2007 until the biennial specifications become effective. Discussion of these management issues and recommendations for Council consideration are outlined below.

LIMITED ENTRY TRAWL FISHERIES IN 2005

The GMT reviewed Pacific Fisheries Information Network Quota Species Monitoring (PacFIN QSM) data through October 22, 2005, and acknowledges that the catch of petrale sole is 2,783 mt (2,685 mt landed and 98 mt discard), which is 0.8% above the 2005 Acceptable Biological Catch/Optimum Yield (ABC/OY) of 2,762 mt. The groundfish fishery management plan defines overfishing as exceeding the ABC, therefore, the petrale sole stock is subject to overfishing. The GMT considered management measures that could be used to eliminate further catches of petrale sole through the end of the year. Unfortunately, there appear to be no additional management measures available to completely eliminate catch of petrale sole. However, management measures designed to reduce the catch of petrale sole that were implemented in October, such as trip limit reductions and moving the trawl RCA into deeper water, should substantially reduce petrale sole catch for the remainder of the year.

In order to identify risk to the stock resulting from allowing fisheries with petrale bycatch in December, the GMT reviewed historical petrale sole annual landings data by fishery and landings that have occurred during December. These data show that the limited entry bottom trawl fishery is expected to result in the highest petrale sole mortality relative to other fisheries through the remainder of the year. Under current management measures, the GMT anticipates an additional 5 – 10 mt (which is an additional 0.2% - 0.35% over the ABC) of non-tribal petrale sole catch (landings plus discard) will be taken by the limited entry bottom trawl fishery in November and December. With the additional non-tribal catch, the catch of petrale sole in 2005 is predicted to exceed the petrale sole ABC by 0.9% – 1.1%. However, the GMT received notification today that the Makah Tribe reopened their bottom trawl fishery, effective November 1, which could potentially catch an additional 20-30 mt of petrale sole. The Makah fishery has taken 22 mt of petrale sole to date. While the GMT is not endorsing any particular management option, we did discuss options to reduce additional catch of petrale sole. Closing fisheries will likely reduce any additional catch of petrale. However, the GMT cautions that the expectation of a total fishery closure in December may result in a race for fish, which has the potential to increase the catch of petrale sole catch in November in excess of that would otherwise occur. Additionally, the GMT notes that the recent catch of petrale sole has been under substantially under its ABC for the past several years. The estimated ex-vessel value of the trawl fishery in December under current regulations is approximately $600-$800K.

TABLE 1. NON-TRIBAL PETRALE SOLE LANDINGS BY FISHERY, YEAR, AND EXPECTATIONS FOR THE MONTH OF DECEMBER (UNITS IN METRIC TONS)

			Year					December
Sector	Fishery	Gear	2000	2001	2002	2003	2004	Estimate
Limited Entry	LE Groundfish	B-trawl	1,866.4	1,820.7	1,763.8	1,949.0	1,873.8	5.9
		Mwtr-Trawl	3.9	2.8	0.4	0.0	0.8	0.0
		Pot	0.0	0.1	0.0	0.0	0.0	0.0
		Longline	0.4	0.5	0.7	0.5	1.1	trace
Open Access	OA Groundfish	Bottom Troll	0.0	0.0	0.0	0.0	0.0	0.0
		Pot	0.0	0.0	0.0	0.0	0.0	0.0
		Net	0.0	0.1	0.0	0.0	0.0	0.0
		Jig	0.0	0.0	0.0	0.0	0.0	0.0
		Longline	0.0	0.0	0.1	0.1	0.0	0.0
		Pole	0.0	0.0	0.0	0.0	0.0	0.0
		Troll	0.0	0.2	0.1	0.0	0.0	0.0
	California Halibut	Hook & Line	0.0	0.0	0.0	0.0	0.0	0.0
		Net	0.0	0.0	0.0	0.0	0.0	trace
		Trawl	0.2	0.3	0.2	0.1	0.8	trace
	Pink shrimp	Trawl	2.0	2.2	0.9	0.2	0.0	0.0
	Ridgeback Prawn	Trawl	0.2	0.9	0.0	0.5	0.0	0-0.1
	Spot Prawn	Trawl	0.3	0.3	0.2	0.0	0.0	0.0
		Pot	0.0	0.0	0.0	0.0	0.0	0.0
	Pacific Halibut	Longline	0.0	0.0	0.0	0.0	0.0	0.0
	Dungeness Crab	Pot	0.0	0.0	0.0	0.0	0.0	0.0
	Cal Sheephead	Pot	0.0	0.0	0.0	0.0	0.0	0.0
	HMS	Pole	0.0	0.0	0.0	0.0	0.0	0.0
		Longline	0.0	0.0	0.0	0.0	0.0	0.0
	CPS	Net	0.0	0.0	0.0	0.0	0.0	0.0
	Salmon	Troll	0.0	0.0	0.0	0.0	0.0	0.0

RECREATIONAL FISHERIES IN 2005

Oregon

The GMT discussed recreational inseason management for the remainder of 2005 and identified the need for federal recreational regulations to conform to the most recent adjustments to Oregon's recreational regulations. Due to projected attainment of Oregon's recreational black rockfish harvest guideline, the Oregon Department of Fish and Wildlife (ODFW) took action on October 18, 2005, to close recreational groundfish fishing in the ocean and estuary boat fisheries shoreward of 40 fm and to prohibit retention of black rockfish in both the ocean and estuary boat fisheries at any depth. This federal inseason action is effective through December 31, 2005. The groundfish fishery seaward of 40 fm remains open. Shore based fisheries (angling from jetties, beaches, rock formations, or piers, and divers originating from shore) remain open under previous regulations.

California

The GMT notes that NOAA Fisheries staff will correct an error in the current 2005 federal regulations regarding open months within the recreational RCA for the area between 40º10' N. latitude and 36º N. latitude so that section §660.384 (c) (3) (i) (A) (2) reads as follows:

Between 40º10' N. latitude and 36º N. latitude, recreational fishing for all groundfish (except "other flatfish" as specified in paragraph (c) (3) (iv) of this section) is prohibited seaward of the 20 fm (37 m) depth contour along the mainland coast and along islands and offshore seamounts from July 1 through December 31; and is closed entirely from January 1 through June 30 (i.e., prohibited seaward of the shoreline). Closures around the Farallon Islands (see paragraph (c) (3) (i) (C) of this section) and Cordell Banks (see paragraph (c) (3) (i) (D) of this section) also apply in this area.

LIMITED ENTRY TRAWL FISHERIES IN 2006

The trawl bycatch model was updated with bycatch and discard rates based on new West Coast Groundfish Observer Program (WCGOP) data from September 2004 through April 2005. During 2005, selective flatfish gear was required shoreward of the trawl RCA north of 40°10' N. latitude

The GMT analyzed adjustments to trawl RCA boundaries and bimonthly limits for the main target species (sablefish, thornyheads, Dover sole, petrale sole, other flatfish, arrowtooth, slope rockfish, and splitnose) for 2006. The GMT conferred with the Groundfish Advisory Subpanel (GAP) on these changes, and is forwarding the attached option as the GMT's preferred alternative for 2006 inseason adjustments. Of note, the GMT has proposed splitting the period 1 limit into one month cumulative limits to address the fact that biennial regulations may not be in place in time for the 2007 fishery, and that if this is the case, 2007 management will revert to 2006 regulations until regulations are in place. By splitting period 1 into one month limits, catches are likely to be restricted to a degree that won't compromise the fishery later in the year if there are substantial reductions to OYs for managed species, petrale sole in particular, while allowing the flexibility to adjust limits in February. A description of the proposed changes and changes to other species is included in the following sections.

Petrale Sole

In order to avoid exceeding the petrale sole ABC in 2006 and to allow for year round fishing opportunities, the GMT analyzed establishing cumulative limits in the bottom trawl fishery during periods 1 and 6. Previously, petrale sole landings were unlimited in periods 1 and 6.

Canary Rockfish

Based on landings of canary rockfish in the 2005 fishery and discard rate estimates from the WCGOP, the mortality of canary rockfish in the limited bottom trawl sector is higher than originally predicted for the year. In order to reduce mortality of canary rockfish in the 2006 fishery, the GMT modeled options that expand the size of the trawl RCA north of 40°10' N. latitude by moving the shoreward boundary from 100 fm to 75 fm during periods 2 and 5, and this reduces the amount of catch occurring shoreward of the RCA in areas north of 40°10' N. latitude

When modeling catch projections for 2006, the GMT was concerned with the uncertainty associated with canary rockfish catch projections. This uncertainty is due to higher than anticipated bottom trawl landings of canary rockfish during 2005 based on preseason fishery modeling and modeling that occurred during the early part of 2005. Preseason, the bycatch model had predicted that the canary rockfish impacts in the limited entry trawl fishery would be less than 6.0 mt; however, based upon guidance from the GMT, the Council decided to use a placeholder of 8.0 mt in the bycatch scorecard to account for uncertainty in the model (i.e., projected impacts plus a 2.0 mt reserve). By applying the discard rates from the WCGOP inseason, the bycatch model projected that the limited entry trawl fishery caught 9.5 mt of canary rockfish by the end of September 2005 (and the closure from the shoreline to 250 fms beginning October 1 is anticipated to effectively keep canary impacts at this level through the end of 2005). Using the revised bycatch rates from the WCGOP, which includes data through April 2005, the proposed limited entry trawl trip limits for 2006 would result in an estimated canary rockfish impact of 8.3 mt. When these revised bycatch rates are used in conjunction with 2005 management measures, the bycatch model is able to closely approximate the amount of canary rockfish estimated to be taken during 2005. However, the updated model does not include new bycatch data beyond Period 2 in 2005. Therefore, the GMT is still concerned with the degree of uncertainty in projections of the catch of overfished species with selective flatfish trawl gear and acknowledges that the Council may want to consider establishing a reserve for limited entry trawl for canary rockfish. If so, then the GMT would appreciate guidance on the amount of the reserve.

Slope Rockfish Between 40°10' N. latitude and 38° N. latitude

Darkblotched rockfish are not distributed uniformly along the coast. Densities of darkblotched rockfish are highest in waters off Washington and northern Oregon, with a gradient of decreasing density extending to the south. Only about 3% of the National Marine Fisheries Service triennial bottom trawl survey's cumulative catch-per-unit-effort of darkblotched rockfish occurs south of 38° N. latitude This observation of decreased density led to implementation of a management line at 38° N. latitude that allows slope management south of that latitude to be separated from management actions needed to rebuild darkblotched, and allows management between 40°10' N. lat and 38° N. latitude to be intermediate to areas south of 38° N. lat and north of 40°10' N. latitude Slope rockfish management measures during 2005 are summarized below.

	South of 38°	38° - 40°10'	North of 40°10'
2-month limit	40,000 lbs	4,000-20,000 lbs	4,000 lbs
Seaward RCA line	150 fm	150-200 fm	200 fm

Darkblotched rockfish bycatch rates observed between 38° N. latitude and 40°10' N. latitude for all depths greater than 150 fm are considerably lower than for the same depth range north of 40°10' N. latitude. However, when bycatch rates in this depth range between 38° N. latitude and 40°10' N. latitude are compared to bycatch rates from depths greater than 200 fm north of 40°10' N. latitude, they are similar. The GMT is not comfortable applying both the higher cumulative limit amount and a shallower trawl RCA from the area south of 38° N. latitude to the area between 38° N. latitude and 40°10' N. latitude. Cumulative limits on the order of 20,000 lbs per 2 months could likely be accommodated if the seaward trawl RCA boundary were set at 200 fm. However, if the seaward trawl RCA boundary were set at 200 fm, access to slope rockfish species might also prove problematic. Alternatively, a slope rockfish cumulative limit of 8,000 lbs per 2 months could be provided in conjunction with a seaward trawl RCA boundary set at 150 fm. For management measures in this area, the tradeoff is between adjusting slope rockfish cumulative limits or adjusting the position of the trawl RCA. The GMT continues to support management measures for this area that are intermediate to those in the areas north of $40^{o}10'$ N. latitude and south of 38^{o} N. latitude. The GMT discussed this tradeoff with the GAP and industry. The GMT recommends a slope rockfish cumulative limit of 8,000 lbs per 2 months and a seaward trawl RCA boundary of 150 fm for the area between $40^{o}10'$ N. latitude and 38^{o} N. latitude during 2006.

Chilipepper Rockfish south of $40^{o}10'$ N. latitude

The GMT received a request to analyze an increase in the chilipepper limit for areas south of $40^{o}10'$ N. latitude, seaward of the RCA. Chilipepper limits were increased in 2004, and currently include a 12,000 lbs per 2 months limit during the summer months. However, industry members have stated that this limit is not large enough to warrant targeting on this stock, and that traveling to areas where chilipepper are known to occur in high abundance requires substantial fuel cost. The GMT struggled with identifying and analyzing a chilipepper limit that would result in acceptable limits of bycatch of bocaccio, which co-occur with chilipepper. While members of the industry have stated that a limit on the order of 25,000 to 40,000 lbs per 2 months would be needed to warrant targeting of chilipepper, the GMT lacks sufficient information to identify potential bycatch impacts resulting from such limits, primarily because there are insufficient observations in the WCGOP during times when vessels were targeting chilipepper. Although industry could presumably target chilipepper in the future while carrying an observer (thereby increasing the amount of information in the WCGOP), the current 12,000 lbs per two month limits can be achieved in as few as one or two tows. The means that even if the amount of observer data were to be increased during times when chilipepper are being targeted, it is likely that the amount of information would still be limited. The GMT notes that the exempted fishing permit (EFP) process may be the best mechanism for acquiring information sufficient to adequately manage chilipepper opportunities, and recommends that members of industry explore developing an EFP proposal appropriate for obtaining information to manage this segment of the fishery. Additionally, the GMT plans to revisit this item next year to explore opportunities for possibly acquiring data for use in managing the fishery.

Lingcod

The GMT reviewed available catch and discard information pertaining to lingcod in the limited entry bottom trawl fishery. This information shows that there are considerable discards of lingcod in the limited entry bottom trawl fishery and believes that allowing increased retention of lingcod can be accommodated. In 2005, north of $40^{o}10'$N latitude, the selective flatfish trawl limits were 800 lbs per two months for periods 1, 2, 5, and 6 and were 1,000 lbs per two months for periods for 3 and 4. The large and small footrope limits for 2005 were 500 lbs per two months. South of $40^{o}10'$N latitude, the small footrope limits were 800 lbs per two months for periods 1, 2, 5, and 6 and were 1,000 lbs per two months for periods 3 and 4. The large footrope limits were the same as north of $40^{o}10'$ N latitude. While the GMT is concerned that a substantial increase in the lingcod limit may encourage targeting of lingcod and additional bycatch of overfished species (which tend to reside in areas of similar rocky habitat), the GMT believes that a modest increase in lingcod retention can be accommodated and recommends that lingcod limits in this fishery be increased to 1,200 lbs per two months coastwide for all trawl gear types.

LIMITED ENTRY AND OPEN ACCESS FIXED GEAR FISHERIES IN 2006

Sablefish North of 36^o N. latitude

In recent years, the sablefish daily trip limit (DTL) fishery north of 36^o N. latitude has caught less than their allocation. As a result the GMT believes that some liberalization of the DTL fishery can be accommodated. In 2005, the DTL limits for January – September were 300 lbs per day, or 1 landing per week up to 900 lbs, not to exceed 3,600 lbs per 2 months. These DTL limits were increased for October through December to 500 lbs per day, or 1 landing per week up to 1,500 lbs, not to exceed 9,000 lbs per 2 months. The GMT is concerned with the inability to control effort in this fishery and recommends a cautious approach to liberalizing this fishery. The GMT analyzed two options including 1) maintaining the previously scheduled daily limit of 300 lbs per day, raising the weekly limit to 1,000 lbs, and raising the two month limit to 5,000 lbs, and 2) raising the daily limit to 400 lbs, raising the weekly limit to 1,200 lbs, and raising the two month limit to 4,800 lbs. The GMT believes that radical changes in effort are mostly driven by changes in the daily and weekly limit, and as a result the GMT believes there is a greater risk of needing to restrict the fishery later in the year under option 2. While the GMT believes total catch can be effectively managed under either option, having to restrict the fishery later in the year means that there would be an inequitable distribution of catch and revenues because fisheries in the southern areas start earlier than fisheries in the north.

Shelf Rockfish, Shortbelly, and Widow Rockfish South of 34^{o}27' N. latitude

The GMT received a request to increase the shelf rockfish, shortbelly, and widow rockfish limit in this area from 2,000 lbs per two months to 3,000 lbs per two months for limited entry fixed gear and from 500 lbs per two months to 750 lbs per two months for open access fixed gear during 2006. In 2005, these increases were implemented inseason for periods 4 through 6. After analyzing the landings during 2005, the GMT believes that the requested increase can be accommodated for the entire year in 2006. Therefore, the GMT recommends that shelf rockfish, shortbelly, and widow rockfish limits south of 34^{o}27' N. latitude be set at 3,000 lbs per 2 months for limited entry fixed gear and to 750 lbs per 2 months for open access during 2006.

Black Rockfish between 40^{o}10' N latitude and the OR/CA Border (42^o N latitude)

The GMT received a request to increase the black rockfish limit to 6,000 lbs per two months between 40^{o}10' N latitude and 42^o N latitude for limited entry and open access fixed gear. In 2005, the black rockfish limit was increased to 6,000 lbs per 2 months in this area for periods 3 through 6. A review of landed catch occurring after this change revealed no unacceptable impacts to black rockfish catch (particularly with respect to black rockfish state harvest guidelines and commercial/recreational catch sharing), and therefore the GMT recommends that black rockfish limits be increased to 6,000 lbs per t2 months in the area between 40^{o}10 N latitude and the OR/CA border.

WASHINGTON RECREATIONAL FISHERIES IN 2006

In August, the Washington Department of Fish and Wildlife (WDFW) took inseason action by emergency rule to close the Washington recreational bottomfish fisheries deeper than a line approximating 30 fm north of Leadbetter Pt. as the canary and yelloweye rockfish catches were approaching the state's recreational harvest targets for those species. As the state recreational harvest targets are annual targets which are used to stay within joint WA/OR annual harvest guidelines, the GMT recommends that the 30 fm closure be removed for the 2006 Washington recreational fishery, beginning January 1, 2006. WDFW plans to bring forward inseason proposals at the March 2006 meeting to help ensure that the Washington recreational fishery does not exceed the canary or yelloweye rockfish harvest target, and the 30 fm depth closure will remain available as an inseason action item should the canary or yelloweye rockfish harvest target be approached.

OREGON RECREATIONAL FISHERIES IN 2006

To slow the harvest of black rockfish, the Oregon Department of Fish and Wildlife (ODFW) took action in July 2005 to reduce the daily recreational marine fish bag limit from 8 fish to 5 fish. ODFW took additional action in August 2005 to prohibit retention of cabezon in the recreational ocean boat, due to attainment of the annual state harvest guideline for cabezon. The federal and state harvest guidelines are set on an annual basis, and the inseason actions taken in 2005 were in response to attainment of harvest guidelines set for the 2005 fishing year. It is the recommendation of the GMT that the recreational bag limit regulations that were in place in January 2005 are implemented in January 2006 to allow fisheries access to harvest. ODFW anticipates taking federal inseason action in March, pending Commission approval of regulations defining the 2006 recreational fishery. As the federal and state harvest guidelines are approached in 2006, ODFW expects to take inseason actions similar in nature to those taken in 2005. The regulations that were in place in January 2005 read as follows:

"The bag limits for each person engaged in recreational fishing in the EEZ seaward of Oregon are two lingcod per day, which may be no smaller than 24 in (61 cm) total length; and 10 marine fish per day, which excludes Pacific halibut, salmon, tuna, perch species, sturgeon, sanddabs, lingcod, striped bass, and baitfish (herring, smelt, anchovies, and sardines), but which includes rockfish, greenling, cabezon, and other groundfish species. The minimum size limit for cabezon retained in the recreational fishery is 16 in (41 cm) and for greenling is 10 in (26 cm). Taking and retaining canary rockfish and yelloweye rockfish is prohibited."

CALIFORNIA RECREATIONAL FISHERIES IN 2006

The GMT recommends that the 2006 federal groundfish regulations for the area south of 34º 27' N. latitude be revised so that Sec. 660.384 (c) (3) (i) (A) (4) reads as follows:

(4) South of 34º27.00' N. latitude, recreational fishing for all groundfish (except California scorpionfish as specified below in this paragraph and in paragraph (v) and "other flatfish" as specified in paragraph (c)(3)(iv) of this section) is prohibited seaward of a boundary line approximating the 60-fm (110-m) depth contour from March 1 through August 30 and November 1 through December 31 along the mainland coast and along islands and offshore seamounts; and is prohibited seaward of a boundary line approximating the 30-fm (55-m) depth contour from September 1 through October 31; except in the CCAs where fishing is prohibited seaward of the 20-fm (37-m) depth contour when the fishing season is open (see paragraph (c)(3)(i)(B) of this section). Recreational fishing for all groundfish (except "other flatfish") is closed entirely from January 1 through February 28 (i.e., prohibited seaward of the shoreline). Recreational fishing for California scorpionfish south of 34º27.00' N. latitude is prohibited seaward of a boundary line approximating the 30-fm (55-m) depth contour from October 1 through October 31, and seaward of the 60-fm (110-m) depth contour from November 1 through December 31, except in the CCAs where fishing is prohibited seaward of the 20-fm (37-m) depth

contour when the fishing season is open. Recreational fishing for California scorpionfish south of 34°27.00' N. latitude is closed entirely from January 1 through September 30 (i.e., prohibited seaward of the shoreline). Coordinates for the boundary line approximating the 30-fm (55-m) and 60-fm (110-m) depth contours are specified in Sec. 660.391 and Sec. 660.392.

This change is expected to alleviate confusion among recreational anglers on what depths are open to fishing and provide for a more enforceable depth restriction. An impact analysis, using projected catch estimates for 2006 (based on 2004 California Recreational Fisheries Survey estimates), indicates that this change will not significantly increase groundfish catches in this area during this time period and can be accommodated within the current harvest targets.

GMT RECOMMENDATIONS FOR 2005

1. Provide guidance to address overfishing on petrale sole for December 2005.
2. Implement adjustments in the Oregon recreational ocean and estuary boat fisheries (40 fm seaward boundary of the recreational RCA, prohibit retention of black rockfish) to conform with state adjustments implemented in October, effective through December 31, 2005.
3. Adopt corrected recreational regulations for California as detailed in this report.

GMT RECOMMENDATIONS FOR 2006

1. Adopt proposed changes to trawl RCA boundaries as described in option 3
2. Adopt proposed changes to trawl cumulative limits for sablefish, thornyheads, Dover sole, petrale sole, other flatfish, arrowtooth, slope rockfish, and splitnose as described in option 3.
3. Consider establishing a reserve in the scorecard for canary rockfish in the limited entry bottom trawl fishery, and specify the amount.
4. Increase limits for lingcod in the coastwide for the limited entry trawl fishery to 1,200 lbs per two months (for all gear types).
5. Select an option for the limited entry fixed gear and open access fixed gear DTL fishery for sablefish north of 36° N latitude
6. Adopt limited entry fixed gear and open access fixed gear shelf rockfish, shortbelly, and widow rockfish limits south of 34°27’ N latitude
7. Adopt limited entry fixed gear and open access fixed gear black rockfish limits between 40°10’ N latitude and 42°.
8. Remove the 30 fm depth closure in the Washington recreational fishery, beginning January 1, 2006.
9. Adopt recreational regulations for Oregon and California as detailed in this report.

OPTION 3: CHANGES TO TRAWL CUMULATIVE LIMITS AND RCA BOUNDARIES FOR 2006 MANAGEMENT

Option 3

Subarea	Period	RCA Config INLINE	RCA Config OUTLINE	Cumulative Limits Sable	Lspine	Sspine	Dover	O'flat	Petrale	Arrowtth	Slope Rock
North 40 10	Jan	75	200*	7,000	7,500	2,000	25,000	55,000	30,000	50,000	2,000
	Feb	75	200*	7,000	7,500	2,000	25,000	55,000	30,000	50,000	2,000
	2	75	200	14,000	15,000	4,000	50,000	110,000	30,000	100,000	4,000
	3	100	200	20,000	23,000	5,800	35,000	110,000	30,000	100,000	4,000
	4	100	200	20,000	23,000	5,800	35,000	110,000	30,000	100,000	4,000
	5	75	200	20,000	23,000	5,800	35,000	110,000	30,000	100,000	4,000
	6	75	200*	14,000	15,000	4,000	35,000	110,000	60,000	100,000	4,000
N 40 10: If SFFT gear used during period	Jan	75	200*	2,500	1,500	1,500	10,000	45,000	12,500	40,000	2,000
	Feb	75	200*	2,500	1,500	1,500	10,000	45,000	12,500	40,000	2,000
	2	75	200	7,000	3,000	3,000	28,000	90,000	25,000	80,000	4,000
	3	100	200	13,500	3,000	3,000	28,000	90,000	28,000	80,000	4,000
	4	100	200	13,500	3,000	3,000	28,000	90,000	28,000	80,000	4,000
	5	75	200	7,000	3,000	3,000	28,000	90,000	28,000	80,000	4,000
	6	75	200*	5,000	3,000	3,000	20,000	90,000	25,000	80,000	4,000
38 - 40 10	Jan	75	150	8,500	9,500	2,450	25,000	55,000	30,000	5,000	4,000
	Feb	75	150	8,500	9,500	2,450	25,000	55,000	30,000	5,000	4,000
	2	100	150	17,000	19,000	4,900	50,000	110,000	30,000	10,000	8,000
	3	100	150	17,000	19,000	4,900	35,000	110,000	30,000	10,000	8,000
	4	100	150	17,000	19,000	4,900	35,000	110,000	30,000	10,000	8,000
	5	100	150	17,000	19,000	4,900	35,000	110,000	30,000	10,000	8,000
	6	75	150	17,000	19,000	4,900	35,000	110,000	60,000	10,000	8,000
S 38	Jan	75	150	8,500	9,500	2,450	25,000	55,000	30,000	5,000	20,000
	Feb	75	150	8,500	9,500	2,450	25,000	55,000	30,000	5,000	20,000
	2	100	150	17,000	19,000	4,900	50,000	110,000	30,000	10,000	40,000
	3	100	150	17,000	19,000	4,900	35,000	110,000	30,000	10,000	40,000
	4	100	150	17,000	19,000	4,900	35,000	110,000	30,000	10,000	40,000
	5	100	150	17,000	19,000	4,900	35,000	110,000	30,000	10,000	40,000
	6	75	150	17,000	19,000	4,900	35,000	110,000	60,000	10,000	40,000

note: splitnose limits are equivalent to slope rock limits
petrale is a sublimit of other flatfish in periods 2-5
* means that petrale areas are open during the period

MORTALITY IMPACTS FROM PROPOSED TRAWL LIMIT ADJUSTMENTS AND RCA BOUNDARIES

Option 3 Impacts

		North	South	Total	HG
Rebuilding Species	Lingcod	136.3	41.1	177.4	
	Canary	5.7	2.6	8.3	
	POP	62.6	0.0	62.6	
	Darkbltch	112.4	27.9	140.3	
	Widow	0.9	0.1	0.9	
	Bocaccio	-	47.4	47.4	
	Yelloweye	0.2	0.1	0.3	
	Cowcod	-	2.8	2.8	
Target Species	Sablefish	2,246.1	751.9	2,998.1	3,427
	Longspine	155.3	466.4	621.7	2,449
	Shortspine	490.7	321.5	812.3	1,011
	Dover	5,700.1	1,570.3	7,270.4	7,504
	Arrowtooth	5,758.5	30.0	5,788.4	5,800
	Petrale	2,341.4	397.0	2,738.4	2,762
	Other Flat	635.1	676.7	1,311.8	4,090
	Slope Rock	204.6	246.5	451.1	n1160 s639

GROUNDFISH ADVISORY SUBPANEL REPORT ON CONSIDERATION OF INSEASON ADJUSTMENTS IN 2005 AND 2006 GROUNDFISH FISHERIES

The Groundfish Advisory Subpanel (GAP) heard a presentation from Mr. Merrick Burden, Groundfish Management Team (GMT), on proposed recommendations for inseason adjsutments for the remainder of 2005 and the start of the 2006 season and has the following comments.

2005

Petrale

In response to the current level of Petrale catch, the GAP recommends maintaining the 250 fathom line north of 38° N. Latitude and eliminating the Petrale trip limit for the coastwide fishery beginning December 1st. Other restrictions have already been implemented to reduce or eliminate Petrale catch. According to National Marine Fisheries Service (NMFS) staff, the bottom trawl fishery on the West Coast brings in between $600,000 - $800,000 in ex-vessel revenues during the month of December. The alternative to eliminating the Petrale trip limit is to to shut down the entire bottom trawl fishery. Based on the ex-vessel revenues generated by this fishery in December, this alternative would cause extreme negative economic impacts. This is a prime example of using econimc data to demonstrate the importance of a given fishery to participants and associated coastal communities. The GAP recommends the Council consider the drastic economic effects that shutting this fishery down completely would cause, and implement a zero trip limit for Petrale as the management measure for the remainder of 2005.

2006

Limited Entry Trawl

The GAP suports Option 3 as presented by the GMT with the exception of the first period being divided into two monthly limits. The GAP wishes to remind the Council that one month limits induce discards which ultimately punish the industry later in the year. The GAP would prefer seeing Period 1 set up as a two-month cumulative limit.

Limited Entry Fixed Gear and Open Access Sablefish DTL Fishery

The majority of the GAP supports Option 2 (300 lbs/day, 1,000 lbs/week, 5,000 lbs/ 2 months) as the preferred option. A minority of the GAP supports Option 1 (400lbs/day, 1,200 lbs/week, 4,800 lbs/2 months).

Fixed Gear Limited Entry and Open Access Shelf Rockfish

The GAP supports a shelf rockfish limit increase south of 34° 27' north latitude for limited entry fixed gear to 3,000 lbs and 750 lbs for open access fixed gear.

Fixed Gear Limited Entry and Open Access Black Rockfish

The GAP support a black rockfish increase to 6,000 lbs between 40°10' north latitude and the Oregon-California border.

Recreational Fishery
The GAP supports the proposal to increase the recreational fishing area south of 34°27` north latitude from zero fathoms to 60 fathoms for the months of March and April.

PFMC
11/02/05

TRIBAL COMMENTS ON CONSIDERATION OF INSEASON ADJUSTMENTS IN 2005 AND 2006 GROUNDFISH FISHERIES

The Makah Tribe has continued their bottom trawl fishery for the last two months of the year. Petrale sole is an important target species in this fishery. To date the fishery has taken as much as 22 mt, and could potentially take an additional 20 mt-30 mt (of the 2762 mt optimum yield). The Makah Tribe proposes no inseason closure of their fishery unless there is a conservation necessity and the treaty catch is estimated to be 50 % of the harvestable surplus in their usual and accustomed fishing areas.

PFMC
11/02/05

TRIBAL COMMENTS ON CONSIDERATION OF INSEASON ADJUSTMENTS IN 2005 AND 2006 GROUNDFISH FISHERIES

The Makah Tribe is planning a DTS fishery for 2006. To this end they would need something more liberal than the current 300 lb/trip limit on combined thornyhead species (as stated in Agenda Item D.1.b Supplemental Tribal Comments 2). The Makah Tribe is proposing to follow the LE trawl limits for both shortspine and longspine thornyheads.

PFMC
11/03/05

Agenda Item H.4.d
Public Comment
November 2005

Subject: [Fwd: petrale 2005]
From: PFMC Comments <pfmc.comments@noaa.gov>
Date: Tue, 27 Sep 2005 09:55:24 -0700
To: John DeVore <John.DeVore@noaa.gov>
CC: John Coon <John.Coon@noaa.gov>
X-Mozilla-Status: 0001
X-Mozilla-Status2: 00000000
>From - Tue Sep 27 14: 10:45 2005
X-Mozilla-Status: 0001
X-Mozilla-Status2: 00000000
Return-Path: <pfmc.comments@noaa.gov>
Received: from [10.0.0.108] ([65.106.153.163]) by mercury.akctr.noaa.gov (Netscape Messaging Server 4.15 mercury Jun 21 2001 23:53:48) with ESMTP id INHJ1800.6GL; Tue, 27 Sep 2005 09:55:56 -0700
Message-ID: <4339797C.2050603@noaa.gov>
Reply-To: wdiller@sbcglobal.ne
Organization: Pacific Fishery Management Council
User-Agent: Mozilla Thunderbird 1.0.6 (Windows/20050716)
X-Accept-Language: en-us, en
MIME-Version: 1.0
Content-Type: multipart/mixed; boundary="------------060506020507050708060706"

-------- Original Message --------
Subject:petrale 2005
Date: Mon, 26 Sep 2005 22:34:02 -0700
From: Bill Diller <wdiller@sbcglobal.net>
To:<pfmc.comments@noaa.gov>

Nice job "managing" the petrale fishery! Maybe you folks would qualify for jobs at FEMA managing disasters, you've done good a making one. sincerely, Bill Diller GF0068, former petrale trawler.

Pacific Fishery Management Council

Agenda Item H4

Gary Rogers (owner)

PO Box 3003

Brookings-Harbor, Or 97415

F/V Seal – Beach Trawler, 45' LOA (fishes less then 100 fathoms)

Seal Fisheries

Seal Rock Trucking

The PFMC Management style, over the last few years has been, off and on again, more then I can count.. This tears families apart, making it impossible to hire, train, and keep good employees, not to mention maintaining boats, trucks, fishing gear, and montages. It also tears at the social fabric of coastal communities, Ports, fuel docks, suppliers, banks and restaurants and other support industries, and the employees and families of those businesses.

The Public notice dated September 30th was once again late. This time later then unusual, it was post marked October 20th and not received until October the 26th.

The counsel is mandated to provide for maximum sustainable yield (year round) to provide for maximum benefit for the nation, and to provide for the social and economic benefits of those communities involved, and to provide resource protection. If this were private industries you would be unemployed, Please do your job or give someone else a chance.

Gary Rogers

Gary Rogers

MENT OF COMMERCE
NIC AND ATMOSPHERIC ADMINISTRATION
FISHERIES SERVICE
ERIES DIVISION, F/NWO2
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ROGERS, GARY
PO BOX 3003
HARBOR OR 97415

CONSIDERATION OF INSEASON ADJUSTMENTS IN 2005 AND 2006 GROUNDFISH FISHERIES

The Council set optimum yield (OY) levels and various management measures for the 2005 and 2006 groundfish management seasons with the understanding these management measures will likely need to be adjusted periodically through the biennial management period with the goal of attaining, but not exceeding, the OYs. The Groundfish Management Team (GMT) and the Groundfish Advisory Subpanel (GAP) will begin meeting on Sunday, October 30, 2005 (see Ancillary A and Ancillary B agendas) to discuss and recommend inseason adjustments to ongoing 2005 and upcoming 2006 groundfish fisheries.

Under this agenda item, the Council is to consider advisory body advice and public comment on the status of ongoing fisheries and recommended inseason adjustments prior to adopting final changes as necessary. The Council may provide guidance to the GMT and GAP prior to making final inseason adjustments under Agenda Item H.13 on Friday, November 4 or make final inseason adjustments under this agenda item. If the latter course is chosen, there will be opportunity to confirm or clarify the Council decision under Agenda Item H.13.

Council Action:

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

Reference Materials:

1. Agenda Item H.4.d, Public Comment.

Agenda Order:

a. Agenda Item Overview — John DeVore
b. Report of the Groundfish Management Team — Susan Ashcraft
c. Reports and Comments of Advisory Bodies
d. Public Comment
e. **Council Action:** Adopt Preliminary or Final Inseason Adjustments for 2005 and 2006 Groundfish Fisheries

PFMC
10/12/05

Agenda Item H.5.c
Supplemental GAP Report
November 2005

GROUNDFISH ADVISORY SUBPANEL REPORT ON OFF YEAR SCIENCE IMPROVEMENT

The Groundfish Advisory Subpanel (GAP) recommends proceeding with the following Council sponsored workshops. They are presented here in priority order.

1. Initial Biomass/B_{MSY} (target biomass) Workshop
2. Recreational Fishery Information Network (RecFIN) Workshop
3. Santa Cruz Juvenile Rockfish Survey Workshop

The GAP recommends that the National Marine Fisheries Service preassessment meeting in August-October be dedicated primarily to evaluating the validity of the data to be used in the model, not modeling.

PFMC
11/02/05

GROUNDFISH MANAGEMENT TEAM REPORT ON OFF-YEAR SCIENCE IMPROVEMENTS

The Groundfish Management Team (GMT) has discussed several proposed off-year science workshops prior to the next assessment cycle, and believes that all of the workshops and efforts identified below are likely to increase the value and knowledge base of future assessments. The GMT recommends that Council guidance and support be provided in as rapid a time frame as possible, in order for such workshops to provide guidance in a timely fashion for the 2007 assessment cycle.

Post-assessment Review: The Northwest Fisheries Science Center (NWFSC) has raised the idea of facilitating a review in early in 2006 of the process and challenges that arose in the most recent assessment cycle, in order to evaluate realistic workloads and expectations prior to the next assessment cycle. The GMT strongly supports the idea of such a review.

The GMT recognizes that the formal list of species to be considered for the 2007 assessment cycle will not be forthcoming until March. This schedule leaves little more than a year between the time when potential species to be assessed will be identified, and the beginning of the assessment review process. In order for federal and state agencies to apportion age reading and port sampling resources appropriately, priorities should be identified as rapidly as possible. The GMT is interested in working with NMFS science centers and state agencies in an informal, collaborative process to better prioritize such resources, and believes this process should begin as early as possible. The GMT believes that it would be desirable for other Council advisory bodies to engage in this process as well.

Recreational Fisheries Data Workshop: Accounting for mortality in the recreational fishery has become increasingly important in rebuilding efforts for overfished species. To that end, the GMT strongly supports working closely with the RecFIN Statistical Subcommittee and other scientists and managers to ensure that we are basing recreational catch information on the best available science relative to catch estimation, average weight of catch, discard mortality and survival rates, and the filtering process for developing recreational catch per unit of effort (CPUE) time series. A recreational data workshop to address these, and other issues suggested by the RecFIN technical committee, would be valuable for the next assessment cycle. Issues regarding the availability of raw data to assessment authors, as discussed in at least one Stock Assessment Review (STAR) panel, should also be addressed.

Juvenile Survey Workshop: The Southwest Fisheries Science Center (SWFSC) juvenile rockfish survey has been ongoing since 1983, with a recent expansion of sea-time and spatial coverage, while the Pacific Whiting Conservation Cooperative (PWCC) and NWFSC survey for hake and juvenile rockfish has surveyed most of the west coast since 1999. The participants of these two surveys have cooperated considerably in recent years, and have begun to explore the potential for integrating results from the two surveys into a single, coastwide index. A workshop to explore this possibility, and to explore the advantages and drawbacks of these surveys more generally, would likely benefit the 2007-2008 assessment cycle and process considerably. This workshop could also address the use of non-traditional juvenile surveys, such as the impingement surveys used in the cabezon stock assessment this year.

B_0/B_{msy} Workshop: The Science and Statistical Committee (SSC) has in the past suggested a workshop to develop explicit guidance regarding how B_0, the equilibrium, unfished biomass of a population, is to be determined for assessments and rebuilding analyses. This issue continues to be extremely important, and the GMT supports the idea of such a workshop.

Pre-assessment Data and Modeling Workshops: The NWFSC hosted two important workshops prior to the engagement of this year's assessment cycle, which provided scientists with an integrated overview of the available data and methods. This is clearly a critical element of the assessment process, and both of these workshops will be important for clarifying future data and model specifications. Although these workshops will presumably be sponsored by the NWFSC, participation by members from the Council advisory bodies would be beneficial to facilitate the process for the next assessment cycle.

With the possible exception of the clearly critical need for pre-assessment data and modeling workshops, the GMT has not identified priorities for these proposals, and believes that all of these topics are equally important for both the next assessment cycle and the longer term scientific basis for managing west coast fisheries.

PFMC
11/02/05

Agenda Item H.5.c
Supplemental SSC Report
November 2005

SCIENTIFIC AND STATISTICAL COMMITTEE REPORT ON
OFF-YEAR SCIENCE IMPROVEMENTS

The Scientific and Statistical Committee (SSC) received a briefing from Dr Jim Hastie Northwest Fisheries Science Center (NWFSC) regarding off-year science activities. The NWFSC has committed to supporting a workshop to examine the two available pre-recruit groundfish surveys. Also under consideration is a de-briefing meeting, which probably would be held in conjunction with the March Council meeting, to review the lessons learned during the 2005 assessment cycle and begin development of terms of reference for the 2007 cycle.

The SSC strongly recommends that plans for the de-briefing meeting be developed as soon as possible. For this meeting the SSC requests that the NWFSC staff summarize the comments provided by the committee of independent experts (CIE) reviewers regarding technical as well as process and logistical issues that arose during the 2005 Stock Assessment Review (STAR) Panels. The SSC recommends that Dr. Robert Mohn, the CIE reviewer who participated in all of the 2005 STAR Panels, be invited to the de-briefing meeting to share his view on how the STAR Panel process could be improved.

Members of the SSC identified numerous issues that could be organized into a series of four workshops during 2006 (not listed in priority order): (1) a RecFIN Workshop to discuss issues regarding recreational data collection, estimation, and use in in-season management, (2) a Data Workshop to discuss issues such as reconstructing historical catches and developing guidelines for pre-processing of assessment data and producing abundance indices for assessments, (3) a Modeling Workshop to develop guidelines for issues such as adjusting input CVs on tuning indices and effective sample sizes for length and age composition data, and (4) an Assessment Science Workshop to discuss approaches to estimating B_0 and threshold biomass levels, and using these estimates in harvest control rules. The workshops probably will not be able to occur until summer or fall 2006, and times for the workshops should be identified soon so that interested parties will be able to plan their schedules.

The SSC Groundfish Subcommittee will take the lead in developing a comprehensive list of issues arising during the 2005 assessment cycle and topics for discussion at each of the 2006 workshops. SSC Groundfish Subcommittee will collaborate with the NMFS and Council to develop terms of reference for the workshops. Members of the Groundfish Management Team and Groundfish Advisory Subpanel will be invited to share their thoughts on the 2005 assessment cycle and how the process could be improved for the next cycle.

Possible Workshop Topics Arising during SSC Discussions:

- *Use of juvenile surveys.*
- *Tuning data errors.*
- *Biomass-based targets and thresholds.*
- *RecFIN especially CRFS.*
- *Age data, ageing errors, age composition generation.*
- *Pre-assessment workshop to encourage input from industry and other groups.*
- *Spatial assessments.*

- *Priors on steepness and q.*
- *Reconstructing historical catch series.*
- *Model complexity.*
- *Steps towards developing an ecosystems report.*
- *Longitudinal review to compare modeling approaches and look for common patterns across species.*
- *Guidelines for dealing with trans-boundary stocks, e.g., lingcod.*
- *Estimating (defining) SB_0 when there are changes in growth and/or maturity.*
- *Guidelines for assessments lacking current tuning indices (e.g., cowcod and yelloweye).*

PFMC
11/02/05

PACIFIC STATES MARINE FISHERIES COMMISSION
205 S.E. SPOKANE STREET, SUITE 100 • PORTLAND, OREGON 97202-6413
PHONE: (503) 595-3100 • FAX: (503) 595-3232
www.psmfc.org

RECEIVED
OCT 0 7 2005
PFMC

October 5, 2005

Dr. Donald McIsaac
Pacific Fishery Management Council
7700 Ambassador Place, Suite 200
Portland, OR 97220-1384

Dear Don:

Over the past three years, RecFIN has made a number of substantive changes to its marine recreational data collection programs. I have periodically briefed the Council on progress made in this transition. However, the Council has not yet had the opportunity to review this new program in its entirety. To ensure that RecFIN is providing the Council with recreational statistics that address its management needs and conform with the best available science, the RecFIN Technical Committee suggests that a workshop be convened to: (1) allow the SSC to review RecFIN's marine recreational surveys and estimation methodologies, (2) obtain input from FMP teams, panels and stock assessment authors regarding their needs for recreational data and data documentation, and (3) develop standard communication channels and review procedures to ensure RecFIN's continued ability to produce technically sound and transparent estimates for the Council. With regard to the latter, we request Council guidance regarding the extent to which (a) the routine annual recreational catch estimates that RecFIN currently produces, and (b) periodic changes to survey or estimation methods that RecFIN may consider in the future should be subject to review. We also want the Council to feel comfortable with and provide guidance into the respective roles of the RecFIN Statistical Subcommittee and the SSC in reviewing RecFIN changes.

We would hope that the Council could suggest a date, location, and representatives for such a meeting that works in with the Council calendar. We would leave it to the Council or staff to assure appropriate representation of all pertinent Council bodies. We are open to suggestions as to the involvement of Groundfish, HMS, Salmon and CPS teams and advisory panel reps, stock assessment representatives, and SSC participation in such a meeting.

PSMFC would be happy to provide arrangements for such a workshop at a time and place convenient to the parties involved. Your thoughts and desires along with that of the Council on this suggestion are appreciated.

Sincerely,

Russell Porter
Senior Program Manager
RecFIN Technical Committee Chairman

Agenda Item H.5.d
Public Comment

Pacific Fishery Management Council –
San Diego, California
November 3, 2005

Comments to Council regarding Off year science adjustments

My objective in these comments is simply to raise an issue. After participating in Council decision making for about one year, it is becoming clear to me that this decision making body needs more than simple "off year science adjustments." The Council needs a major new commitment to improvements in our capabilities for planning and decision making. We need a real long run research and development plan.

A renewed commitment to research and development is needed to meet the Council's current mission. A higher commitment to research will be even more important if a renewed Magnuson-Stevens Act increases the Council's responsibilities.

Examples of areas where research and tools development are needed include*:

- -Designing and evaluating bycatch reduction strategies
- -Designing and evaluating strategies for moving the fishing fleets toward full retention
- -Developing models of the linkages between fish landings and community impacts
- -Developing ecosystem-based management capabilities including:
    - -Delineating and characterizing ecosystems
    - -Developing conceptual models of the food web
    - -Developing indices of ecosystem health
    - -Calculating total removals and showing how they relate to biomass, production, optimal yields, and tropic structure.
    - -Developing models of the relationships between climate and ocean monitoring and ecosystem considerations (productivity, non-target species, tropic interactions and ecological indicators)
- -Developing models of the relationships between resource surveys (non-target species, food habits, ecology, habitat interactions) and ecosystem considerations
- -Assessing how uncertainty is characterized and improving how uncertainty is incorporated in conservation and management decisions.

Note that these activities are supported by data gathering but not driven by it.

Developing a strategic research and development agenda will take valuable Council time and it will take money and talent to execute. Without Council effort it is doubtful that much research and development work of strategic significance will get done, decisions will get made the same way – and the risk of law suits will remain high. In order to break out of this cycle, the Council must make the effort to develop a meaningful research and development agenda -- an agenda that is closely linked to Council decision making needs – current and anticipated.

This is too important a task to delegate to the Science and Statistical Committee (SSC). The focus of R&D agenda setting should be the Council and the Council's advisory structure, with input from the SSC.

Now the $64,000 question, Why bother to lay out an R&D agenda when there is not enough money to do the R&D? It is a good question. There isn't a simple answer other than citing the axiom that good things come to those who are prepared. The likelihood of securing funding is vastly increased if we know what and why we need it and what we are going to do with it. In addition, we would expect research partners like NGO's and universities to align themselves with us if we have a clear vision of where we are going. With alignment we will benefit from their efforts without having to pay for them directly.

Hopefully these comments will provoke some thought. Hopefully some of you agree with my assessment. It would be reassuring to see the Council's 2006 agenda shaped to accommodate this strategic issue.

* Several of these items were taken from "Considering ecosystem-based fisheries management in the California Current" by John C. Field and Robert C. Francis, published in Marine Policy, 2005. (John Field is a member of the PFMC Groundfish Management Team.)

Steve Barrager
Groundfish Advisory Panel
November 3, 2005

Agenda Item H.5
Situation Summary
November 2005

OFF-YEAR SCIENCE IMPROVEMENTS

This Council meeting marks the end of the “on-year” for intensive science activities as the last of the new groundfish stock assessments and rebuilding analyses are formally approved under Agenda Item H.2. While it is not entirely accurate to characterize the biennial management cycle in terms of an “on-year” and “off-year” for science, it is correct to distinguish the year in which assessments are conducted (the “on year”) and the year other science activities are planned to prepare for the following assessment cycle and to resolve scientific issues that play a significant role in groundfish decision-making.

There are many activities that have been planned and/or should be considered for “off-year” science improvements. Some of these activities may be planned and sponsored by the National Marine Fisheries Service Northwest Fisheries Science Center (NWFSC) (e.g., a post-assessment workshop to review how well the assessment process worked this year, a pre-assessment data and modeling workshop to prepare for the next round of assessments, etc.); some activities may be planned and sponsored by the Council or the Council’s Scientific and Statistical Committee (e.g., a B_0 (initial biomass)/ B_{MSY} (target biomass) workshop); and some activities may be recommended by other entities (e.g., a Recreational Fisheries Information Network (RecFIN) workshop-- see Agenda Item H.5.d, Attachment 1).

The Council should consider the proposals and advice of the NWFSC, Council advisory bodies, other agencies, and the general public regarding off-year science improvements and plan and prioritize science activities for 2006.

Council Action:

Plan and Prioritize Science Activities for 2006.

Reference Materials:

1. Agenda Item H.5.d, Attachment 1: October 5, 2005 letter from Russell Porter, chair of the RecFIN Technical Committee, to Dr. Donald McIsaac requesting a RecFIN workshop.

Agenda Order:

a. Agenda Item Overview — John DeVore
b. Northwest Fisheries Science Center Report — Elizabeth Clarke
c. Reports and Comments of Advisory Bodies
d. Public Comment
e. **Council Action:** Plan and Prioritize Science Activities for 2006

PFMC
10/17/05

Agenda Item H.6.a
Attachment 1
November 2005

PUBLIC REVIEW DRAFT

AMENDMENT 18
(BYCATCH MITIGATION PROGRAM)
AMENDMENT 19
(ESSENTIAL FISH HABITAT)

TO THE

PACIFIC COAST GROUNDFISH FISHERY MANAGEMENT PLAN

FOR THE CALIFORNIA, OREGON, AND WASHINGTON GROUNDFISH FISHERY

PACIFIC FISHERY MANAGEMENT COUNCIL
7700 NE AMBASSADOR PLACE, SUITE 200
PORTLAND, OR 97220
503-820-2280
866-806-7204
WWW.PCOUNCIL.ORG

SEPTEMBER 2005

PREFACE

This document shows proposed changes to the groundfish fishery management plan (FMP) developed by Council/National Marine Fisheries Service (NMFS) staff based on the preferred alternatives in the Bycatch Mitigation Program final environmental impact statement (Amendment 18) and the Essential Fish Habitat (EFH) environmental impact statement (Amendment 19). Substantive changes address elements of the preferred alternative for each of these actions. As part of Amendment 18, the FMP has also been updated to better reflect the current management framework. Table 1 shows changes in the organization of chapters under Amendment 18. Text has been revised in chapters 1, 2, 6, 9, 10, and 11 of the current FMP under Amendment 18. Text in chapters 1, 6, and 7 (a new chapter created by Amendment 18) has been revised under Amendment 19. Because of changes in the chapter structure, chapter 8 is renumbered chapter 9 and chapter 12 is renumbered chapter 11, but no other changes are made in these chapters.

Chapter 6, Management Measures, has been substantially reorganized and revised. Material in chapter 9 (Restrictions On Other Fisheries) and chapter 11 (Management Measures that Continue in Effect with Implementation of Amendment 4) have been incorporated into chapter 6, outdated references to foreign and joint-venture fishing have been deleted, and the structure of the chapter has been modified to emphasize the range of management measures available to the Council. Management measures to mitigate the adverse effects of fishing on EFH are added to Chapter 6 through Amendment 19. Table 2 provides a guide to the disposition of sections in chapters 6 and 11 of the current FMP under the proposed revisions.

In general, for deletions are marked by ~~strikethrough~~, Amendment 18 insertions by double underline, and insertions made by amendment 19 by dotted underline. Notes, for example requesting advisory body input, are in ***[boldface italic brackets]***.

Chapter 6 and the new Chapter 7 are exceptions. Because they are comprehensively reorganized, with much text added and deleted, in most cases, using strikethrough and double underline was deemed too distracting. Instead, the following marks are used to indicate changes:

Annotations at the right-hand margin, like this:

[6.3.2 Standardized Reporting Methodology]

indicate the location in the current FMP, by section number and heading, of the text that follows.

Paragraphs based on text currently in the FMP, but substantially modified by Amendment 18, are indicated by a single rule in the left-hand margin, like this:

New paragraphs inserted by Amendment 18 are indicated by a double rule in the left-hand margin, like this:

In both Chapter 6 and the new Chapter 7 (created from Section 6.6) paragraphs substantially modified by Amendment 19 are indicated by a dotted line in the left-hand margin, like this:

New paragraphs inserted by Amendment 19 are indicated by a triple rule in the left-hand margin, like this:

Strikethrough and double underline (or dotted underline) is used in paragraphs where there have been minor changes in the current text. (The paragraphs are annotated with the current section number and heading, as described above.) Copy edits (e.g., changes in punctuation) are not marked.

Readers interested in the substance of deleted sections in chapters 6 and 11 (as indicated in Table 2), or substantially modified text, may refer to the current FMP, using the annotations and Table 2 as guides.

Table 1. Guide to chapter-level changes.

Chapters as Revised by Amendment 18	FMP through Amendment 17 (December 2004)	Notes on Changes Made By Amendment 18
Chapter 1 Introduction	Chapter 1 Introduction	Revised and Updated
Chapter 2 Goals and Objectives	Chapter 2 Goals and Objectives	Objective added, definitions added
Chapter 3 Areas and Stocks Involved	Chapter 3 Areas and Stocks Involved	No changes
Chapter 4 Optimum Yield	Chapter 4 Optimum Yield	No changes
Chapter 5 Specification and Apportionment of Harvest Levels	Chapter 5 Specification and Apportionment of Harvest Levels	Minor edits for consistencies
Chapter 6 Management Measures	Chapter 6 Management Measures	Substantially revised and reorganized
	Chapter 7 Experimental Fisheries	Renumbered Chapter 8
	Chapter 8 Scientific Research	Renumbered Chapter 9
Chapter 7 Essential Fish Habitat		Creates new chapter from material in Section 6.6 (then amended by Amendment 19)
Chapter 8 Experimental Fisheries		Renumbered and revised
Chapter 9 Scientific Research		Renumbered, no other changes
	Chapter 9 Restrictions on Other Fisheries	Deleted with material incorporated into Chapter 6
Chapter 10 Procedures for Reviewing State Regulations	Chapter 10 Procedures for Reviewing State Regulations	Background section revised
	Chapter 11 Management Measures that Continue in Effect with Implementation of Amendment 4	Deleted with material incorporated into Chapter 6
Chapter 11 Groundfish Limited Entry		Renumbered, no other changes
	Chapter 12 Groundfish Limited Entry	Renumbered Chapter 11
References	References	No changes
Appendices Contents	Appendices Contents	No changes

Table 2. Guide to Revision of Chapter 6 and 11

Current FMP	Location under revision	Notes
6.0 MANAGEMENT MEASURES	6.1 Introduction	Substantially revised to describe chapter organization
6.1 General List of Management Measures	6.1.1 Overview of Management Measures for West Coast Groundfish Fisheries	Substantially revised to describe chapter organization Old sections 6.1.1-6.1.10 moved
6.1.1 Permits, Licenses, and Endorsements	6.9 Measures to Control Fishing Effort, Including Permits and Licenses	Moderately revised
6.1.2 Mesh Size	6.6.1.2 Trawl Gear	Incorporated into new text
6.1.3 Landing and Frequency Limits	6.7.2 Commercial Fisheries	Text added
6.1.4 Quotas, Including Individual Transferable Quotas	6.7.1 All Fisheries	No changes to text
6.1.5 Escape Ports and Panels	6.6 Gear Definitions and Restrictions	Incorporated into new text
6.1.6 Size Limits	6.7.1 All Fisheries	No changes to text
6.1.7 Bag Limits	6.7.3 Recreational Fisheries	New text added
6.1.8 Time/Area Closures (Seasons and Closed Areas)	6.8 Time/Area Closures	Substantially revised, new text and sections added
6.1.9 Other Forms of Effort Control	6.9 Measures to Control Fishing Effort…	Moderately revised
6.1.10 Allocation	6.3 Allocation	No changes to text
6.2 General Procedures for Establishing and Adjusting Management Measures	6.2 General Procedures for Establishing and Adjusting Management Measures	Moderate revision for readability
6.2.1 Routine Management Measures	6.2.1 Routine Management Measures	List of measures broken out as section 6.2.1.1 and updated
6.2.2 Resource Conservation Issues - The "Points of Concern" Framework	6.2.2 Resource Conservation Issues—The Points of Concern Framework	Moderate revision for readability
6.2.3 Nonbiological Issues--The Socioeconomic Framework	6.2.3 Nonbiological Issues—The Socioeconomic Framework	Moderate revision for readability
6.2.3.1 Allocation	6.3 Allocation	No changes to text
6.3 Bycatch Management	--- [heading only]	--
6.3.1 Bycatch of Nongroundfish Species	6.5.2 Bycatch of Nongroundfish in Groundfish Fisheries	Text added, sections on ESA, MMPA & MBTA added
6.3.2 Standardized Reporting Methodology	6.4 Standardized Total Catch Reporting and …	Substantially revised with new text
6.3.3 Measures to Control Bycatch	6.5 Bycatch Mitigation Program	Substantially revised with new text
6.4 Recreational Catch and Release Management	6.5.3.4 Recreational Catch and Release Management	Moderately revised
6.5 Other Management Measures	-- [Heading only]	--
6.5.1 Generic	-- [Heading only]	--
6.5.1.1 Permits	6.9.1 General Provisions for Permits	No changes to text
6.5.1.2 Observers	6.4.1.1 Monitoring Total Catch At Sea	New text added
6.5.1.3 Habitat Protection (General)	7.0 Essential Fish Habitat	Substantially revised
6.5.1.4 Vessel Safety Considerations	6.10.2 Vessel Safety	Substantially revised
6.5.2 Domestic--Commercial	6.1 Introduction	New text added
6.5.2.1 Permits (General)	6.9.1.1 Commercial Fisheries Permits	Moderately revised
6.5.2.2 Catch Restrictions	6.7 Catch Restrictions, 6.7.2 Commercial Fisheries	Text in 6.7 substantially revised; prohibited species discussion in 6.7.2 moderately revised

Current FMP	Location under revision	Notes
6.5.2.3 Gear Restrictions	6.6.1 Commercial Fisheries	Moderately revised
6.5.2.4 Reporting Requirements	6.4.2 Vessel Reporting Requirements, 6.9 Measures to Control Fishing Effort…	Substantially revised, new text, reorganized
6.5.2.5 Vessel Identification	6.10.3 Vessel Identification	Substantially revised
6.5.3 Domestic - Recreational	-- [Heading only]	--
6.5.3.1 Permits (General)	6.9.1.2 Recreational Fisheries Permits	No changes to text
6.5.3.2 Catch Restrictions	6.7 Catch Restrictions	Original 6.5.3.2 text equivalent to text in original 6.5.2.2; incorporated into new text
6.5.3.3 Gear Restrictions	Deleted	Equivalent text from 11.4 inserted in 6.6.2
6.5.4 Joint Venture--Domestic Vessels	Deleted	Obsolete – no joint venture fisheries
6.5.5 Joint Venture--Foreign Vessels	Deleted	Obsolete – no foreign fisheries
6.5.5.1 Permits	Deleted	Obsolete – no foreign fisheries
6.5.5.2 Target Species	Deleted	Obsolete – no foreign fisheries
6.5.5.3 Incidental Catch	Deleted	Obsolete – no foreign fisheries
6.5.5.4 Prohibited Species	Deleted	Obsolete – no foreign fisheries
6.5.5.5 Season and Area Restrictions	Deleted	Obsolete – no foreign fisheries
6.5.5.6 Reporting and Recordkeeping Requirements	Deleted	Obsolete – no foreign fisheries
6.5.5.7 Dumping	Deleted	Obsolete – no foreign fisheries
6.5.5.8 Fishery Closure	Deleted	Obsolete – no foreign fisheries
6.5.5.9 Observers	Deleted	Obsolete – no foreign fisheries
6.5.5.10 Other Restrictions	Deleted	Obsolete – no foreign fisheries
6.5.6 Foreign-Commercial	Deleted	Obsolete – no foreign fisheries
6.5.6.1 Permits	Deleted	Obsolete – no foreign fisheries
6.5.6.2 Target Species	Deleted	Obsolete – no foreign fisheries
6.5.6.3 Incidental Catch	Deleted	Obsolete – no foreign fisheries
6.5.6.4 Prohibited Species	Deleted	Obsolete – no foreign fisheries
6.5.6.5 Season, Area, and Gear Restrictions	Deleted	Obsolete – no foreign fisheries
6.5.6.6 Reporting and Recordkeeping Requirements	Deleted	Obsolete – no foreign fisheries
6.5.6.7 Dumping	Deleted	Obsolete – no foreign fisheries
6.5.6.8 Fishery Closure	Deleted	Obsolete – no foreign fisheries
6.5.6.9 Observers	Deleted	Obsolete – no foreign fisheries
6.5.6.10 Other Restrictions	Deleted	Obsolete – no foreign fisheries
6.5.7 Foreign-Recreational	Deleted	Obsolete – no foreign fisheries
6.5.8 Access Limitation and Capacity Reduction Programs	6.9.4 Data Collection	No changes to text
6.6 Essential Fish Habitat	7.0 ESSENTIAL FISH HABITAT	Revised by Amendment 19, text incorporated under section 7.1
6.6.1 MSA Directives Relating to Essential Fish Habitat	7.1 MSA Directives Relating to EFH	Revised by Amendment 19
6.6.2 Definition of Essential Fish Habitat for Groundfish	7.2 Definition of EFH	Revised by Amendment 19
6.6.2.1 Composite Essential Fish Habitat Identification	--	Replaced by Section 7.2.1 describing HSP methodology
6.6.3 Management Measures To Minimize Adverse Impacts on Essential Fish Habitat from Fishing	7.4 Management Measures To Minimize Adverse …	Revised by Amendment 19

Current FMP	Location under revision	Notes
6.6.4 Review and Revision of Essential Fish Habitat Definitions and Descriptions	7.7 Review and Revision…	No changes to text
9.0 RESTRICTIONS ON OTHER FISEHERIES	6.7.2 Commercial Fisheries	Moderately revised
11.0 MANAGEMENT MEASURES THAT CONTINUE IN EFFECT WITH IMPLEMENTATION OF AMENDMENT 4		Introductory paragraph deleted
11.1 Vessel Identification	Deleted	Substitute reference to regulations, otherwise obsolete
11.2 Gear Restrictions	Deleted	11.2.1.1.1-11.2.1.1.6 moved to Chapter 2-definitions
11.2.1 Commercial Fishing	Deleted	Equivalent definition in Chapter 2
11.2.1.1 Trawl gear	6.6.1.2 Trawl Gear	Substantially revised, incorporated with text from 6.1.2
11.2.1.2 Fixed gear	6.6.1.3 Non-trawl Gear	Substantially revised, new text
11.2.1.3 Nontrawl gear	6.6.1.3 Non-trawl Gear	11.2.1.3.1-11.2.1.3.7 moved to Chapter 2-definitions
11.2.2 Recreational Fishing	6.6.2 Recreational Fisheries	Substantially revised
11.2.2.1 Hook-and-line		Moved to Chapter 2-definitions
11.2.2.2 Spears		Moved to Chapter 2-definitions
11.3 Species Managed with a HG or Quota	Deleted	Outdated and incorrect
11.4 Catch Restrictions	6.7 Catch Restrictions	Moderately revised
11.4.1 Commercial Fishing	Deleted	Outdated and incorrect
11.4.2 Recreational Fishing	Deleted	Outdated and incorrect
11.4.3 Restrictions on the Catch of Groundfish in Non-Groundfish Fisheries	Deleted	Outdated and incorrect
11.4.3.1 Pink shrimp	Deleted	Outdated and incorrect
11.4.3.2 Spot and ridgeback prawns	Deleted	Outdated and incorrect
11.5 Joint Ventures	Deleted	Outdated and incorrect
11.5.1 Pacific Whiting	Deleted	Outdated and incorrect
11.5.2 Jack Mackerel (North of 39 N. Latitude)	Deleted	Outdated and incorrect
11.5.3 Shortbelly Rockfish	Deleted	Outdated and incorrect
11.6 Foreign Fishery	Deleted	Outdated and incorrect
11.6.1 Pacific Whiting	Deleted	Outdated and incorrect
11.6.2 Jack Mackerel (North of 39 N. Latitude)	Deleted	Outdated and incorrect
11.7 Prohibitions	Deleted	Substitute reference to regulations in 6.10.4 Prohibitions and Penalties
11.8 Facilitation of Enforcement	Deleted	Substitute reference to regulations in 6.10.4 Prohibitions and Penalties
11.9 Penalties	Deleted	Substitute reference to regulations in 6.10.4 Prohibitions and Penalties

Table 3. Guide to revision of EFH appendix material added to the FMP by Amendment 11.

Current FMP	Location Under Revision
11.10 ESSENTIAL FISH HABITAT	Deleted as redundant to Section 7.1
11.10.1 MSA Directives Relating to EFH	Deleted as redundant to Section 7.1
11.10.2 Definition of EFH for Groundfish, and Composite EFH Identification	Replaced by Appendix B
11.10.3 Adverse Impacts on EFH From Fishing Gear and Practices, and Measures to Manage Them	Replaced by Appendix C
11.10.3.1 Identification of Adverse Impacts of Fishing Gear on EFH	Replaced by Appendix C
11.10.3.2 Measures to Minimize Fishing Effects on Groundfish EFH	Deleted as redundant to Section 7.4
11.10.4 Adverse Impacts of Nonfishing Related Activities, Gear, and Practices, and Measures to Manage Them	Replaced by Appendix D
11.10.4.1 Adverse Nonfishing Impacts and Recommended Conservation Measures	Replaced by Appendix D
11.10.5 Consultation Procedures - Nonfishing Impacts	Deleted as redundant to Section 7.5
11.10.6 Research Needs	Incorporated into Appendix B

Note: The contents of appendices proposed by Amendment 19 are described at the end of this document.

Table of Contents

1.0 INTRODUCTION

1.1 Evolution of the Management Plan

The Pacific Coast Groundfish Fishery Management Plan (FMP) was approved by the U.S. Secretary of Commerce (Secretary) on January 4, 1982, and implemented on October 5, 1982. Prior to implementation of the FMP, management of domestic groundfish fisheries was under the jurisdiction of the states of Washington, Oregon, and California. State regulations have been in effect on the domestic fishery for ~~about 90~~more than 100 years ~~and~~with each state ~~acted~~acting independently in both management and enforcement. ~~However~~Furthermore, many fisheries overlapped state boundaries and participants often operated in more than one state. Management and a lack of uniformity of ~~regulation~~regulations had become a difficult problem, which stimulated the formation of the Pacific States Marine Fisheries Commission (PSMFC) in 1947. PSMFC had no regulatory power but acted as a coordinating entity with authority to submit specific recommendations to states for their adoption. ~~Between implementation of~~The 1977 Fishery Conservation and Management Act (later amended and renamed the Magnuson-Stevens Fishery Conservation and Management Act ~~(~~or Magnuson-Stevens Act~~, then called the Fishery Conservation and Management Act or FCMA) in~~) established eight regional fishery management Councils, including the Pacific Council. Between 1977 and the implementation of the groundfish FMP in 1982, state agencies worked with the Council to address conservation issues. Specifically, in 1981, ~~the management~~managers proposed a rebuilding program for Pacific ocean perch. To implement this program, the states of Oregon and Washington established landing limits for Pacific ocean perch in the Vancouver and Columbia management areas.

Management of foreign fishing operations began in February 1967 when the U.S. and U.S.S.R. signed the first bilateral fishery agreement affecting trawl fisheries off Washington, Oregon, and California. ~~B~~The U.S. later signed bilateral agreements with Japan and Poland ~~were also signed~~for fishing off the U.S. West Coast. Each of these agreements was renegotiated to reduce the impact of foreign fishing on important West Coast stocks, primarily rockfish, Pacific whiting, and sablefish. When the U.S. extended its jurisdiction to 200 miles (upon signing the Fishery Conservation and Management Act of 1976), the National Marine Fisheries Service (NMFS) developed and the Secretary implemented the preliminary management plan for the foreign trawl fishery off the Pacific Coast. From 1977 to 1982, the foreign fishery was managed under that plan. Many of these regulations were incorporated into the FMP, which provided for continued management of the foreign fishery.

~~Subsequent to initial implementation of~~Joint-venture fishing, where domestic vessels caught the fish to be processed aboard foreign vessels, began in 1979 and by 1989 had entirely supplanted directed foreign fishing. These joint ventures primarily targeted Pacific whiting. Joint-venture fisheries were then rapidly replaced by wholly domestic processing; by 1991 foreign participation had ended and U.S.-flagged motherships, catcher-processors, and shore-based vessels had taken over the Pacific whiting fishery. Since then U.S. fishing vessels and seafood processors have fully utilized Pacific Coast fishery resources. Although the Council may entertain applications for foreign or joint venture fishing or processing at any time, provisions for these activities have been removed from the FMP. Re-establishing such opportunities would require another FMP amendment.

Since it was first implemented in 1982, the Council has amended the groundfish FMP~~, the Council has developed 11 amendments~~ 20 times in response to ~~changing resource and fishery conditions. Early amendments added jack mackerel to the fishery management unit, established a management framework for modifying gear regulations, and responded to new requirements in~~changes in the fishery, reauthorizations of the MSA~~ pertaining to habitat and weather-related vessel safety issues. Amendment 4 was~~, and litigation that invalidated provisions incorporated by earlier amendments. During the first ten years of plan implementation, up to 1992, the Secretary approved six amendments. Amendment 4, approved in 1990, was the most significant early amendment; in addition to a comprehensive update ~~that~~and reorganization of the FMP, it established additional framework procedures for establishing and modifying management measures~~ and streamlining the decision and implementation process. Amendment 5 addressed overfishing standards, and Amendment 6~~. Another important change was implemented in 1992 with Amendment 6, which established a license limitation (limited entry) program intended to address overcapitalization ~~of the fishing sector~~by restricting further participation in groundfish trawl, longline, and trap fisheries.

The next decade, through 2002, saw the approval of another seven amendments. Amendment 9 modified the limited entry program by establishing a sablefish endorsement for longline and pot permits. Amendments 11 ~~was prepared in response~~, 12, 13 were responses to changes in the MSA due to the 1996 Sustainable Fisheries Act~~ amendments to the MSA that, among other provisions,~~. These changes required FMPs to identify essential fish habitat (EFH), more actively reduce bycatch and bycatch mortality, and strengthen conservation measures to both prevent fish stocks from becoming overfished~~,~~ and promote rebuilding~~.~~

~~The groundfish FMP has evolved into a document that describes the Council's and the NMFS's procedures for establishing and modifying management measures. It establishes the authority for and limitations on Council actions, but in general does not include specific fishing regulations; rather, it describes how the Council will develop its recommendations for fishing regulations and the process for public involvement in that process.~~ of any stocks that had become overfished. Amendment 14, implemented in 2001, built on Amendment 9 to further refine the limited entry permit system for the economically important fixed gear sablefish fishery. It allowed a vessel owner to "stack" up to three limited entry permits on one vessel along with associated sablefish catch limits. This in effect established a limited tradable quota system for participants in the primary sablefish fishery.

Most of the amendments adopted since 2001 deal with legal challenges to the three Sustainable Fisheries Act of 1996 (SFA)-related amendments mentioned above, which were remanded in part by the Federal Court. These have required new amendments dealing with overfishing, bycatch monitoring and mitigation, and EFH. In relation to the first of these three issues, the MSA now requires FMPs to identify thresholds for both the fishing mortality rate constituting overfishing and the stock size below which a stock is considered overfished. Once the Secretary determines a stock is overfished, the Council must develop and implement a plan to rebuild it to a healthy level. Since these thresholds were established for Pacific Coast groundfish, nine stocks have been declared overfished. The Court found that the rebuilding plan framework adopted by Amendment 12 did not comply with the MSA. In response, Amendments 16-1, 16-2, and 16-3 established the current regime for managing these overfished species.[1] Amendment 16-1, approved in 2003, incorporated guidelines for developing and adopting rebuilding plans and substantially revised Chapters 4 and 5. Amendments 16-2 and 16-3, approved in 2004, incorporated key elements of rebuilding plans into Section 4.5.4.

Amendment 17 modified the periodic process the Council uses to establish and modify harvest specifications and management measures for the groundfish fishery. Although not an SFA-related issue, this change did solve a procedural problem raised in litigation. The Council now establishes specifications and management measures every two years, allowing more time for them to be developed during the Council's public meetings.

Amendment 18, approved in [2006], addresses a remand of elements in Amendment 11 related to bycatch monitoring and mitigation. It incorporates a description of the Council's bycatch-related policies and programs into Chapter 6. It also effected a substantial reorganization and update of the FMP, so that it better reflects the Council's and the NMFS's evolving framework approach to management. Under this framework, the Council may recommend a range of broadly defined management measures for NMFS to implement. In

[1] Although the Secretary declared Pacific whiting overfished in 2002, a 2004 stock assessment found that it had recovered to its rebuilt level. Thus, a rebuilding plan for this species was not adopted by these amendments.

addition to the range of measures, this FMP specifies the procedures the Council and NMFS must follow to establish and modify these measures. When first implemented, the FMP specified a relatively narrow range of measures, which were difficult to modify in response to changes in the fishery. The current framework allows the Council to effectively respond when faced with the dynamic challenges posed by the current groundfish fishery.

Amendment 19, also approved in [2006], revises the definition of groundfish EFH, identified habitat areas of particular concern, and describes management measures intended to mitigate the adverse effects of fishing on EFH. This amendment supplants the definition of EFH added to the FMP by Amendment 11.

1.2 How This Document is Organized

The groundfish FMP is organized into 11 chapters

Chapter 1 (this chapter) describes the development of the FMP and how it is organized.

Chapter 2 describes the goals and objectives of the plan and defines key terms and concepts.

Chapter 3 specifies the geographic area covered by this plan and lists the species managed by it, referred to as the fishery management unit, or fishery management unit.

Chapter 4 describes how the Council determines harvest levels. These harvest limits are related to the maximum sustainable yield (MSY) and allowable biological catch (ABC) for FMU species. Precautionary reductions from these thresholds may be applied, depending on the management status of a given stock. If, according to these thresholds, a stock is determined to be overfished, the Council must recommend measures to end overfishing and develop a rebuilding plan, as specified in this chapter. Based on the thresholds, criteria, and procedures described in this chapter, the Council specifies an optimum yield (OY), or harvest limit, for managed stocks or stock complexes.

Chapter 5 describes how the Council periodically specifies harvest levels and the management measures needed to prevent catches from exceeding those levels. Currently, the Council develops these specifications over the course of three meetings preceding the start of a two-year management period. (Separate OYs are specified for each of the two years in this period.) This chapter also describes how the stock assessment/fishery evaluation (SAFE) document, which provides information important to management, is developed.

Chapter 6 describes the management measures used by the Council to meet the objectives of the MSA and this FMP. As noted above, this FMP is a framework plan; therefore, the range of management measures is described in general terms while the processes necessary to establish or modify different types of management measures are detailed. Included in the description of management measures is the Council's program for monitoring total catch (which includes bycatch) and minimizing bycatch.

Chapter 7 identifies EFH for groundfish FMU species and the types of measures that may be used to mitigate adverse impacts to EFH from fishing.

Chapter 8 describes procedures followed by the Council to evaluate and recommend issuing exempted fishing permits (EFPs). Permitted vessels are authorized, for limited experimental purposes, to harvest groundfish by means or in amounts that would otherwise be prohibited by this FMP and its implementing regulations.

These permits allow experimentation in support of FMP goals and objectives. EFPs have been used, for example, to test gear types that result in less bycatch.

Chapter 9 provides criteria for determining what activities involving groundfish would qualify as scientific research and could therefore qualify for special treatment under the management program.

Chapter 10 describes the procedures used to review state regulations in order to ensure that they are consistent with this FMP and its implementing regulations.

Chapter 11 describes the groundfish limited entry program.

Appendix A contains descriptions of the biological, economic, social, and regulatory characteristics of the groundfish fishery.

Appendix B contains detailed information on groundfish EFH.

Appendix C describes the effects of fishing on groundfish EFH.

Appendix D describes the effects of activities other than fishing on groundfish EFH.

The appendices contain supporting information for the management program. Because these appendices do not describe the management framework or Council groundfish management policies and procedures, and only supplement the required and discretionary provisions of the FMP described in §303 of the MSA, they may be periodically updated without being subjected to the Secretarial review and approval process described in §304(a) of the MSA. These appendices are published under separate cover.

2.0 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 (MSA).

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. Within the constraints of overfished species rebuilding requirements, 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. Achieve a level of harvest capacity in the fishery that is appropriate for a sustainable harvest and low discard rates, and which results in a fishery that is diverse, stable, and profitable. This reduced capacity should lead to more effective management for many other fishery problems. ***[Strategic Plan Capacity Reduction Goal, 2000]***

Objective 3. For species or species groups that are overfished, develop a plan to rebuild the stock as required by the MSA.

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, HG, or allocation of groundfish, if any, unless such action is required by other applicable law.

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.

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. Encourage development of practicable gear restrictions intended to reduce regulatory and/or economic discards through gear research regulated by EFP.

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~~.~~

Utilization.

Objective 10. Develop management measures and policies that foster and encourage full utilization (harvesting and processing) of the Pacific Coast groundfish resources by domestic fisheries.

Objective 11. Recognizing the multispecies nature of the fishery and establish a concept of managing by species and gear or by groups of interrelated species.

Objective 12. Develop management programs that reduce regulations-induced discard and/or which reduce economic incentives to discard fish. ~~Strive to reduce the economic incentives and regulatory measures that lead to wastage of fish.~~ 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. 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, 16-1]

2.2 Operational Definition of Terms

Acceptable Biological Catch (ABC) is a biologically based estimate of the amount of fish that may be harvested from the fishery each year without jeopardizing the resource. It is a seasonally determined catch that may differ from MSY for biological reasons. It may be lower or higher than MSY in some years for species with fluctuating recruitment. The ABC may be modified to incorporate biological safety factors and risk assessment due to uncertainty. Lacking other biological justification, the ABC is defined as the MSY exploitation rate multiplied by the exploitable biomass for the relevant time period.

Biennial fishing period is defined as a 24-month period beginning January 1 and ending December 31.

Bottom (or flatfish bottom) trawl is a trawl in which the otter boards or the footrope of the net are in contact with the seabed. It includes roller (or bobbin) trawls, Danish and Scottish seine gear, and pair trawls fished on the bottom. ***[From 11.2.1.1.2]***

Bottom-contact gear types by design and through normal use make contact with the sea floor. Such contact is more than intermittent in duration and areal extent.

Bycatch means fish which are harvested in a fishery, but which are not sold or kept for personal use and includes economic discards and regulatory discards. Such term does not include fish released alive under a recreational catch and release fishery management program.

Chafing gear is webbing or other material attached to the codend of a trawl net to protect the codend from wear. ***[From 11.2.1.1.5]***

Charter fishing means fishing from a vessel carrying a passenger for hire (as defined in section 2101(21a) of title 46, United States Code) who is engaged in recreational fishing.

Closure, when referring to closure of a fishery, means that taking and retaining, possessing or landing the particular species or species complex is prohibited.

Council means the Pacific Fishery Management Council, including its Groundfish Management Team (GMT), Scientific and Statistical Committee (SSC), Groundfish Advisory Subpanel (GAP), and any other committee established by the Council.

Commercial fishing is (1) fishing by a person who possesses a commercial fishing license or is required by law to possess such license issued by one of the states or the Federal government as a prerequisite to taking, landing, and/or sale; or (2) fishing which results in or can be reasonably expected to result in sale, barter, trade, or other disposition of fish for other than personal consumption.

Density dependence is the degree to which recruitment declines as spawning biomass declines. Typically we assume that a Beverton-Holt form is appropriate and that the level of density-dependence is such that the recruitment only declines by ten percent when the spawning biomass declines by 50%.

~~Domestic annual harvest (DAH) is the estimated total harvest of groundfish by U.S. fishermen. It includes the portion expected to be utilized by domestic processors and the estimated portion, if any, that will be delivered to those foreign processors joint venture processing (JVP) that are permitted to receive U.S. harvested groundfish in the exclusive economic zone (EEZ).~~

~~Domestic annual processing (DAP) is the estimated annual amount of U.S. harvest that domestic processors are expected to process and the amount of fish that will be harvested, but not processed (e.g., marketed as fresh whole fish used for private consumption or used for bait).~~

Double-walled codend is a codend constructed of two walls of webbing. ***[From 11.2.1.1.6]***

$F_{x\%}$ is the rate of fishing mortality that will reduce female spawning biomass per recruit to x percent of its unfished level.

Economic discards means fish which are the target of a fishery, but which are not retained because they are of an undesirable size, sex, quality, or for other economic reasons.

Essential fish habitat (EFH) means those waters and substrate necessary to fish for spawning, breeding, feeding, or growth to maturity.

Exploitable biomass is the biomass that is available to a unit of fishing effort. Defined as the sum of the population biomass at age (calculated as the mean within the fishing year) multiplied by the age-specific availability to the fishery. Exploitable biomass is equivalent to the catch biomass divided by the instantaneous fishing mortality rate.

F is the instantaneous rate of fishing mortality. F typically varies with age, so the F values are presented for the age with maximum F. Fish of other ages have less availability to the fishery, so a unit of effort applies a lower relative level of fishing mortality to these fish.

$F_{0.1}$ is the fishing mortality rate at which a change in fishing mortality rate will produce a change in yield per recruit that is ten percent of the slope of the yield curve at nil levels of fishing mortality.

F_{MSY} is the fishing mortality rate that maximizes catch biomass in the long term.

F_{OF} is the rate of fishing mortality defined as overfishing.

Fishing means (1) the catching, taking, or harvesting of fish; (2) the attempted catching, taking, or harvesting of fish; (3) any other activity which can reasonably be expected to result in the catching, taking, or harvesting of fish; or (4) any operations at sea in support of, or in preparation for, any activity described above. This term does not include any activity by a vessel conducting authorized scientific research.

Fishing year is defined as January 1 through December 31.

Fishing community means a community which is substantially dependent on or substantially engaged in the harvest or processing of fishery resources to meet social and economy needs and includes fishing vessel owners, operators, crew, and recreational fishers and United States fish processors that are based in such community.

Fixed gear (anchored nontrawl gear) includes longline, trap or pot, set net, and stationary hook-and-line gear (including commercial vertical hook-and-line) gears. ***[From 11.2.1.2]***

Gillnet is a single-walled, rectangular net which is set upright in the water. ***[From 11.2.1.3.5]***

Harvest guideline (HG) is an specified numerical harvest objective which is not a quota. Attainment of a HG does not require closure of a fishery.

Hook-and-line means one or more hooks attached to one or more lines. Commercial hook-and-line fisheries may be mobile (troll) or stationary (anchored). ***[From 11.2.1.3.2]***

Incidental catch or incidental species means groundfish species caught when fishing for the primary purpose of catching a different species.

Individual fishing quota (IFQ) means 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.

~~Joint venture processing (JVP) is the estimated portion of DAH that exceeds the capacity and intent of U.S. processors to utilize, or for which domestic markets are not available, that is expected to be harvested by U.S. fishermen and delivered to foreign processors in the EEZ. (JVP = DAH - DAP.)~~

Longline is a stationary, buoyed, and anchored groundline with hooks attached, so as to fish along the seabed. ***[From 11.2.1.3.3]***

Maximum sustainable yield (MSY) is an estimate of the largest average annual catch or yield that can be taken over a significant period of time from each stock under prevailing ecological and environmental conditions. It may be presented as a range of values. One MSY may be specified for a group of species in a mixed-species fishery. 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.

Midwater (pelagic or off-bottom) trawl is a trawl in which the otter boards may occasionally contact the seabed, but the footrope of the net remains above the seabed. It includes pair trawls if fished in midwater. A midwater trawl has no rollers or bobbins on the net. ***[From 11.2.1.1.4]***

MSY stock size means the largest long-term average size of the stock or stock complex, measured in terms of spawning biomass or other appropriate units that would be achieved under an MSY control rule in which the fishing mortality rate is constant. The proxy typically used in this fishery management plan is 40% of the estimated unfished biomass, although other values based on the best scientific information are also authorized.

Nontrawl gear means all legal commercial gear other than trawl gear. ***[From 11.2.1.3]***

Optimum yield (OY) 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.

Overfished describes 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 means 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 (F_{MSY}).

Processing or to process means the preparation or packaging of groundfish to render it suitable for human consumption, retail sale, industrial uses, or long-term storage, including, but not limited to, cooking, canning, smoking, salting, drying, filleting, freezing, or rendering into meal or oil, but does not mean heading and gutting unless additional preparation is done.

Processor means a person, vessel, or facility that (1) engages in processing, or (2) receives live groundfish directly from a fishing vessel for sale without further processing.

Prohibited species are those species and species groups which must be returned to the sea as soon as is practicable with a minimum of injury when caught and brought aboard except when their retention is authorized by other applicable law. Exception may be made in the implementing regulations for tagged fish, which must be returned to the tagging agency, or for examination by an authorized observer.

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.

Recreational fishing means fishing for sport or pleasure, but not for sale.

Regulatory discards are fish harvested in a fishery which fishermen are required by regulation to discard whenever caught or are required by regulation to retain, but not sell.

~~Reserve is a portion of the HG or quota set aside at the beginning of the year to allow for uncertainties in preseason estimates of DAP and JVP.~~

Roller (or bobbin) trawl is a bottom trawl that has footropes equipped with rollers or bobbins made of wood, steel, rubber, plastic, or other hard material which keep the footrope above the seabed, thereby protecting the net. ***[From 11.2.1.1.3]***

Set net is a stationary, buoyed, and anchored gillnet or trammel net. ***[From 11.2.1.3.4]***

Stock Assessment and Fishery Evaluation (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, and the fish processing industry. It summarizes, on a periodic basis, the best available information concerning the past, present, and possible future condition of the stocks and fisheries managed by the FMP.

Target fishing means fishing for the primary purpose of catching a particular species or species group (the target species).

~~Total allowable level of foreign fishing (TALFF) is the amount of fish surplus to domestic needs and available for foreign harvest. It is a quota determined by deducting the DAH and reserve, if any, from a species HG or quota.~~

A total catch limit is a portion of the OY for a groundfish FMU species, stock, or stock complex assigned to a defined fishery sector or to an individual vessel. Total catch is defined as landed catch plus bycatch (discard) mortality. The Council may specify total catch limits that are transferable or nontransferable among sectors or tradable or nontradable between vessels.

Trammel net is a gillnet made with two or more walls joined to a common float line. ***[From 11.2.1.3.6]***

Trap (or pot) is a portable, enclosed device with one or more gates or entrances and one or more lines attached to surface floats. ***[11.2.1.3.7]***

Spawning biomass is the biomass of mature female fish at the beginning of the year. If the production of eggs is not proportional to body weight, then this definition should be modified to be proportional to expected egg production.

Spawning biomass per recruit is the expected egg production of a female fish over its lifetime. Alternatively, this is the mature female biomass of an equilibrium stock divided by the mean level of recruitment that produced this stock.

Spear is a sharp, pointed, or barbed instrument on a shaft. Spears may be propelled by hand or by mechanical means. ***[From11.2.2.2]***

Vertical hook-and-line gear (commercial) is hook-and-line gear that involves a single line anchored at the bottom and buoyed at the surface so as to fish vertically. ***[From 11.2.1.3.1]***

3.0 AREAS AND STOCKS INVOLVED

No changes in this chapter.

4.0 PREVENTING OVERFISHING AND ACHIEVING OPTIMUM YIELD

No Changes in this chapter.

5.0 PERIODIC SPECIFICATION AND APPORTIONMENT OF HARVEST LEVELS

The ability to establish and adjust harvest levels is the first major tool at the Council's disposal to exercise its resource stewardship responsibilities. Each biennial fishing period, the Council will assess the biological, social, and economic condition of the Pacific Coast groundfish fishery and update MSY estimates or proxies for specific stocks (management units) where new information on the population dynamics is available. The Council will make this information available to the public in the form of the *Stock Assessment and Fishery Evaluation (SAFE)* document described in Section 5.1. Based upon the best scientific information available, the Council will evaluate the current level of fishing relative to the MSY level for stocks where sufficient data are available. Estimates of the ABC for major stocks will be developed, and the Council will identify those species or species groups which it proposes to be managed by the establishment of numerical harvest levels (OYs, HGs, or quotas). For those stocks judged to be below their overfished/rebuilding threshold, the Council will develop a stock rebuilding management strategy.

The process for specification of numerical harvest levels includes the estimation of ABC, the establishment of OYs for various stocks, and the calculation of specified allocations between harvest sectors, ~~and the apportionment of numerical specifications to domestic annual processing (DAP), joint venture processing (JVP), total allowable level of foreign fishing (TALFF), and the reserve~~. The specification of numerical harvest levels described in this chapter is the process of designating and adjusting overall numerical limits for a stock either throughout the entire fishery management area or throughout specified subareas. The process normally occurs biennially between November and June, but can occur under specified circumstances, at other times of the fishing year. The Council will identify those OYs which should be designated for allocation between limited entry and open access sectors of the commercial industry. Other numerical limits which allocate the resource or which apply to one segment of the fishery and not another ~~are~~ would be imposed through one of the management measures processes at either 6.2 C or D in Chapter 6. ~~the socioeconomic framework process described in Chapter 6 rather than the specification process~~.

…

5.5 Inseason Procedures for Establishing or Adjusting Specifications

5.5.1 Inseason Adjustments to ABCs

Under the biennial specifications and management measures process, stock assessments for most species will become available every other year, prior to the November Council meeting that begins the three-meeting process for setting specifications and management measures. The November Council meeting that begins that three-meeting process will be the November of the first fishing year in a biennial fishing period. If the Council determines that any of the ABCs or OYs set in the prior management process are not adequately conservative to meet rebuilding plan goals for an overfished species, harvest specifications for that overfished species and/or for co-occurring species may be revised for the second fishing year of the then current biennial management period.

Beyond this process, ABCs, OYs, HGs, and quotas may only be modified in cases where a harvest specification announced at the beginning of the fishing period is found to have resulted from incorrect data or from computational errors. If the Council finds that such an error has occurred, it may recommend the Secretary publish a notice in the *Federal Register* revising the incorrect harvest specification at the earliest possible date.

5.5.2 Inseason Establishment and Adjustment of OYs, HGs, and Quotas

OYs and HGs may be established and adjusted inseason (1) for resource conservation through the points of concern framework described in Chapter 6; (2) in response to a technical correction to ABC described above; or, (3) under the socioeconomic framework described in Chapter 6.

Quotas may be established and adjusted inseason only for resource conservation or in response to a technical correction to ABC. These constraints on establishing and adjusting OYs, HGs, and quotas do not apply to the process for establishing and adjusting sector-specific catch limits, which is provided in section 6.5.3.2.

6.0 MANAGEMENT MEASURES

6.1 Introduction

[6.0 Management Measures]

The FMP, as amended, establishes the fishery management program, the process, and procedures the Council will follow in making adjustments to that program. It also sets the limits of management authority of the Council and the Secretary when acting under the FMP. The preceding two chapters describe the procedures for determining appropriate harvest levels and establishing them on a periodic basis. This chapter describes the procedures and methods that may be use to directly control fishing activities so that total catch of a given species or species group does not exceed specified harvest limits. It is organized around five major themes:

- Section 6.2 describes the procedures for establishing and adjusting management measures, including two decision-making frameworks the Council (in conjunction with its advisory bodies) uses to decide whether management measures need adjustment. These framework procedures allow management decisions, as long as they are consistent with the provisions of this FMP (including the frameworks), to be implemented via Federal regulation without first amending the FMP. This section also describes the procedures for promulgating the regulations needed to implement the management measures authorized by this FMP.

- Section 6.3 describes the criteria the Council will consider when establishing management measures intended to directly allocate harvest opportunity.

- Sections 6.4 and 6.5 describe methods to account for all sources of fishing mortality and to reduce bycatch, and especially bycatch mortality. Bycatch is defined in the MSA as “fish which are harvested in a fishery, but which are not sold or kept for personal use, and includes economic discards and regulatory discards” (16 U.S.C. 1802(2)). Section 6.4 also describes those additional measures necessary to monitor catch and effort or to enforce regulations.

- Section 6.6 through 6.9 inventory the range of management measures available to the Council, as authorized by this FMP. Not all of these management measures will be implemented at any given time.

- Section 6.10 describes those requirements that support the enforcement of management measures.

[6.5.2 Domestic—Commercial]

These procedures, measures, and requirements must be consistent with the goals and objectives of the FMP, the MSA, and other applicable law. All measures, unless otherwise specified, apply to all domestic vessels regardless of whether catch is landed and processed on shore or processed at sea. The procedures by which the Council develops recommendations on revising management measures, and by which NMFS implements those recommendations, are found in Section 6.2.

6.1.1 Overview of Management Measures For West Coast Groundfish Fisheries

[6.1 General List of Management Measures]

In the early stages of fishery development, there is generally little concern with management strategies. As fishing effort increases, management measures become necessary to prevent overfishing and the resulting adverse social and economic impacts. Although recruitment, growth, natural mortality, and fishing mortality affect the size of fish populations, fishery managers only have control over one of these factors—fishing mortality. The principal measures available to the Council to control fishing mortality of the groundfish fisheries in the Washington, Oregon, and California region are:

- Measures to reduce bycatch and bycatch mortality – described in 6.5.
- Defining authorized fishing gear and regulating the configuration and deployment of fishing gear, including mesh size in nets and escape panels or ports in traps—described in Section 6.6.
- Restricting catches by defining prohibited species and establishing landing, trip frequency, bag, and size limits—described in Section 6.7.
- Establishing fishing seasons and closed areas—described in Section 6.8
- Limiting fishing capacity or effort through permits, licenses and endorsements, and quotas, or by means of input controls on fishing gear, such as restrictions on trawl size/shape or longline length or number of hooks or pots—described in Section 6.9. Fishing capacity may be further limited through programs that reduce participation in the fishery by retiring permits and/or vessels.

Although this chapter only discusses in detail the types of management measures outlined above, the Council may recommend and NMFS may implement other useful management measures through the appropriate rulemaking process, as long as they are consistent with the criteria and general procedures contained in this FMP.

6.2 General Procedures for Establishing and Adjusting Management Measures

[6.2 General Procedures for Establishing and Adjusting Management Measures]

This FMP establishes three ~~two~~ framework procedures through which the Council is able to recommend the establishment and adjustment of specific management measures for the Pacific Coast groundfish fishery. The *points of concern framework* allows the Council to develop management measures that respond to resource conservation issues; the *socioeconomic framework* allows the Council to develop management measures in response to social, economic, and ecological issues that affect fishing communities. The *habitat conservation framework* allows the Council to modify the number, extent, and location of areas closed to bottom trawling in order to protect EFH. Criteria associated with each framework form the basis for Council recommendations, and Council recommendations will be consistent with them. The process for developing and implementing management measures normally will occur over the span of at least two Council meetings, with an exception that provides for more timely Council consideration under certain specific conditions.

The time required to take action under ~~either~~ any framework will vary depending on the nature of the action, its impacts on the fishing industry, resource, and environment, and review of these impacts by interested parties. This depends on the range of biological, social, and economic impacts that may need to be considered at the time a particular change in regulations is proposed. Furthermore, other applicable law (e.g., the National Environmental Policy Act, Administrative Procedures Act, Regulatory Flexibility Act, relevant Executive Orders, etc.) may require additional analysis and public comment before measures may be implemented by the Secretary.

The Secretary will develop management measures recommended by the Council for review and public comment as publications in the *Federal Register*, either as notices or regulations. Generally, management measures of broad applicability and permanent effectiveness should be published as regulations. More narrowly applicable measures, which may only apply for short duration (one biennium or less) and may also require frequent adjustment, should be published as notices.

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. Management measures may be imposed for habitat protection, resource conservation, or social or economic reasons consistent with the criteria, procedures, goals, and objectives set forth in the FMP.

The NMFS Regional Administrator will review the Council's recommendation, supporting rationale, public comments, and other relevant information and determine whether to approve, disapprove, or partially approve the Council's recommendation. If the recommendation is approved, NMFS will implement the recommendation through regulation or notice, as appropriate. NMFS will explain any disapproval or partial disapproval of the recommendation to the Council in writing.

The procedures specified in this chapter do not affect the authority of the Secretary to take emergency regulatory action as provided for in Section 305(c) of the MSA if an emergency exists involving any groundfish resource, or to take such other regulatory action as may be necessary to discharge the Secretary's responsibilities under Section 305(d) of the MSA.

Four different categories of management actions are authorized by this FMP, each of which requires a slightly different process. Management measures may be established, adjusted, or removed using any of the four procedures. The four basic categories of management actions are described below

A. Automatic Actions

The NMFS Regional Administrator may initiate automatic management actions without prior public notice, opportunity to comment, or a Council meeting. These actions are nondiscretionary, and the impacts must be reasonably accountable, based on previous application of the action or past analysis. Examples include fishery, season, or gear type closures when a quota has been projected to have been attained. The Secretary will publish a single notice in the *Federal Register* making the action effective.

B. Notice Actions Requiring at Least One Council Meeting and One *Federal Register* Notice

These include all management actions other than automatic actions, which are either nondiscretionary or for which the scope of probable impacts has been previously analyzed.

These actions are intended to have temporary effect, and the expectation is that they will need frequent adjustment. They may be recommended at a single Council meeting, although the Council will provide as much advance information to the public as possible concerning the issues it will be considering at its decision meeting. The primary examples are those inseason management actions defined as routine according to the criteria in Section 6.2.1. These include, but are not limited to, trip landing and frequency limits and size limits for all commercial gear types and closed seasons for any groundfish species in cases where protection of an overfished or depleted stock is required and bag limits, size limits, time/area closures, boat limits, hook limits, and dressing requirements for all recreational fisheries. Previous analysis must have been specific as to species and gear type before a management measure can be defined as routine and acted on at a single Council meeting. If the recommendations are approved, the Secretary ~~will~~ may waive for good cause the requirement for prior notice and comment in the *Federal Register* and will publish a single notice in the *Federal Register* making the action effective. This category of actions presumes the Secretary will find that the need for swift implementation and the extensive notice and opportunity for comment on these types of measures, along with the Council already having analyzed the scope of their impacts, will serve as good cause to waive the need for additional prior notice and comment in the *Federal Register*.

C. Management Measures Rulemaking For Actions Developed Through the Three-Council-Meeting Biennial Specifications Process and Two *Federal Register* Rules

These include (1) management action developed through the biennial specifications process; (2) management measures being classified as routine; or (3) trip limits that vary by gear type, closed seasons or areas, and in the recreational fishery, bag limits, size limits, time/area closures, boat limits, hook limits, and dressing requirements the first time these measures are used. Examples include: changes to or imposition of gear regulations; imposition of landings limits, frequency limits, or limits that differ by gear type; closed areas or seasons used for the first time on any species or species group or gear type. The Council will develop and analyze the proposed management actions over the span of at least two Council meetings (usually April and June) and provide the public advance notice and opportunity to comment on both the proposals and the analysis prior to and at the second Council meeting. If a management measure is designated as routine under this procedure, specific adjustments of that measure can subsequently be announced in the *Federal Register* by notice as described in the previous paragraphs. The Secretary will publish a proposed rule in the *Federal Register* with an appropriate period for public comment followed by publication of a final rule in the *Federal Register*.

The three-Council-meeting process refers to two decision meetings. The Council will develop proposed harvest specifications during the first meeting (usually November). They will finish drafting harvest specifications and develop the management measures during the second meeting (usually April). Finally, at the third meeting, the Council will make final recommendations to the Secretary on the complete harvest specifications and management measures biennial management package (usually June). For the Council to have adequate information to identify proposed management measures for public comment at the first management measures meeting, the identification of issues and the development of proposals normally must begin at a prior Council meeting.

D. Full Rulemaking For Actions Normally Requiring at Least Two Council Meetings and Two *Federal Register* Rules (Regulatory Amendment)

These include any proposed management measure that is highly controversial or any measure that directly allocates the resource. These also include management measures that are intended to have permanent effect and are discretionary, and for which the impacts have not been previously analyzed. Full rulemakings will normally use a two-Council-meeting process, although additional meetings may be required to fully develop the Council's recommendations on a full rulemaking issue. Regulatory measures to implement an FMP amendment will be developed through the full rulemaking process. The Secretary will publish a proposed rule in the *Federal Register* with an appropriate period for public comment followed by publication of a final rule in the *Federal Register*.

Council-recommended management measures addressing a resource conservation issue must be based upon the identification of a point of concern through that decision-making framework, consistent with the specific procedures and criteria listed in Section 6.2.2.

Council-recommended management measures addressing social or economic issues must be consistent with the specific procedures and criteria described in Section 6.2.3.

Council-recommended changes to habitat protection measures must be consistent with the specific procedures and criteria described in Section 6.2.4.

6.2.1 Routine Management Measures

Routine management measures are those that the Council determines are likely to be adjusted on an annual or more frequent basis. The Council will classify measures as routine through either the specifications and management measures or rulemaking processes (C. or D. above). In order for a measure to be classified as routine, the Council will determine that the measure is appropriate to address the issue at hand and may require further adjustment to achieve its purpose with accuracy.

As in the case for all proposed management measures, prior to initial implementation as routine measures, the Council will analyze the need for the measures, their impacts, and the rationale for their use. Once a management measure has been classified as routine through one of the two rulemaking procedures outlined above, it may be modified thereafter through the single meeting notice procedure (B. above) only if (1) the modification is proposed for the same purpose as the original measure, and (2) the impacts of the modification are within the scope of the impacts analyzed when the measure was originally classified as routine. The analysis of impacts need not be repeated when the measure is subsequently modified if the Council determines that they do not differ substantially from those contained in the original analysis. The Council may also recommend removing a routine classification.

Experience gained from management of the Pacific Coast groundfish fishery indicates that certain measures usually require modification on a frequent basis to ensure that they meet their stated purpose with accuracy. For commercial fisheries, these measures are trip landing limits and trip frequency limits, including cumulative limits, and notification requirements. They have been applied to the commercial fishery either to stretch the duration of the fishery, so as not to disturb traditional fishing and marketing patterns; to reduce discards and waste; or to discourage targeted fishing while allowing small incidental catches when attainment of a HG or quota is imminent. In cases where protection of an overfished or depleted stock is required, the Council may impose limits that differ by gear type, or establish closed areas or seasons. These latter two measures were not historically imposed through the annual management cycle (now biennial) because of their allocative implications. However, this additional flexibility has become necessary to allow the harvest of healthy stocks as much as possible while protecting and rebuilding overfished and depleted stocks, and equitably distributing the burdens of rebuilding among sectors. The first time a differential trip limit or closed season is to be imposed in a fishery, it must be imposed during the biennial management cycle (with the required analysis and opportunity for public comment) and subsequently may be modified inseason through the routine adjustment process.

For recreational fisheries, bag limits, size limits, time/area closures, boat limits, hook limits, and dressing requirements may be applied to particular species, species groups, sizes of fish and gear types. For the recreational fishery, bag and size limits have been imposed to spread the available catch over a large number of anglers, in order to avoid waste, and to provide consistency with state regulations.

Routine management measures are also often necessary to meet the varied and interwoven mandates of the MSA and FMP. These mandates include: preventing overfishing and rebuilding overfished species in a manner consistent with rebuilding plans, reducing bycatch, allowing the harvest of healthy stocks as much as possible while protecting and rebuilding overfished and depleted stocks, and equitably distributing the burdens of rebuilding among the sectors.

Any measure designated as routine for a particular species, species group, or gear type may not be treated as routine for a different species, species group, or gear type without first having been classified as routine. Each year, the SAFE document will list all measures that have been designated as routine.

The Council will conduct a continuing review of landings of those species for which HGs, quotas, OYs, or specific routine management measures have been implemented and will make projections of the landings at various times throughout the year. If in the course of this review it becomes apparent that the rate of landings is substantially different than anticipated, and that the current routine management measures will not achieve harvest management objectives, the Council may recommend inseason adjustments to those measures. Such adjustments may be implemented through the single-meeting notice procedure (B. above).

Routine Management Measures as of January 1, 2005:

<u>Commercial limited entry and open access fisheries:</u>

> Trip landing and frequency limits, size limits, for all gear types may be imposed: to extend the fishing season; to minimize disruption of traditional fishing and marketing patterns; to reduce discards; to discourage target fishing while allowing small incidental catches to be landed; to protect overfished species; to allow small fisheries to operate outside the normal season; and, for the open access fishery only, to maintain landings at the historical proportions during the 1984-88 window period.

> Trip landing and frequency limits have been designated as routine for the following species or species groups: black rockfish, blue rockfish, bocaccio, canary rockfish, chilipepper rockfish, cowcod, darkblotched rockfish, Pacific ocean perch, shortbelly rockfish, splitnose rockfish, widow rockfish, yelloweye rockfish, yellowtail rockfish, minor nearshore rockfish or shallow and deeper minor nearshore rockfish, shelf or minor shelf rockfish, and minor slope rockfish; DTS complex, which is composed of Dover sole, sablefish, shortspine thornyheads, and longspine thornyheads, both as a complex and for the species within the complex; arrowtooth flounder, English sole, petrale sole, Pacific sanddabs, rex sole, and the flatfish complex, which is composed of those species plus any other FMP flatfish species; Pacific whiting; lingcod; cabezon; and "other fish" as a complex consisting of all groundfish species listed in the FMP and not otherwise listed as a distinct species or species group.

> Size limits have been designated as routine for sablefish and lingcod.

> Trip landing and frequency limits that differ by gear type and closed seasons may be imposed or adjusted on a biennial or more frequent basis for the purpose of rebuilding and protecting overfished or depleted stocks. To achieve the rebuilding of an overfished or depleted stock, a sector or sectors of the primary Pacific whiting may be closed if a total catch limit of an overfished species has been designated for the whiting fishery and that total catch limit is reached before the sector's whiting allocation is reached. Total catch limits in the primary Pacific whiting fishery may be established or adjusted as routine management measures.

<u>Recreational fisheries all gear types:</u>

> Routine management measures for all groundfish species, separately or in any combination, include: bag limits, size limits, time/area closures, boat limits, hook limits, and dressing requirements. All routine management measures on recreational fisheries are intended to keep landings within the harvest levels announced by NMFS, to rebuild and protect overfished or depleted species, and to maintain consistency with State regulations, and for the other purposes set forth in this section.

> <u>Bag limits</u> may be imposed to spread the available catch over a large number of anglers; to protect

and rebuild overfished species; to avoid waste.

Size limits may be imposed to protect juvenile fish; to protect and rebuild overfished species; to enhance the quality of the recreational fishing experience.

Season duration restrictions may be imposed to spread the available catch over a large number of anglers; to protect and rebuild overfished species; to avoid waste; to enhance the quality of the recreational fishing experience.

All fisheries, all gear types:

Depth-based management measures, particularly the setting of closed areas known as GCAs may be imposed on any sector of the groundfish fleet using specific boundary lines that approximate depth contours with latitude/longitude coordinates. Depth-based management measures and the setting of closed areas may be used to protect and rebuild overfished stocks.

The current list of routine management measures is published in Federal regulations at 50 CFR 660.370.

6.2.2 Resource Conservation Issues—The Points of Concern Framework

[6.2.2 Resource Conservation Issues—The Points of Concern Framework]

The points of concern process is the Council's second major tool (along with setting harvest levels) in exercising its resource stewardship responsibilities. The Council developed the points of concern criteria to assist it in determining when a focused review on a particular species or species group is warranted, which might result in the need to recommend the implementation of specific management measures to address the resource conservation issue. This process is intended to foster a continuous and vigilant review of the Pacific Coast groundfish stocks and fishery to prevent unintended overfishing or other resource damage. To facilitate this process, a Council-appointed management team (the GMT or other entity) will monitor the fishery throughout the year, taking into account any new information on the status of each species or species group. By this means they will identify resource conservation issues requiring a management response. The Council is authorized by this FMP to act based solely on evidence that one or more of these points of concern criteria has been met. This allows the Council to respond quickly and directly to a resource conservation issue. In conducting this review, the GMT or other entity will use the most current catch, effort, and other relevant data from the fishery.

In the course of the continuing review, a point of concern occurs when any one or more of the following ~~is found~~ situations occurs or is expected to occur:

1. Catch for the calendar year is projected to exceed the best current estimate of ABC for those species for which an OY, HG or quota is not specified.
2. Catch for the calendar year is projected to exceed the current OY, HG or quota.
3. Any change in the biological characteristics of the species or species complex is discovered, such as changes in age composition, size composition, and age at maturity.
4. Exploitable biomass or spawning biomass is below a level expected to produce MSY for the species/species complex under consideration.
5. Recruitment is substantially below replacement level.
6. Estimated bycatch of a species or species group increases substantially above previous estimates, or there is information that abundance of a bycatch species has declined substantially.
7. Impacts of fishing gear on EFH are discovered and modification to gear or fishing regulations could reduce those impacts.

Once a point of concern is identified, the GMT will evaluate current data to determine if a resource conservation issue exists and will provide its findings in writing at the next scheduled Council meeting. If the GMT determines a resource conservation issue exists, it will provide its recommendation, rationale, and analysis for the appropriate management measures that will address the issue.

In developing its recommendation for management action, the Council will choose an action from one or more of the ~~following categories which include~~ categories listed below, although they may also identify other necessary measures. These categories cover the types of management measures most commonly used to address resource conservation issues:

- HGs
- Quotas
- Cessation of directed fishing ~~(foreign, domestic or both)~~ on the identified species or species group with appropriate allowances for incidental harvest of that species or species group
- Size limits
- Landing limits
- Trip frequency limits
- Area or subarea closures
- Time closures
- Seasons
- Gear limitations, which include, but are not limited to, definitions of legal gear, mesh size specifications, coded specifications, marking requirements, and other gear specifications as necessary.
- Observer or other monitoring coverage
- Reporting requirements
- Permits
- ~~Other necessary measures~~

~~Direct allocation of the resource between different segments of the fishery is, in most cases, not the preferred response to a resource conservation issue.~~ Council recommendations to directly allocate the resource will be developed according to the criteria and process described in Section 6.2.3, the socioeconomic framework.

After receiving the GMT's report and comments from its advisory bodies, the Council will take public testimony and, if appropriate, will recommend management measures to the NMFS Regional Administrator, accompanied by supporting rationale and analysis of impacts. The Council's analysis will include a description of (a) how the action will address the resource conservation issue, consistent with the objectives of the FMP; (b) likely impacts on other management measures, other fisheries, and bycatch; (c) economic impacts, particularly the cost to the commercial and recreational segments of the fishing industry; and (d) impacts on fishing communities.

The NMFS Regional Administrator will review the Council's recommendation and supporting information and will follow the appropriate implementation process described in Section 6.2, D depending on the amount of public notice and comment provided by the Council and the intended permanence of the management action. If the Council anticipates that the recommended measures will be adjusted frequently, it may classify them as routine through the appropriate process described in Section 6.2.1.

If the NMFS Regional Administrator does not concur with the Council's recommendation, the Council will be notified in writing of the reasons for the rejection.

Nothing in this section is meant to derogate from the authority of the Secretary to take emergency action under Section 305(c) of the MSA.

6.2.3 Non-biological Issues—The Socioeconomic Framework

From time to time, non-biological issues may arise that require the Council to recommend management actions to address certain social or economic issues in the fishery. Resource allocation, seasons, or landing limits based on market quality and timing, safety measures, and prevention of gear conflicts make up only a few examples of possible management issues with a social or economic basis. In general, there may be any number of situations where the Council determines that management measures are necessary to achieve the stated social and/or economic objectives of the FMP.

Either on its own initiative or by request, the Council may evaluate current information and issues to determine if social or economic factors warrant imposition of management measures to achieve the Council's established management objectives. Actions that are permitted under this framework include all of the categories of actions authorized under the points of concern framework with the addition of direct resource allocation.

If the Council concludes that a management action is necessary to address a social or economic issue, it will prepare a report containing the rationale in support of its conclusion. The report will include the proposed management measure, a description of other viable alternatives considered, and an analysis that addresses the following criteria: (a) how the action is expected to promote achievement of the goals and objectives of the FMP; (b) likely impacts on other management measures, other fisheries, and bycatch; (c) biological impacts; (d) economic impacts, particularly the cost to the fishing industry; (e) impacts on fishing communities; and (f) how the action is expected to accomplish at least one of the following, or any other measurable benefit to the fishery:

1. Enable a quota, HG, or allocation to be achieved.
2. Avoid exceeding a quota, HG, or allocation.
3. Extend domestic fishing and marketing opportunities as long as practicable during the fishing year, for those sectors for which the Council has established this policy.
4. Maintain stability in the fishery by continuing management measures for species that previously were managed under the points of concern mechanism.
5. Maintain or improve product volume and flow to the consumer.
6. Increase economic yield.
7. Improve product quality.
8. Reduce anticipated bycatch and bycatch mortality.
9. Reduce gear conflicts, or conflicts between competing user groups.
10. Develop fisheries for underutilized species with minimal impacts on existing domestic fisheries.
11. Increase sustainable landings.
12. ~~Increase~~ Reduce fishing ~~efficiency~~ capacity.
13. Maintain data collection and means for verification.
14. Maintain or improve the recreational fishery.

~~15. Any other measurable benefit to the fishery.~~

The Council, following review of the report, supporting data, public comment, and other relevant information, may recommend management measures to the NMFS Regional Administrator accompanied by relevant background data, information, and public comment. The recommendation will explain the urgency in implementing the measure(s), if any, and reasons therefore.

The NMFS Regional Administrator will review the Council's recommendation, supporting rationale, public comments, and other relevant information, and, if it is approved, will undertake the appropriate method of implementation. Rejection of the recommendation will be explained in writing.

The procedures specified in this chapter do not affect the authority of the Secretary to take emergency regulatory action as provided for in Section 305(c) of the MSA if an emergency exists involving any groundfish resource, or to take such other regulatory action as may be necessary to discharge the Secretary's responsibilities under Section 305(d) of the MSA.

If conditions warrant, the Council may designate a management measure developed and recommended to address social and economic issues as a routine management measure, provided that the criteria and procedures in Section 6.2.1 are followed.

Quotas, including allocations, implemented through this framework will be set for one-year periods and may be modified inseason only to reflect technical corrections to an ABC. (In contrast, quotas may be imposed at any time of year for resource conservation reasons under the points of concern mechanism.)

6.2.4 The Habitat Conservation Framework

In order to protect EFH from the adverse effects of fishing, the Council has identified areas that are closed to bottom trawling (see sections 6.8 and 7.4). These areas are described in Federal regulations and may be modified through the full rulemaking process as described under Section 6.2 D. The Council shall establish an EFH Oversight Committee (OC). At the request of the Council, the EFH OC would review the areas currently closed to bottom trawling and recommend to the Council the elimination of existing areas or the addition of new areas, or modification of the extent and location of existing areas. In making its recommendation to the Council, the committee should consider, but is not limited to considering, the best available scientific information about:

1. The importance of habitat types to any groundfish FMU species for their spawning, breeding, feeding, or growth to maturity.

2. The presence and location of important habitat (as defined immediately above).

3. The presence and location of habitat that is vulnerable to the effects of bottom trawl fishing.

4. The presence and location of unique, rare, or threatened habitat.

5. The socioeconomic and management-related effects of closures, including changes in the location and intensity of bottom trawl fishing effort, the displacement or loss of revenue from fishing, and social and economic effects to fishing communities attributable to the location and extent of closed areas.

When making their recommendation to the Council, the committee may also include in their recommendations proposed changes in the designation of habitat areas of particular concern (HAPC) consistent with the proposed modification of the location and extent of areas closed to bottom trawling. For example, if a current closed area, which is also identified as an HAPC, is recommended for elimination, the committee may recommend whether or not to retain the HAPC designation. Any such recommendation with respect to an HAPC would trigger the process for the modification of HAPC (by FMP amendment) described in Section 7.3.2. Upon receipt of a recommendation from the committee, the Council will decide whether to begin the rulemaking process described in Section 6.2 D for establishing, adjusting, or removing discretionary management measures intended to have a permanent effect.

6.2.5 Indian Treaty Rights

[FMP Appendix (11.7.6) Indian Treaty Rights]

Treaties with a number of Pacific Northwest Indian tribes reserve to those tribes the right of taking fish at their usual and accustomed fishing grounds and stations (U AND A) in common with other citizens of the United States. NMFS has determined that the tribes that have U AND A in the area managed by this FMP are the Makah, Hoh, and Quileute Tribes, and the Quinault Indian Nation. Several tribal fisheries exist for species covered by the FMP. The Federal government has accommodated these fisheries through a regulatory process, found at 50 CFR 660.324. Until such time as tribal treaty rights are finally adjudicated or the regulatory process is modified or repealed, the Council will continue to operate under that regulatory process to provide recommendations to the Secretary on levels of tribal groundfish harvest.

6.3 Allocation

[6.1.10 Allocation]

Allocation is the apportionment of an item for a specific purpose or to a particular person or group of persons. Allocation of fishery resources may result from any type of management measure, but is most commonly a numerical quota or HG for a specific gear or fishery sector. Most fishery management measures allocate fishery resources to some degree, because they invariably affect access to the resource by different fishery sectors by different amounts. These allocative impacts, if not the intentional purpose of the management measure, are considered to be indirect or unintentional allocations. Direct allocation occurs when numerical quotas, HGs, or other management measures are established with the specific intent of affecting a particular group's access to the fishery resource.

Fishery resources may be allocated to accomplish a single biological, social or economic objective, or a combination of such objectives. The entire resource, or a portion, may be allocated to a particular group, although the MSA requires that allocation among user groups be fair and equitable, reasonably calculated to promote conservation, and determined in such a way that no group, person, or entity receives an ~~undue~~ excessive share of the resource. The socioeconomic framework described in Section 6.2.3 provides criteria for direct allocation. Allocative impacts of all proposed management measures should be analyzed and discussed in the Council's decision-making process.

[6.2.3.1 Allocation]

In addition to the requirements described in Section 6.2.3, the Council will consider the following factors when intending to recommend direct allocation of the resource.

1. Present participation in and dependence on the fishery, including alternative fisheries.
2. Historical fishing practices in and historical dependence on the fishery.
3. The economics of the fishery.
4. Any consensus harvest sharing agreement or negotiated settlement between the affected participants in the fishery.
5. Potential biological yield of any species or species complex affected by the allocation.
6. Consistency with the MSA national standards.
7. Consistency with the goals and objectives of the FMP.

The modification of a direct allocation cannot be designated as routine unless the specific criteria for the modification have been established in the regulations.

6.4 Standardized Total Catch Reporting and Compliance Monitoring Program

Fishery managers participating in the Council process need accurate estimates of total fishing mortality. Total fishing mortality data are needed to both set accurate harvest specifications and management measures and to adjust management measures inseason so that OYs may be achieved, but not exceeded. Various state, Federal, and tribal catch monitoring systems are used in West Coast groundfish management. These are coordinated through the 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.

Total catch has two major components: fish that are retained, landed, and sold or kept for personal use and fish that are discarded, either at sea or on shore.[2] (For obvious economic reasons, most undesired fish are discarded at sea.) This discarded component is what the MSA defines as bycatch.[3] Total catch and total fishing mortality may differ because some bycatch may survive capture and subsequent discard, or release. Bycatch mortality varies depending on the physiology of a particular species, the type of fishing gear used, and how fish are handled from the time of capture until they are released back into the water.

Commercial and recreational groundfish fisheries have been managed through a variety of measures intended to limit catch to the level established by an OY. These include cumulative landing limits for commercial fisheries and bag limits for recreational fisheries (see Section 6.7). When these measures are less restrictive, few constraints are imposed on fisheries and fish are primarily discarded for economic reasons. (In recreational fisheries, an economic discard would be a personal assessment of the desirability of a particular fish or fish species). When one stock has a comparatively low landing or bag limit in a multispecies fishery, because it is depleted for example, fish may be discarded once the limit is reached in order to continue fishing for other species. Under these conditions bycatch can be a large portion of total catch and total fishing mortality. With a standardized reporting methodology, managers are better able to track bycatch both inseason and cumulatively, information that is essential to developing management programs to reduce bycatch and bycatch mortality. Therefore, maintaining a standardized reporting methodology to assess the amount and type of bycatch occurring in the fishery, in addition to being required by the MSA (16 U.S.C. 1853(a) (11)), is an important management task. This FMP meets that requirement through a standardized reporting methodology not just for the amount and type of bycatch occurring in the fishery, but for total catch (landed catch plus bycatch mortality) in the fishery.

In order to better monitor and manage bycatch, the Council supports accounting for total catch by specified fishery sectors. Beginning with the 2003 fishing year, as part of its evaluation of proposed management measures, the Council has been projecting total catches by fishery sector. Actual landings and estimated bycatch have also been categorized by fishery sector. Methods to accurately estimate sector- and species-specific total catch are needed to support the Council's bycatch mitigation program (Section 6.5). The Council relies on a combination of state, tribal, and Federal reporting and monitoring programs to determine total catch. NMFS is responsible for evaluating the adequacy of Federal standardized reporting methodologies for assessing the amount and type of bycatch occurring in a fishery. In 2004, NMFS published *Evaluating Bycatch: A National Approach to Standardized Bycatch Monitoring Programs,* which describes

2 The MSA further defines the term fish to mean "finfish, mollusks, crustaceans, and all other forms of marine animal and plant life other than marine mammals and birds" 16 U.S.C. 1802(12).

3 Using the term bycatch has led to considerable confusion, because many people use the term synonymously with the concept of incidental catch, or that part of the catch which is not the target of the fishery. In single species fisheries, incidental catch and discards may be largely coincident. But in multi-species fisheries there may be multiple targets, and species that might be considered incidental are commonly retained, depending on the market and regulatory environment. In this FMP, the MSA definition of bycatch is used, as distinct from incidentally-caught species.

Federal standardized bycatch reporting methodologies and evaluates the adequacies of these methodologies, including those used for the West Coast groundfish fisheries. Federal reporting requirements in this fishery are described below.

6.4.1 Total Catch Reporting Methodology

6.4.1.1 Monitoring Total Catch At Sea – Observer and Electronic Monitoring Programs

[6.5.1.2 Observers]

The MSA defines the term "observer" as "any person required or authorized to be carried on a vessel for conservation and management purposes by regulations or permits under this Act." The MSA also sets out guidelines for vessels carrying observers, observer training requirements, and observer status as Federal employees.

All fishing vessels operating in this management unit, which includes catcher/processors, at-sea processors, and those vessels that directly or incidentally harvest groundfish in ~~the~~ waters off Washington, Oregon, and California ~~area and land in another area,~~ may be required to accommodate an observer or ~~video~~ electronic-monitoring system for the purpose of collecting scientific data or verifying catch ~~landings~~ and discard used for scientific data collection. These vessels may also be required to accommodate an observer program or electronic monitoring system for the purpose of estimating total catch inseason to implement a sector- or vessel-specific total catch limit program. ~~An observer program will be considered only for circumstances where other data collection methods are deemed insufficient for management of the fishery.~~ Implementation of any observer program or electronic monitoring system will be in accordance with appropriate Federal procedures, including economic analysis and public comment. Any Federal program that requires the collection of information from fishery participants is also subject to the requirements of the Paperwork Reduction Act (PRA).

The Regional Administrator will implement an observer program through a Council-approved Federal regulatory framework. Details of how observer coverage will be distributed across the West Coast groundfish fleet will be described in an observer coverage plan that is appropriate to the purpose of the particular observer program goals. An observer coverage plan designed for a scientific data collection program will likely be different from an observer coverage plan designed for a sector- or vessel-specific total catch monitoring program. NMFS will publish an announcement of the authorization of the observer program and description of the observer coverage plan in the *Federal Register*. Development and implementation of an observer program is done through the full rulemaking process at Section 6.2, D.

Electronic monitoring is an automated alternative to some human data collection systems. Electronic monitoring equipment may provide accurate, timely, and verifiable information on some elements of fishing operations at a lower cost than that provided by an at-sea observer. Electronic monitoring is an integrated assortment of electronic components combined with a software operating system. An electronic monitoring system typically includes one or more video cameras, a CPU with removable hard drive, and software that can integrate data from other components of a vessel's electronic equipment. The system autonomously logs video and vessel sensor data during the fishing trip without human intervention. When the vessel has completed its fishing operations and returned to port, the video and other data are transferred to a separate computer system for analysis. Video records are typically reviewed by human samplers on shore, but electronic techniques are being too developed to automate some of this activity. Electronic monitoring has been tested in various Canadian fisheries and has successfully addressed specific fishery monitoring objectives. NOAA Fisheries began testing electronic monitoring equipment in the 2004 shore-based whiting fishery, in order to determine whether a full-retention program could be adequately monitored by an electronic monitoring system. This FMP authorizes the use of electronic monitoring programs for appropriate sectors of the fishery. Development and implementation of an electronic monitoring program would be done through the full rulemaking process at 6.2, D.

There may be a priority need for observers on at-sea processing vessels to collect data normally collected at shore-based processing plants. Certain information for management of the fishery may be obtained from logbooks and other reporting requirements, but the collection of some types of data would be too onerous for some fishermen to collect. Processing vessels must be willing to accommodate onboard observers and may be required to provide ~~the required~~ observers prior to issuance of any necessary Federal permits.

6.4.1.2 Commercial Fisheries

The total catch accounting methodology for commercial groundfish fisheries has two main components: monitoring landed catch through reports by fish processors (fish receiving tickets) and at-sea observer programs to estimate bycatch. Observer coverage rates vary by fishery, with at-sea processors (whiting catcher-processors and motherships) being required to carry one or two observers depending on vessel length. Fishery observers for the remainder of the commercial groundfish fleet are required to carry observers in accordance with the NMFS observer coverage plan. Because non-whiting fishery observers are usually placed aboard only a fraction of the vessels in a given sector, their observations must be expanded using statistical methods in order to estimate total catch across a sector. For some fishery sectors there may not be any direct observation or reporting of bycatch; in such cases standard bycatch rates, developed using the best scientific information, may be used to estimate bycatch. When combined with information on landed catch, this gives an estimate of total catch. The Council uses total catch information in inseason management to determine the relationship between catch at a given point and an annual OY. Management measures within a given year may be adjusted based on total catch information in order to prevent total catch from exceeding OY levels. Fishery managers also use historic total catch data in stock assessments and to develop future harvest specifications and management measures.

[Section 6.5.2.4 Reporting Requirements]

The owner or operator of any vessel that retains fish harvested in the area managed by this FMP whose port of landing is outside the management area may be required to report those catches in a timely manner through a Federal reporting program. They also may be required to submit a completed fish landing ticket from Washington, Oregon, or California, or an equivalent document containing all of the information required by the state on that fish ticket.

Monitoring Total and Landed Catch

Federal regulations require fishers to sort all species with trip limits, HGs, or OYs, including all overfished species. The states also require limited entry groundfish trawl fishermen to maintain logbooks to record the start and haul locations, 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. Catch weight 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, who collect species composition data, otoliths for ageing, lengths, and other biological data. A suspension of at-sea sorting requirements coupled with full retention of catch is allowed in the shoreside whiting fishery under an EFP. Amendment 10 to the FMP authorized this suspension of at-sea reporting requirements through a rulemaking, rather than just through an EFP.

Landings, logbook data, and state port sampling data are reported inseason to the PacFIN database, which is managed by the PSMFC. The GMT and PSMFC manage the Quota Species Monitoring (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. QSM reports also include bycatch (discard) estimates, allowing them to be used to track total catch. The GMT recommends prescribed landing limits and other inseason management measures to allow Council-managed fisheries 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.

Groundfish Observer Programs

Vessels participating in the at-sea Pacific whiting fishery have been carrying observers voluntarily since 1991. NMFS made observer coverage mandatory for at-sea processors in July 2004 (65 FR 31751). 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, an extensive amount of information on bycatch species in this fishery.

NMFS first implemented the West Coast Groundfish Observer Program (WCGOP) in August 2001, placing observers aboard commercial groundfish vessels to monitor discards. By regulation (50 CFR 660.360), all vessels that participate in commercial groundfish fisheries must 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 biological data, such as fish length, sex, and weight. The program currently deploys observers coastwide 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 monitor between 10% and 20% of the catch, as a proportion of total landings. Given the skewed distribution of bycatch in West Coast groundfish fisheries, many observations in each sampling strata (gear type and area) are needed to estimate representative bycatch rates.

The FMP does not currently authorize foreign fisheries for groundfish. According to the MSA, observers would be required on any foreign vessels operating in the Exclusive Economic Zone (EEZ).

6.4.1.3 Recreational Fisheries

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.

The Marine Recreational Fisheries Statistical Survey (MRFSS) was an integral part of the RecFIN program until recently, and was the principle program used to estimate effort and catches in the recreational fisheries. The MRFSS used field-intercept surveys to estimate catch and a random phone survey of coastal populations to estimate effort. The results of these two surveys were combined in the RecFIN database to estimate total fishing effort, fishing mortality, and other estimates useful for management. MRFSS was not designed to estimate catch and effort at the level of precision needed for inseason management or assessment. Thus, while MRFSS continues to be used as a nationwide statistical tool for assessing national recreational fisheries data, it is no longer relied upon to support inseason West Coast groundfish management. In recent years, the three states, NMFS, and PSMFC have been revamping the way that West Coast recreational fisheries data are collected and estimates are generated so that the data system better supports inseason management. Each state has either improved upon existing sampling projects, such as Washington’s Ocean Sampling Program, and Oregon’s Ocean Recreational Boat Survey and Shore and Estuary Boat Survey, or developed new sampling programs, such California's Recreational Fisheries Survey. Data collected by these state sponsored programs are submitted to RecFIN, and forms the basis for estimating catch and effort. All three states have accelerated their reporting rates to RecFIN. Beginning in 2005, the states plan to provide recreational fisheries data within one month of the fishing activity; for example, fisheries data through the end of January would be available at the end of February.

The Washington Department of Fish and Wildlife's Ocean Sampling Program (OSP) generates catch and effort estimates for the recreational boat-based groundfish fishery, which are provided to 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 (Neah Bay, La Push, Westport, and Ilwaco), 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.

The Oregon Department of Fish and Wildlife's (ODFW) Ocean Recreational Boat Survey (ORBS) is responsible for collecting both effort and catch data for the ocean boat portion of the recreational fishery in Oregon. Samplers are stationed in 12 major ports: Astoria, Garibaldi, Pacific City, Depoe Bay, Newport, Florence, Winchester Bay, Charleston, Bandon, Port Orford, Gold Beach, and Brookings. Samplers collect effort information by either conducting exit/entrance counts in the larger ports, or conducting trailer/slip counts in the smaller ports. Upon a vessel's return, samplers examine landed catch, collect released information, and collect biological data used to calculate the average size of landed fish by species. The ORBS submits effort and catch estimates to the PSMFC's RecFIN program. ODFW in cooperation with PSMFC has developed the Shore and Estuary Boat Survey (SEBS) in order to develop effort and catch estimates for the shore and estuary boat portions of Oregon's recreational fishery. Effort is determined using a license frame based phone survey. In addition, SEBS is responsible for collecting discard information from the Oregon ocean charter fleet. Samplers act as observers on charter vessels, enumerating releases by species, and taking lengths before fish are released. This information is used to calculate an average size of fish discarded in the recreational fishery.

The California Department of Fish and Game (CDFG), in cooperation with PSMFC, implemented the California Recreational Fisheries Survey (CRFS) in 2004. CRFS combines the prior MRFSS party and charter vessels (PC) sampling program, the high-quality sampling methodology (for private recreational vessels) used by California's, and several new methodologies specifically designed for CRFS into a single, coordinated, statewide program. This program is designed to produce more timely and accurate catch and effort estimates than were available through the MRFSS program while continuing to provide the comprehensive coverage used in the MRFSS program for all recreational fisheries in both boat (private boats, rental boats, and party/charter boats) and shore (pier, jetty, beach and bank) modes of fishing. CRFS employs the following methodologies for sampling these different modes of recreational fishing:

- Private and rental boats (PR) are divided into primary and secondary sampling sites. Primary sites are sampled using a public launch ramp access point survey for effort and catch at high use sites during daylight hours. These sites are defined as those where 90% or more of the catch of important species are landed. Secondary sites are sampled using a roving access point survey for effort and catch. These sites are defined as those sites in a particular month where less than 10% of the total catch of important species is landed.
- Man-made (MM) sites, composed of piers, jetties and breakwaters, are sampled using a roving access point survey for catch and effort.
- Beach and Bank (BB) sites are sampled using two surveys: a roving access point survey at publicly

accessible beaches and banks during daylight hours for catch rates and an angler license database (ALD) telephone survey for all effort.

- PC vessels are sampled using two surveys: a weekly telephone survey of all PC vessels for effort and on board sampling for catch.
- Estimates of private access and night fishing effort and catch for PR, MM, and BB by trip type are derived using the ALD telephone survey for effort and catch rates from access point surveys for catch.

For all modes of fishing, samplers examine landed catch, collect release information and fishing location, and collect biological data used to calculate the average size of landed fish by species. In addition, samplers act as observers on charter vessels, enumerating releases by species, and taking lengths before fish are released. The data, along with effort information for all modes, are entered by PSMFC into the RecFIN database. Estimates of catch and effort are then generated by PSMFC staff and posted on the RecFIN website. These estimates are greatly improved over those from MRFSS, not only because of the improvements in sampling methodologies, but because of changes in sampling rates, reporting intervals, geographical resolution, and expansion processes. CRFS, which employs a sampling rate in excess of three times that from MRFSS, provides monthly estimates for six geographical regions in California that are expanded from species catch rates based upon trip types and stated target species.

6.4.2 Vessel Compliance Monitoring and Reporting Requirements

In addition to authorizing Federal and state programs to collect total catch data, this FMP authorizes the collection of fisheries data needed for compliance monitoring. The following types of data may be collected through a regulatory program intended to ensure vessel compliance with fishery management measures:

[6.5.2.4 Reporting Requirements]

1. Vessel name.
2. Radio call sign.
3. Documentation number or Federal permit number.
4. Company representative and telephone, fax, and/or telex number.
5. Vessel location including daily positions.
6. Check-in and check-out reports giving the time, date, and location of the beginning or ending of any fishing activity.
7. Gear type.
8. Reporting area and period.
9. Duration of operation.
10. Estimated catch by species and area, species disposition (including discards, product type, and weights).
11. Product recovery ratios and products sold (in weight and value by species and product type, and if applicable, size or grade).
12. Any other information deemed necessary for management of the fishery.

Vessels also may be required to maintain and submit logbooks, accurately recording the following information in addition to the information listed above, and for a specified time period: daily and cumulative catch by species, effort, processing, and transfer information; crew size; time, position, duration, sea depth, and catch by species of each haul or set; gear information; identification of catcher vessel, if applicable; information on other parties receiving fish or fish products; and any other information deemed necessary.

Vessels may be required to inform a NMFS enforcement or U.S. Coast Guard office prior to landing or offloading any seafood product. Such vessels may also be required to report prior to departing the Washington, Oregon, and California management area with fish or fish products on board.

This FMP authorizes the use of vessel monitoring system (VMS) programs in order to improve compliance with area and/or season closures. 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. At the processing center, the information is validated and analyzed before being disseminated for fisheries management, surveillance, and enforcement purposes. VMS transceivers document the vessel's position using Global Positioning System (GPS) satellites. Depending on the defined need, position transmissions can be made on a predetermined schedule or upon request from the processing center. VMS transceivers are designed to be tamper resistant. The vessel operator is unable to alter the signal or the time of transmission and in most cases the vessel operator is unaware of exactly when the unit is transmitting the vessel's position. VMS programs used to improve compliance in several fisheries with differing area and/or season closures may require the use of a declaration system. A declaration system in association with VMS requires fishery participants declare their intended fishing activity, allowing enforcement personnel to differentiate between vessels subject to differing area and/or season closures.

New regulatory requirements for the collection of fishery-related data would need to be implemented through the full rulemaking process detailed at Section 6.2, D. Any Federal program that requires the collection of information from fishery participants is also subject to the requirements of the PRA.

6.5 Bycatch Mitigation Program

[6.3.3 Measures to Control Bycatch]

Unquantified bycatch increases management risk because harvest limits may be inadvertently exceeded. Regulatory-induced discards are inefficient because society does not benefit from fish with economic value that are discarded to meet regulatory requirements. Bycatch can also include protected species and organisms comprising ecologically important biogenic habitat. Thus, more generally, bycatch may have broader environmental effects. The MSA requires FMPs to include conservation and management measures that, to the extent practicable, minimize bycatch and the mortality of unavoidable bycatch (16 U.S.C. 1853(a)(11)). FMPs may also be subject to bycatch reduction requirements under the Endangered Species Act (ESA), the Marine Mammal Protection Act (MMPA), the Migratory Bird Treaty Act (MBTA), and other Federal laws. Federal guidance on assessing the practicability of a potential management program is found at 50 CFR 600.350.

Working with NMFS, the states, and the tribes, the Council uses a three-part strategy to meet the MSA's bycatch-related mandates: (1) gather data through a standardized total catch reporting methodology; (2) use Federal/state/tribal agency partners to assess these data through bycatch models that estimate when, where, and with which gear types bycatch of varying species occurs; and (3) develop management measures that minimize bycatch and bycatch mortality to the extent practicable. The FMP's total catch reporting methodology is described in Section 6.4.1. Bycatch models that assess observer and other data to estimate bycatch amounts occurring in the different sectors of the fishery are routinely reviewed through the Council's SSC and GMT as part of the Council's harvest specifications and management measures rulemaking process. These models are intended to continuously improve the Council's use of the best available scientific information on species-to-species catch ratios. This section describes the Council's bycatch mitigation program and the management measures intended to minimize bycatch and bycatch mortality.

6.5.1 Bycatch of Groundfish Species in Groundfish Fisheries

Groundfish bycatch in the groundfish fisheries includes both groundfish that are discarded for regulatory reasons, such as a vessel having achieved a trip limit for one species within an assemblage, and groundfish that are discarded for economic reasons, such as a vessel having taken more fish than can be stored in its hold, or having taken more of a particular species than is desired by a processor. The Council may initiate new and practicable management measures to reduce groundfish bycatch in the groundfish fisheries under either the harvest specifications and management measures rulemaking process (6.2, C.) or full rulemaking process (Section 6.2, D.) It is usually through the harvest specifications development process that the Council is made aware of new data and analyses on groundfish bycatch and bycatch mortality rates. The Council manages its groundfish fisheries to allow targeting on more abundant stocks while constraining the total mortality of overfished and precautionary zone stocks. For overfished stocks, measures to constrain total mortality are primarily intended to reduce bycatch of those stocks. The FMP defines stock status of overfished, precautionary zone, and more abundant stocks at Section 4.5. Management measures the Council has used to reduce total catch of overfished species are detailed for each species at Section 4.5.4. At Section 4.6, the FMP requires that landed catch OYs be reduced from total catch OYs to account for bycatch mortality.

The Council has all of the management measures detailed in Sections 6.5 – 6.10 at its disposal to manage directed catch and reduce bycatch of groundfish species in the groundfish fisheries. Because of the interaction among the various species and the regular incorporation of new information into the management system, the details of the specific measures will change over the years, or within years, based on the best available science. Management measures will be designed taking into account the co-occurrence ratios of target stocks with overfished stocks. To protect overfished species and minimize bycatch through reducing incidental catch of those species, the Council will particularly use, but is not limited to: catch restrictions detailed in Section 6.7 to constrain the catch of more abundant stocks that commingle with overfished species, in times and areas where higher abundance of overfished species are expected to occur; the appropriate time/area closures detailed in Section 6.8 and designed to prevent vessels from operating during times when or in areas where overfished species are most vulnerable to a particular gear type or fishery; and gear restrictions described in Section 6.6, where that gear restriction has been shown to be practicable in reducing overfished species incidental catch rates.

6.5.2 Bycatch and Incidental Take of Non-Groundfish Species in Groundfish Fisheries

[6.3.1 Bycatch of Nongroundfish Species]

Certain non-groundfish species may be taken incidentally in fisheries targeting groundfish. This FMP authorizes management measures to minimize, to the extent practicable, the bycatch of non-groundfish species or the incidental take of species not defined as fish under the MSA. Non-groundfish species subject to bycatch or incidental take minimization measures may be marine fish species managed under another Council FMP, or marine animals or plants not managed with an FMP, yet subject to the protections of the ESA, the MMPA, the MBTA, or other Federal laws. Marine mammals and birds are specifically excluded from the MSA definition of fish and are therefore not defined as bycatch under the MSA. Notwithstanding, the Council may manage fisheries to minimize the incidental take of these species.

Generally, the Council will initiate the process of establishing or adjusting management measures when a resource problem with a non-groundfish species is identified and it has been determined that groundfish fishing regulations would reduce the total impact on that species or stock. This would usually occur when a state or Federal resource management agency (such as the U.S. Department of the Interior, NMFS, or state fishery agency) or the Council's Salmon Technical Team (STT) presents the Council with information substantiating its concern for a particular species. The Council will review the information and refer it to the

SSC, GMT, STT, or other appropriate technical advisory group for evaluation. If the Council determines, based on this review, that management measures may be necessary to prevent harm to a non-groundfish species facing conservation problems or to address requirements of the ESA, MMPA, other relevant Federal natural resource law or policy, or international agreement, it may implement appropriate management measures in accordance with the procedures identified in Section 6.2. The intention of the measures may be to share conservation burdens while minimizing disruption of the groundfish fishery, but under no circumstances may the intention be simply to provide more fish to a different user group or to achieve other allocation objectives.

6.5.2.1 Endangered Species Act Species

Marine species protected under the ESA that are not otherwise protected under either the MMPA or the MBTA (see below) include various salmon and sea turtle species. Threatened and endangered Pacific salmon runs are protected by a series of complex regulations affecting marine and terrestrial activities. In the West Coast groundfish fisheries, management measures to reduce incidental salmon take have focused on the Pacific whiting fisheries, which have historically encountered more salmon than the non-whiting groundfish fisheries. Salmon bycatch reduction measures include marine protected areas (MPA) where Pacific whiting fishing is prohibited (See 6.8.4), and as at-sea observer program intended to track whiting and incidental species take inseason (See 6.4.1.1). Sea turtles are rare in areas where groundfish fisheries are prosecuted and the incidental take of a sea turtle has not been documented in any directed groundfish fishery.

6.5.2.2 Marine Mammal Protection Act Species

Incidental take of marine mammals is addressed under the MMPA and its implementing regulations. Section 118 of the MMPA requires that NMFS place all commercial fisheries into one of three categories based on the level of incidental serious injury and mortality of marine mammals that occur in each fishery. To implement this requirement, NMFS publishes a list of U.S. commercial fisheries and categorizes their effects on marine mammals. Directed West Coast groundfish fisheries have consistently been categorized as Category III fisheries, meaning that they are “commercial fisheries determined by the [NMFS] Assistant Administrator to have a remote likelihood of, or no known incidental mortality and serious injury of marine mammals”.

6.5.2.3 Migratory Bird Treaty Act Species

Incidental take of seabirds is addressed under the MBTA and its implementing regulations. The MBTA implements various treaties and conventions between the U.S., Canada, Mexico, Japan, and the former Soviet Union for the protection of migratory birds. Under the Act, taking, killing, or possessing migratory birds is unlawful. The U.S. Fish and Wildlife Service (USFWS) is the Federal agency responsible for management and protection of migratory birds, including seabirds. NMFS is required to consult with the USFWS if FMP actions may affect seabird species listed as endangered or threatened. 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 the groundfish fisheries and would require seabird incidental catch mitigation if a significant problem is found to exist. 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.

6.5.3 Measures to Reduce Bycatch and Bycatch Mortality

Over the life of the FMP, the Council has used a suite of measures to reduce bycatch and bycatch mortality in the groundfish fisheries. Early bycatch reduction measures concentrated on trawl net modifications intended to reduce the bycatch of juvenile groundfish (Section 6.6.1). In 1993, the Council addressed concerns over potential bycatch of endangered or threatened salmon in the whiting fishery by imposing the Columbia River and Klamath River Conservation Zones (Section 6.8.4). Since 2000, the Council has concentrated its bycatch reduction efforts on constraining total catch of overfished species through gear restrictions (See Section 6.6), catch restrictions (Section 6.7), time/area closures (Section 6.8), and effort restrictions (Section 6.9). The Council and NMFS have also used permit restrictions and effort reduction programs (Section 6.9) to reduce total and incidental catch in the groundfish fisheries. Effort reduction measures implemented in recent years include the sablefish endorsement and tier program for the limited entry fixed gear fleet and the vessel/permit buyback program for the limited entry trawl fleet.

Any of the measures specified in Sections 6.5 through 6.10 may, where practicable, be used to reduce groundfish or non-groundfish bycatch in the groundfish fisheries. The Council will develop measures to reduce bycatch and bycatch mortality in accordance with the points of concern or the socioeconomic framework provisions of the FMP (Section 6.2.3). The process for implementing and adjusting such measures may be initiated at any time. New bycatch reduction management measures would need to be developed through either the harvest specifications and management measures rulemaking process (Section 6.2, C.) or the full rulemaking process (Section 6.2, D). In addition, some measures may be designated as routine, which would allow adjustment at a single meeting based on the factors provided for in Section 6.2.1. Beyond the directed catch and bycatch management measures provided in Sections 6.6 through 6.10, this Section 6.5.3 provides additional bycatch and bycatch mortality reduction programs available for Council use.

6.5.3.1 Full Retention Programs

A full retention program is a regulatory regime that requires participants in a particular sector of the fishery to retain either all of the fish that they catch or all of some species or species group that they catch. Requiring full retention of all or a portion of a vessel's catch allows more careful enumeration of total catch under appropriate monitoring conditions. Full retention requirements also encourage affected fishery participants to tailor their fishing activities so that they are less likely to encounter non-target species. The Council may develop full retention programs for the groundfish fisheries, when such programs are accompanied by an appropriate monitoring mechanism (Section 6.4) and where such programs are sufficiently enforceable (Section 6.10) such that they are not expected to increase total mortality of overfished species. The development of any full retention will be accompanied by an analysis of the practicability of requiring retention of all of the designated species.

6.5.3.2 Sector-specific and Vessel-specific Total Catch Limit Programs

Total catch limits are defined in Section 2.2

The Council may specify total catch limits that are transferable or nontransferable among sectors or tradable or nontradable between vessels.

The Council may develop sector- and/or vessel-specific total catch limit programs for the groundfish fisheries when such programs are accompanied by an appropriate monitoring mechanism (Section 6.4) and where such programs are sufficiently enforceable (Section 6.10) such that they are not expected to increase vessel detection-avoidance activities.

<u>Sector-specific Total Catch Limit Program</u>

A sector-specific total catch limit program is one in which a fishery sector would have access to a pre-determined (probably through the harvest specifications and management measure process, Section 6.2, C) amount of a groundfish FMU species, stock, or stock complex that would be allowed to be caught by vessels in that sector. Once a total catch limit is attained, all vessels in the sector must cease fishing until the end of the limit period, unless the total catch limit is increased by the transfer of an additional limit amount. A sector-specific total catch limit program could be based on either: 1) monitoring of landed catch and inseason modeling of total catch based on past landed catch and bycatch rates, or 2) monitoring of total catch and real-time delivery of total catch data. If a sector-specific total catch limit program is based on inseason monitoring of landed catch, a sector would close when inseason total catch modeling estimated that the sector had achieved an FMU species, stock, or stock complex total catch limit. If a sector-specific total catch limit program is based on inseason monitoring of total catch, a sector would close when inseason total catch monitoring estimated that the sector had achieved an FMU species, stock, or stock complex total catch limit. If inseason monitoring of total catch is possible, sector participants in a sector-specific total catch limit program could either fish in an open competition with each other for total catch limits or could cooperate with each other to keep their total catch below total catch limits.

In developing a sector-specific total catch program, the Council will initially consider the following ten groundfish fishery sectors for assignment of total catch limits:

1. Non-whiting limited entry trawl vessels.
2. At-sea Pacific whiting catcher-processors.
3. Limited entry trawl vessels delivering to at-sea Pacific whiting motherships.
4. Limited entry trawl vessels delivering Pacific whiting to shore-based processing plants.
5. Limited entry longline vessels.
6. Limited entry pot vessels.
7. Directed open access vessels. These are vessels without a groundfish limited entry permit that on a per-trip or per-landing basis demonstrate a fishing strategy targeting groundfish.
8. Incidental open access vessels. These are vessels that on a per-trip or per-landing basis are not fishing under a groundfish limited entry permit and not targeting groundfish, but may catch some amount of groundfish incidentally.
9. Tribal vessels targeting groundfish (see Section 6.2.4)
10. Recreational fishers (fishing from a vessel, from shore, or by another means), including charter (for hire) vessels.

As necessary, the Council will establish criteria for deducting total catch by a particular vessel from a particular sector's total catch limit. For example, the same limited entry trawl vessel may make landings attributable to the shore-based whiting sector or the non-whiting limited entry trawl sector, assignment of a particular landing (and associated bycatch) to one or the other sector would be necessary. Similarly, an open access vessel may target groundfish on a particular trip or time of year, falling into the directed open access sector, while at other times targeting nongroundfish species but catching groundfish incidentally and falling into the incidental open access sector. In general, the composition of a particular vessel's landing and bycatch associated with that landing will be used as the basis for assigning total catch to a sector (recognizing that associated bycatch may be directly monitored or estimated). However, other criteria may be used if appropriate.

Sector-specific total catch limits may be applied to one or more of the ten sectors enumerated above and separate limits may apply to one or more FMU species, stocks, or stock complexes. Two or more of these sectors may be grouped and assigned an overall total catch limit for a given FMU species, stock, or stock complex; similarly, any of the ten sectors may be further subdivided to create additional sectors for the purpose of assigning a total catch limit for a given FMU species, stock, or stock complex. In considering which sectors should be assigned a total catch limit for a given FMU species, stock, or stock complex, the Council will consider current and/or projected total catch of the FMU species, stock, or stock complex by vessels in that sector and the capacity of current monitoring programs to provide sufficiently accurate and timely data to

manage to a total catch limit, or the feasibility of establishing such a monitoring program for the sector in question.

Vessel-specific Total Catch Limit Program

Vessel-specific total catch limits are similar to individual vessel quotas (see Section 6.9.3) as applied to groundfish FMU species, stocks, or stock complexes and require more intense monitoring than a sector-specific total catch limit program. Vessel-specific total catch limits may be established for vessels participating in a sector for which sector-specific total catch limits have already been established. Under a vessel-specific total catch limit program, the participating vessels would be monitored inseason and each vessel would be prohibited from fishing once it had achieved its total catch limit for a given FMU species, stock, or stock complex. The Council will establish the criteria necessary to determine what portion of a sector-specific total catch limit will be assigned to any vessel qualifying for a vessel-specific total catch limit. The Council also may attach incentives, such as increased cumulative landing limits, or requirements, such as carrying observers, when assigning total catch limit amounts to a vessel.

Inseason Adjustment of Sector Total Catch Limits

The Council may increase or decrease a sector limit during the limit period (for example, the fishing year or biennial management period), but should only do so in exigent circumstances and based on the criteria described below. If increasing sector limits inseason were to become a common management response, this could erode their effectiveness as incentives to fishery participants to adopt bycatch-reducing techniques and practices. Furthermore, adjusting a sector total catch limit could make the application of vessel-specific total catch limits in that sector difficult. A change in the sector limit would require a corresponding adjustment to each vessel limit, which would have to be accounted for in any monitoring program.

Inseason (during the limit period) the Council should only increase a sector total catch limit for a constraining species (a species whose OY or total catch limit prevents attainment of target species' OYs) if all of the following conditions are met:

1. Total catch monitoring indicates a constraining species' sector total catch limit will be exceeded well before the end of the limit period and the estimated target species' total catch for that sector (for the limit period) is well below the total catch previously predicted for the limit period.

2. Monitored and projected total catch in other sectors (with or without sector total catch limits) indicates that the OY for the constraining species in question (established on an annual or other basis) will not be exceeded if the sector total catch limit is increased.

An increase in a sector total catch limit could be done through a transfer from another sector's total catch limit for the same species.

The Council may need to reduce a sector's total catch limit because of an overage in one or more sectors. An overage means total catch that exceeds or is projected to exceed a sector's total catch limit for a particular species or species group. The term overage also applies to sectors not operating under total catch limits if total catch of the species in question (actual or projected) is above previous projections made for those sectors prior to the start of any given period (bimonthly period, fishing year, etc.). The Council could also reduce a sector's total catch limit in the form of a sector-to-sector transfer, as described above. The following principals should apply when considering an inseason downward adjustment in a total catch limit:

1. In order to avoid an overage, fishing may be prohibited after the date when a sector's total catch limit is projected to be reached, rather than waiting to close the fishery based on retrospective total catch estimates (available, for example, in the QSM report). This strategy is relevant to sectors without real-time reporting.

2. A downward adjustment should only be considered as a last resort when it is being considered for use as a compensation for projected overages in other sectors. Measures to rapidly reduce projected total catch in sectors where the overages are projected to occur, or in sectors without total catch limits (or for non-catch-limited species) should be considered first. These measures could be, for example, changes to landing limits or changes in the size, configuration, and duration of time/area closures.

3. If a sector has an overage that needs to be compensated for by a change in total catch limits for other sectors, any downward adjustment in those sector's total catch limits should reflect an equitable reduction across all sectors, either through a proportional reduction in equivalent total catch limits or through the application of other management measures intended to reduce total catch of the species in question.

4. In the case of a reduction that is part of an intra-sector transfer, the criteria described above for an increase shall apply. In no case shall a reduction consequent of a transfer disadvantage the vessels in a sector in comparison to other sectors and with respect to fishing opportunity.

6.5.3.3 Catch Allocation to, or Gear Flexibility For, Gear Types With Lower Bycatch Rates

Catch allocations (Section 6.3), catch limits (Section 6.7), and fishing areas (Section 6.8) may be set so that users of gear types with lower bycatch rates have greater fishing opportunities than users of gear with higher bycatch rates. Increased fishing opportunities for users of gear types with lower bycatch rates could come in the form of increased overall amounts of fish available for directed or incidental harvest, increased landings limits, or increased allowable fishing areas. Increased fishing opportunities made available under this provision may not be provided in such a way that the number of fishing vessels participating in the groundfish fisheries is expected to increase.

Recreational Catch and Release Management

[6.4 Recreational Catch and Release Management]

The Council may develop recreational catch-and-release programs for any groundfish stock through ~~the appropriate rulemaking process~~ <u>either the harvest specifications and management measures rulemaking (Section 6.2, C.) or the full rulemaking (Section 6.2, D.) processes.</u> The Council will assess the type and amount of groundfish caught and released alive during fishing under such a program and the mortality of such fish. Management measures for such a program will, to the extent practicable, minimize mortality and ensure extended survival of such groundfish.

6.6 Gear Definitions and Restrictions

The Council uses gear definitions and restrictions to protect juvenile fish (trawl mesh size), to disable lost gear so that it no longer catches fish (biodegradable escape panels for pots), to slow the rates of catch in particular sectors (recreational fisheries hook limits), to reduce bycatch of non-target species (trawl configuration requirements), and to protect marine habitat (trawl roller gear size restrictions). Gear types permitted for use in the West Coast groundfish fisheries in Federal waters are listed in Federal regulations at

50 CFR 660.302 and in a nationwide list of fisheries at 50 CFR 600.725. No vessel may fish for groundfish in Federal waters using any gear other than those authorized in Federal regulations. Gear definitions and restrictions for both the commercial and recreational fisheries may be revised using either the specifications-and-management-measures rulemaking process (Section 6.2, C.) or the full rulemaking process (Section 6.2, D.). When developing revisions to gear definitions and restrictions, the Council shall consider the expense of such revisions to fishery participants and the time required for participants to work with gear manufacturers to meet new requirements.

6.6.1 Commercial Fisheries

[6.5.2.3 Gear Restrictions]

This ~~plan~~ FMP authorizes the use of trawls, pots (traps), longlines, hook-and-line (mobile or fixed) and setnets (gillnets and trammel nets) as legal gear for the commercial harvest of groundfish.

6.6.1.1 Prohibitions

The use of setnets is prohibited in all waters north of 38° N. latitude.

Bottom trawl gear with footropes larger than eight inches in diameter is prohibited shoreward of a line approximating the 100 fm depth contour. This boundary line is defined in Federal regulations by precise latitude-longitude coordinates (see 50 CFR 660, Subpart G). In order to protect groundfish EFH, this makes permanent a prohibition implemented biennially to reduce the bycatch of overfished species. The origin of this prohibition is discussed further below in Section 6.6.1.2.

The use of bottom trawl footrope gear with a footrope diameter larger than 19 inches is prohibited in the management area.

The use of dredge gear is prohibited in the management area.

The use of beam trawl gear is prohibited in the management area.

States may implement parallel measures within their waters.

6.6.1.2 Trawl Gear

[11.2.1.1 Trawl gear and 6.1.2 Mesh Size]

Trawl gear is a cone or funnel-shaped net, which is towed or drawn through the water by one or two vessels. Trawls are used both on the ocean bottom and off bottom. They may be fished with or without trawl doors. They may employ warps or cables to herd fish. Trawl gear includes roller, bottom, and pelagic (mid-water) trawls, and as appropriate, trawls used to catch non-groundfish species but which incidentally intercept groundfish. Trawl gear is complex, usually constructed from several panels of mesh and engineered with varying ropes, chains, and trawl doors to target particular sizes, shapes, or species of fish. The Council has historically worked with the trawl industry and the states, usually through the issuance of EFPs, to develop new trawl gear restrictions intended to accomplish one or more FMP goals, usually the reduction of bycatch. The following discussion of the Council's efforts to modify trawl gear provides examples of the types of trawl gear modifications that may be made to meet FMP goals, but does not limit the range of future trawl gear restrictions.

In the early-mid 1990s, the Council engaged the trawl industry in a series of discussions on modifying trawl nets to minimize juvenile fish bycatch. Since 1995, bottom trawl nets have been required to be constructed with a minimum mesh size of 4.5 inches, and pelagic trawl nets with a minimum mesh size of three inches. Minimum net mesh sizes are intended to allow immature fish to pass through trawl nets. To ensure the success of minimum mesh size restrictions in allowing juvenile fish to escape trawl nets, the Council also developed restrictions preventing trawlers from using a double-walled codend. Further restrictions related to this objective include prohibitions on encircling the whole of a bottom trawl net with chafing gear and restrictions on the minimum mesh size of pelagic trawl chafing gear (16 inches).

In 2000, the Council began to distinguish between large and small footrope trawl gear. Large footrope gear is bottom trawl gear with a footrope diameter larger than eight inches, including any material (rollers, bobbins, etc.) encircling the footrope. Small footrope gear is bottom trawl gear with a footrope diameter of eight inches or smaller. Pelagic trawl gear is required to have unprotected footrope gear and is not permitted to be encircled with chains, rollers, bobbins, or other material. Initially, the Council used the distinction between large and small footrope gear to prohibit large footrope use for less abundant, nearshore, and continental shelf species. Large footrope gear allows trawlers to access rockier areas, by bouncing the bottom of the trawl net over larger obstructions without tearing. Allowing only small footrope gear in nearshore and shelf areas was intended to reduce trawl access to newly-designated overfished species and their rockier habitats.

Since the Council introduced Rockfish Conservation Areas (RCAs, Section 6.8.2) in 2002 (through emergency rulemaking, later made permanent regulations), large footrope trawl gear has been prohibited inshore of the western boundary of the trawl RCA. RCA boundary lines are set to approximate ocean bottom depth contours and the western boundary of the trawl RCA has not been shallower than a line approximating the 150 fm depth contour. (See Section 6.8.3 for the use of RCAs as a management tool.) Six of the eight overfished species are continental shelf species and this restriction on the use of large footrope gear continues to reduce trawler access to rocky nearshore habitat. Over time, these footrope size restrictions, coupled with restricted landing limits, have re-configured trawl activities in the nearshore area so that they primarily target the more abundant flatfish species.

In 2005, the Council introduced new trawl gear requirements for small footrope trawl gear north of 40°10.00’ N. latitude. Trawlers operating inshore of the Trawl RCA are required to use selective flatfish trawl gear, which is configured to reduce bycatch of rockfish while allowing the nets to retain flatfish. Selective flatfish trawl nets have an ovoid trawl mouth opening that is wider than it is tall and the headropes on these nets are recessed from the trawl mouth. This combination of a flattened oval shape and a recessed headrope herds flatfish into the trawl net while allowing rockfish to slip up and over the headrope, never entering the net. Groundfish trawlers worked with the State of Oregon to develop these nets in order to have greater access to healthy flatfish stocks. The Council is working with the State of California to determine whether the selective flatfish trawl net is also effective at reducing the bycatch of southern overfished species in fisheries targeting more abundant southern stocks.

As part of a suite of measures intended to mitigate the adverse effects of fishing in groundfish EFH, the eight inch footrope restriction described here is made permanent, as listed in Section 6.6.1.1, prohibitions. A 100 fm management line, the shoreward boundary of the trawl RCA when the permanent measure was implemented, is identified as the seaward extent of the prohibition.

6.6.1.3 Nontrawl Gear

[11.2.1.3 Nontrawl gear; 11.2.1.2 Fixed gear]

Nontrawl gear includes all legal commercial gear other than trawl gear. Fixed gear (anchored nontrawl gear) includes longline, pot, set net, and stationary hook-and-line gear. Fixed gear must be marked, individually or at each terminal end as appropriate, with a pole, flag, light, and radar reflector attached to each end of the set, and a buoy clearly identifying the owner. In addition, fixed gear shall not be left unattended for more than seven days. Reporting of fixed gear locations is not required, but fixed gear fishermen are encouraged to do so

with the U.S. Coast Guard. Reporting of fixed gear will facilitate compensation claims by fishermen who have lost fixed gear.

Since 1982, groundfish traps have been required to be constructed with biodegradable escape panels in such a manner that an opening of at least eight inches in diameter results when the escape panel deteriorates. These biodegradable panels ensure that, if a trap is lost or not attended for extended periods of time, it will not continue to fish. Gear that has been lost and continues to capture fish while it is unattended is often referred to as ghost fishing gear.

Mesh size in fish pots (traps) also affects the size of fish retained in the trap. By increasing the minimum mesh size in all or part of the trap, small fish may be allowed to escape. There are no minimum mesh size requirements for groundfish pot vessels. However, sablefish is the primary trap gear target species and fishermen are usually paid more per pound for larger-sized sablefish. Thus, there are few incentives for trap fishermen to use smaller mesh sizes.

6.6.2 Recreational Fisheries

[11.2.2 Recreational Fishing]

Recreational fishing is fishing with authorized gear for personal use only, and not for sale or barter. The only types of fishing gear authorized for recreational fishing are hook-and-line and spear. The definition of hook-and-line gear for recreational fishing is the same as for commercial fishing. Hook limits, restrictions on the number of hooks that may be used per fishing line, or on the size or configuration of hooks used in a recreational fishery, have been established as routine management measures under 6.2.1. Hook limits are used in the recreational fishery to either constrain recreational fishery effort by limiting the number of hooks per fishing line, or to select for certain species by limiting the size of hooks used.

6.6.3 Bottom-contact Gear

In order to mitigate the adverse impacts of fishing on groundfish EFH, the Council may impose restrictions on a range of gear types collectively termed bottom-contact gear. These are gear types that by design and through normal use make contact with the sea floor. Such contact is more than intermittent in duration and areal extent. Bottom trawl and groundfish fixed gear are examples of gear types that are considered bottom contact gear. Midwater trawl gear, although it may occasionally make contact with the sea floor during deployment, is an example of a gear type not considered a bottom contact gear because the gear is not normally intended to be deployed so that it makes such contact, nor is such contact normally more than intermittent. Similarly, vertical hook-and-line gear that during normal deployment is not permanently in contact with the bottom would not be considered bottom-contact gear. For the purpose of regulation, specified legal gear types may be designated bottom contact or non-bottom-contact.

6.7 Catch Restrictions

[6.5.2.2 Catch Restrictions]

The FMP authorizes the commercial and recreational harvest of species listed in Chapter 3 of this plan, and provides for limiting the harvest of these species in Chapters 5 and 6. The Council uses a variety of management measures to constrain rates of total catch, including direct limits on amounts that may be taken and landed in commercial and recreational fisheries. Trip limits constrain landed catch in the commercial fisheries; bag limits constrain landed catch in the recreational fisheries. Total catch limits constrain incidental catch amounts permitted in a particular fishery or sector and may refer to either amounts of incidentally caught non-target species that are not discarded (not considered bycatch under the MSA), to amounts of non-target

species that are discarded, or to both. Designating certain species as prohibited ensures that the FMP complies with international, Federal, and state regulations and management requirements for non-groundfish species.

[11.4 Catch Restrictions]

Groundfish species harvested directly or incidentally in the territorial sea (0-3 nautical miles) will be counted toward any catch limitations established under the authority of this FMP. These catch restrictions apply to domestic fisheries off Washington, Oregon, and California. Procedures for designating and adopting catch restrictions are found in Section 6.2.

6.7.1 All Fisheries

Quotas, size limits, and total catch limits may be applied to either commercial (groundfish or non-groundfish) or recreational fisheries.

[6.1.4 Quotas, Including Individual Transferable Quotas]

Quotas. Quotas may be used for certain species. Quotas are specified harvest limits, the attainment of which causes closure of the fishery for that species, gear type, or individual participant. Quotas may be established for intentional allocation purposes or to terminate harvest at a specified point. They may be specified for a particular area, gear type, time period, species or species group, and/or vessel or permit holder. Quotas may apply to either target species or bycatch species.

[6.1.6 Size Limits]

Size limits. Size limits are used to prevent the harvest of immature fish or fish that have not reached their full reproductive capacity. In some cases, size limits are used in reverse to harvest younger recruit or pre-recruits and to protect older, larger spawning stock. ~~Generally, harvesting the larger members of the population tends to increase the yield by taking advantage of the combined growth of individual fish.~~ Slot limits, which prohibit the retention of fish that are either smaller than a lower size limit or larger than a higher size limit, are used to protect both immature fish and more fecund older fish. Size limits may be applied to all fisheries, but are generally used where fish are handled individually or in small groups such as trap-caught sablefish and recreational-caught fish. Size limits lose their utility in cases where the survival of the fish returned to the sea is low (e.g., rockfish).

Total catch limits. The Council has historically managed total catch of groundfish species by monitoring direct and incidental catch inseason, and then making inseason adjustments to catch and other restrictions to ensure that annual total catch does not exceed allowable harvest amounts. Expected bycatch amounts of overfished species are set aside as anticipated incidental take in various fisheries. Total catch limits, by contrast, are sector-specific or vessel-specific limits on total catch (landed and discarded catch) of groundfish FMU species. A cumulative trip limit is the maximum amount of groundfish species or species group that may be taken and retained, possessed, or landed per vessel in a specified period of time without a limit on the number of landings or trips, unless otherwise specified. In setting the biennial specifications and management measures, the Council will review the total harvestable surplus of individual FMU species or species groups and determine whether there are fishery sectors that may be managed with total catch limits. If a sector or vessel achieves a total catch limit inseason, all vessels in the sector, in the case of sector limits, or the individual vessel, in the case of vessel limits, would have to cease fishing at that time, unless the total catch limit is increased by means of a transfer or trade to the sector or vessel in question. Fisheries managed with total catch limits also must be subject to monitoring and requirements that provide real-time or projected total catch reporting (See Section 6.4).

6.7.2 Commercial Fisheries

[6.5.2.2 Catch Restrictions]

Prohibited Species. It is unlawful for any person to retain any species of salmonid or Pacific halibut caught by means of fishing gear authorized under this FMP, except where a Council approved monitoring program is in effect. State regulations prohibit the landing of crab incidentally caught in trawl gear off Washington and Oregon. However, trawl fishermen may land Dungeness crab in the State of California north of Point Reyes in compliance with the state landing law. Retention of salmonids and Pacific halibut caught by means of other groundfish fishing gear is also prohibited unless authorized by 50 CFR Part 300, Subparts E or F; or Part 600, Subpart H. Specifically, salmonids are prohibited species for trawl, longline, and pot gear. Halibut may be retained and landed by troll and longline gear only during times and under conditions set by International Pacific Halibut Commission and/or other Federal regulations. Salmon taken by troll gear may be retained and landed only as specified in troll salmon regulations. Groundfish species or species groups under this FMP for which the quota has been reached shall be treated in the same manner as prohibited species. Species identified as prohibited must be returned to the sea as soon as practicable with a minimum of injury when caught and brought aboard, after allowing for sampling by an observer, if any. Exceptions may be made for the recovery of tagged fish.

The FMP authorizes the designation of other prohibited species in the future or the removal of a species from this classification, consistent with other applicable law for that species. The designation of other prohibited species or the removal of species from this classification must be made through either the biennial or annual specifications-and-management-measures rulemaking process (Section 6.2, C.) or through the full rulemaking process (Section 6.2, D.)

[6.1.3 Landing and Frequency Limits]

Trip limits. A trip limit is the amount of groundfish that may be taken and retained, possessed, or landed from a single fishing trip. Trip limits, trip frequency limits, and trip limits that vary by gear type or fishery may be applied to either groundfish or non-groundfish fisheries. Trip landing limits and trip frequency limits are used to control landings to delay achievement of a quota or HG and thus avoid premature closure of a fishery if it is desirable to extend the fishery over a longer time. Trip landing limits also may be used to minimize targeting on a species or species group while allowing landings of some level of incidental catch. Trip landing limits are most effective in fisheries where the fisherman can control what is caught. In a multispecies fishery, trip limits can discourage targeting while, at the same time, providing for the landing of an incidental catch species that requires a greater degree of protection than the other species in the multispecies catch. Conversely, a trip limit may be necessary to restrict the overall multispecies complex catch in order to provide adequate protection to a single component of that catch.

[9.0 Restrictions on Other Fisheries]

Trip limits for non-groundfish fisheries. For each non-groundfish fishery considered, a reasonable limit on the incidental groundfish catch may be established that is based on the best available information (from EFPs, logbooks, observer data, or other scientifically acceptable sources). These limits will remain unchanged unless substantial changes are observed in the condition of the groundfish resource or in the effort or catch rate in the groundfish or non-groundfish fishery. Incidental limits or species categories may be imposed or adjusted in accordance with the appropriate procedures described in Section 6.2. The Secretary may accept or reject but not substantially modify the Council's recommendations. ~~The trip limits for the pink shrimp and spot and ridgeback prawn fisheries in effect when Amendment 4 is implemented will be maintained unless modified based on the above criteria through the management adjustment framework.~~ The objectives of this framework are to:

- Minimize discards in the non-groundfish fishery by allowing retention and sale, thereby increasing fishing income;

- Discourage targeting on groundfish by the non-groundfish fleet; and,

- Reduce the administrative burden of reviewing and issuing EFPs for the sole purpose of enabling non-groundfish fisheries to retain groundfish.

6.7.3 Recreational Fisheries

[6.1.7 Bag Limits]

Bag limits. A bag limit is a restriction on the number of fish that may be taken and retained by an individual angler operating in a recreational fishery, usually within a period of a single day. Bag limits have long been used in the recreational fishery and are perhaps the oldest method used to control recreational fishing. The intended effect of bag limits is to spread the available catch over a large number of anglers and to avoid waste.

Boat limits. A boat limit is a cumulative restriction on the total number of fish that may be taken and retained by all of the persons operating from a recreational fishery vessel. Boat limits restrict the overall per-vessel catch in a recreational fishery. A boat limit may prevent an angler from taking what would otherwise be allowed within an individual bag limit, depending on the number of fish already taken on that boat.

Dressing requirements. Anglers may be subject to requirements that they retain the skin on their filleted catch in order to allow port biologists and enforcement officers to better identify recreational catch by species.

6.8 Time/Area Closures

The Council uses a variety of time/area closures both to control the directed rate of catch of targeted species, to reduce the incidental catch of non-target, protected (including overfished) species; and to prevent fishing in specified areas in order to mitigate the adverse effects of such activities on groundfish EFH. Time/area closures vary by type both in their permanency and in the size of area closed. When the Council sets fishing seasons (Section 6.8.1) it generally uses latitude lines extending from shore to the EEZ boundary to close large sections of the EEZ for part of a fishing year to one or more fishing sectors. RCAs (at Section 6.8.2), by contrast, are coastwide fishing area closures bounded on the east and west by lines connecting a series of coordinates approximating a particular depth contour. RCAs are gear-specific and their eastern and western boundaries may vary during the year. RCAs also may be polygons that are closed to fishing for a brief period (less than one year) in order to provide short-term protection for the more migratory overfished or other protected species. Groundfish fishing areas (GFAs) (at Section 6.8.3) are enclosed areas of high abundance of a particular species or species group and may be used to allow targeting of a more abundant stock within that enclosed area. Long-term bycatch mitigation closed areas (Section 6.8.4) have boundaries that do not vary by season and are not usually modified annually or biennially. Ecologically important habitat closed areas (Section 6.8.5) and the bottom trawl footprint closure (6.8.6) are established in order to mitigate the adverse effects of fishing on EFH. MPA (MPAs) (at Section 6.8.7) are longer-term, discrete closed areas with unchanging boundary lines that may apply to one or more fishing sectors. Because the RCAs, the Yelloweye

Rockfish Conservation Area, and the Cowcod Conservation Areas have all been implemented to protect overfished groundfish species, they are collectively referred to in Federal regulations as Groundfish Conservation Areas (GCAs).

The coordinates defining the boundaries of time/area closures are published in Federal regulations. In order to ensure consistency between the areas named in this FMP (see below) and corresponding areas defined in Federal regulations, the Council may publish in the groundfish SAFE or other publication detailed specifications for these time/area closures, by means of maps, lists of coordinates, or other descriptors.

[6.1.8 Time/Area Closures (Seasons and Closed Areas)]

6.8.1 Seasons

Fishing seasons are closures of all or a portion of the West Coast EEZ for a particular period and time of year. Seasons may be used to constrain the rate of fishing on a targeted species, to encourage targeting of a more abundant stock during periods of higher aggregation, or to limit catch of a protected species during its spawning season. Seasons may be for the entire fleet, for particular sectors within the fleet, for regions of the coast, or for individual vessels. Designation and adoption of seasons must be made through either a specifications-and-management-measures rulemaking (Section 6.2, C.) or a full rulemaking (Section 6.2, D.)

Seasons have been used to manage the commercial Pacific whiting trawl and limited entry fixed gear fisheries. The non-tribal whiting fishery is divided into three sectors: catcher boats that deliver to shorebased processing plants, catcher vessels that deliver to motherships at sea, and at-sea catcher-processors. Each of these sectors is managed with its own season. The shorebased sector also includes an early season for waters off California, to allow vessels in that area to access whiting when it is migrating through waters off California. The limited entry, fixed gear sablefish fishery is managed with a seven-month season, April through October. Outside the primary seasons for both whiting and fixed gear sablefish, incidental catch allowances of these species are provided to allow retention of incidental catch.

In addition to the whiting and sablefish seasons, intended to constrain the directed catch of the target stocks within a particular period, commercial fisheries may be constrained by season to protect overfished species. Lingcod are known to spawn and nest in the winter months. Male lingcod guard the nests and are easily caught with hook-and-line gear during the nesting period. Lingcod has a higher rate of discard survival than many other groundfish species; however, lingcod eggs are easy prey if the guarding male is removed from the nest. Commercial non-trawl and recreational fisheries closures during the winter months have been part of the lingcod rebuilding strategy since 2000 and are discussed in the rebuilding plan at 4.5.4.4.

Recreational fisheries also may be managed with fishing seasons, either to constrain the directed catch of target species or to reduce the incidental catch of protected species. Winter recreational fishery season closures are part of the lingcod rebuilding strategy. Fishing seasons with one or more closed periods during the fishing year are intended to reduce catch rates of both more abundant and protected stocks. Seasonal closures are used off all three states—in combination with bag limits, RCAs, and other measures—to prevent recreational fisheries from exceeding expected harvest levels.

6.8.2 Rockfish Conservation Areas

In September 2002, NMFS implemented an emergency rule at the Council's request to implement a Darkblotched Rockfish Conservation Area to close continental shelf/slope waters north of 40°10.00' N. latitude. Since January 2003, the Council has used coastwide RCAs to reduce the incidental catch of overfished species in waters where they are more abundant. Of the eight currently overfished species, six are continental shelf species, and RCAs have primarily been designed to close continental shelf waters. Section 4.5.4 describes the role of RCAs play in this FMP's overfished species rebuilding plans.

Different gear types have greater or lesser effects on different overfished species. Thus, RCAs are designed to be gear-specific to better target protection for the species most affected by each gear group. For example, darkblotched rockfish and Pacific Ocean Pearch are continental slope species that are most frequently taken with trawl gear, which means that the Trawl RCA must extend out to greater depths in order to protect these species. Yelloweye rockfish, in contrast, is more frequently taken with hook-and-line gear, which means that both the commercial and recreational hook-and-line fisheries require yelloweye rockfish protection measures as part of that species' rebuilding plan. The Non-Trawl RCA is concentrated over the continental shelf, while the recreational fisheries use season closures and a MPA to reduce yelloweye rockfish bycatch.

RCAs are typically bounded on the east and west by lines drawn between a series of latitude/longitude coordinates approximating certain depth contours. An RCA may also be a polygon, designated by lines drawn between a series of latitude/longitude coordinates, which is closed to fishing for some period less than a year in duration. Some RCAs may extend to the shoreline. Although both the eastern and western RCA boundaries have changed over time for all of the gear groups, the area between the trawl RCA boundary lines approximating the 100 fm and 150 fm depth contours has remained closed since January 2003. Adopted potential RCA boundary lines are described in Federal regulations at 50 CFR 660.390-394. The size and shape of the RCAs may be adjusted inseason via the routine management measures process (Section 6.2.1) by using previously adopted potential RCA boundary lines. Designation and adoption of new potential RCA boundary lines must be made through either a specifications-and-management-measures rulemaking (Section 6.2, C.) or a full rulemaking (Section 6.2, D.)

6.8.3 Groundfish Fishing Areas

Groundfish Fishing Areas (GFAs) are areas of known higher abundance of a particular species or species group, enclosed by straight lines connecting a series of coordinates. A GFA designated for a more abundant species may be used to constrain fishing for that species within that particular GFA. For example, fishing for schooling species, such as petrale sole or chilipepper rockfish, could be allowed within GFAs for those species, but not permitted outside of the GFAs, where fisheries for those species might have higher incidental catches of overfished species.

Designation and adoption of GFAs must be made through either a specifications-and-management-measures rulemaking (Section 6.2, C.) or a full rulemaking (Section 6.2, D.)

6.8.4 Long-term Bycatch Mitigation Closed Areas

The Council uses a variety of time/area closures to reduce incidental catch of protected species in fisheries targeting groundfish. The extent and configuration of these areas do not vary seasonally and they are not usually modified through inseason or biennial management actions. The location and extent of these areas are described by coordinates published in permanent regulations. Modification of such permanent regulations would require full notice-and-comment rulemaking as described at Section 6.2 D. As of January 1, 2005, there are five such closures:

1. Klamath River Conservation Zone (KRCZ): Established in Federal regulations in 1993 to reduce the bycatch of threatened and endangered salmon stocks taken incidentally in the Pacific whiting fisheries. The KRCZ is closed to trawling for whiting. Its boundaries are defined as the ocean area surrounding the Klamath River mouth, bounded on the north by 41°38.80 N. latitude, on the west by 124°23.00' W. long., and on the south by 41°26.63' N. latitude.

2. Columbia River Conservation Zone (CRCZ): Established in Federal regulations in 1993 to reduce the bycatch of threatened and endangered salmon stocks taken incidentally in the Pacific whiting fisheries. The CRCA is closed to trawling for whiting. Its boundaries are defined as the ocean area surrounding the Columbia River mouth, bounded by a line extending for six nautical miles due west from North Head along 46°18.00' N. latitude to 124°13.30' W. longitude, then southerly along a line of 167 true to 46°11.10' N. latitude by 124°11.00' W. longitude, then northeast along Red Buoy Line to the tip of the south jetty.

3. Western Cowcod Conservation Area (CCA): First established via *Federal Register* notice in 2001 as an overfished species rebuilding measure. Incorporated into the FMP (Section 4.5.4.6) via Amendment 16-3 and established in Federal regulation in 2005 to reduce the bycatch of cowcod taken incidentally in all commercial and recreational fisheries for groundfish. The Western CCA is an area south of Point Conception defined by a series of coordinates describing straight lines enclosing a polygon.

4. Eastern Cowcod Conservation Area: First established via *Federal Register* notice in 2001 as an overfished species rebuilding measure. Incorporated into the FMP (Section 4.5.4.6) via Amendment 16-3 and established in Federal regulation in 2005 to reduce the bycatch of cowcod taken incidentally in all commercial and recreational fisheries for groundfish. The Eastern CCA is an area west of San Diego defined by a series of coordinates describing straight lines enclosing a polygon.

5. <u>Yelloweye Rockfish Conservation Area (YRCA):</u> First established via *Federal Register* notice 2003 as an overfished species rebuilding measure. Incorporated in the FMP (Section 4.5.4.8) via Amendment 16-3 and established in Federal regulation in 2005 to reduce the bycatch of yelloweye rockfish in the recreational fisheries for groundfish and halibut. The YRCA is a C-shaped area off the northern Washington coast defined by a series of coordinates describing straight lines enclosing a polygon.

6.8.5 Ecologically Important Habitat Closed Areas

The Council has identified discrete areas that are closed to fishing or to fishing with specified gear types, or are only open to fishing with specified gear types. These ecologically important habitat closed areas are intended to mitigate the adverse effects of fishing on groundfish EFH. They may be categorized as bottom trawl closed areas (BTCAs), bottom contact closed areas (BCCAs), and areas closed to all fishing (as defined in the MSA and this FMP, Section 2.2) or closed to all fishing with limited exceptions for specified gear types. For the purpose of regulation each type of closed area should be treated differently. For the purposes of BTCAs the definition of bottom trawl gear in Federal regulations applies (see also Section 6.6.1.2). For the purposes of BCCAs the definition of bottom contact gear in this FMP (Section 6.6.3) and in Federal regulations applies.

The extent and configuration of these areas do not vary seasonally and they are not usually modified through inseason or biennial management actions. For this reason they may be considered MPAs (Section 6.8.7). The location and extent of these areas are described by a series of latitude-longitude coordinates enclosing a polygon published in permanent Federal regulations. For areas closed to bottom trawl gear, the habitat conservation framework may be used to eliminate such closed areas or modify their location or extent. Modification of permanent regulations describing these closed areas would require full notice-and-comment rulemaking as described at Section 6.2 D. As of June 30, 2006, there are 52 such closures: ***[NB: Amendatory language should be consistent with the areas implemented by final rule.]***

Bottom Trawl Closed Areas

Off of Washington:

1. Olympic_2
2. Biogenic_1
3. Biogenic_2
4. Grays Canyon
5. Biogenic_3

Off of Oregon:

1. Nehalem Bank / Shale Pile
2. Astoria Canyon
3. Siletz Deepwater
4. Daisy Bank / Nelson Island
5. Newport Rockpile / Stonewall Bank
6. Heceta Bank
7. Deepwater off Coos Bay
8. Bandon High Spot
9. Rogue Canyon

Off of California:

1. Eel River Canyon
2. Blunts Reef
3. Mendocino Ridge
4. Delgada Canyon
5. Tolo Bank
6. Point Arena Offshore
7. Cordell Bank
8. Biogenic Area 12
9. Farallon Islands / Fanny Shoal
10. Half Moon Bay
11. Monterey Bay / Canyon
12. Point Sur Deep
13. TNC/ED Area 2
14. TNC/ED Area 1
15. TNC/ED Area 3
16. Potato Bank
17. Cherry Bank
18. Hidden Reef / Kidney Bank
19. Catalina Island
20. Cowcod Conservation Area East

For the purpose of regulating the use of fishing gear in BTCAs in waters off of California, Scottish seine (or fly dragging) gear is not considered bottom trawl gear. The Scottish seine method deploys a weighted rope on the sea bottom in a large polygonal shape, attached to a codend net. The rope is pulled across the bottom, herding the fish towards the codend, which is then hauled back to the vessel.

<u>Bottom Contact Closed Areas</u>

Off of Oregon:
1. Thompson Seamount
2. President Jackson Seamount

Off of California:
1. Cordell Bank (within 50 fm isobath)
2. Davidson Seamount

<u>Closed to Fishing</u>

Off of California, except for specified gear types:
1. Anacapa Island SMCA

Off of California, closed to all fishing:
1. Anacapa Island SMR
2. Carrington Point
3. Footprint
4. Gull Island
5. Harris Point
6. Judith Rock
7. Painted Cove
8. Richardson Rock
9. Santa Barbara
10. Scorpion
11. Skunk Point
12. South Point

Maps showing the locations of these closures and coordinates defining their boundaries, as published in Federal regulations, appear in FMP Appendix C.

6.8.6 Bottom Trawl Footprint Closure

As a precautionary measure, to mitigate the adverse effects of fishing on groundfish EFH, the West Coast EEZ seaward of a line approximating the 700 fm isobath is closed to bottom trawling. This is called the footprint closure because the 700 fm isobath is an approximation of the historic extent of bottom trawling in the management area. This closure is therefore intended to prevent the expansion of bottom trawling into areas where groundfish EFH has not been adversely affected by fishing. The closure encompasses the part of the EEZ deeper than 3,500 m, the isobath defining the deepest extent of groundfish EFH. Therefore, this closure applies to a part of the management area not identified as groundfish EFH. This measure is intended to be precautionary, recognizing that in the future the best available scientific information may indicate that habitat not currently identified as groundfish EFH is indeed groundfish EFH.

Although primarily intended to mitigate the adverse effects of fishing on EFH, the trawl footprint closure encompasses the part of the EEZ (depths greater than 3,500 m) not currently identified as EFH. As noted above, the closure is precautionary; there is limited information on the importance to groundfish of habitats in all areas at depths greater than 700 fm. This closure is intended to prevent adverse effects from bottom trawling while over time more information is gathered about groundfish habitat within this area or the relationship between habitats in this area and groundfish EFH. Because this closure applies to an area where bottom trawling effort has been limited or nonexistent, the socioeconomic impacts are modest.

6.8.7 Marine Protected Areas

Executive Order (EO) 13158 on MPAs was signed on May 26, 2000. This EO defines MPAs as "any area of the marine environment that has been reserved by Federal, state, territorial, tribal, or local laws or regulations to provide lasting protection to part or all of the natural or cultural resources therein". Under this FMP, MPAs include all marine areas closed to fishing for any or all gear group(s), by the FMP or implementing Federal regulations for conservation purposes, and which have stable boundaries over time (thereby providing lasting protection). In 2005 the Marine Protected Areas Federal Advisory Committee on Establishing and Managing a National System of Marine Protected Areas made several recommendations on specifying this definition of MPA. They define lasting protection as enduring long enough to enhance the conservation, protection, or sustainability of natural or cultural marine resources. The minimum duration of "lasting" protection ranges from ten years to indefinite, depending on the type and purpose of MPA. The use of the term "indefinite" indicates permanent protection while recognizing that an MPA designation and level of protection may change for various reasons, including changes in the resources protected and in how society values those resources. Although all of the time/area closures described in Sections 6.8.2-6.8.6 may be modified through full notice-and-comment rulemaking, most either are practically permanent (portions of the GCAs) or are intended to be permanent (habitat closed areas and the trawl footprint closure). These time/area closures offer lasting protection and may be considered MPAs. New MPAs may be established or these MPAs may be revised through either a specifications-and-management-measures rulemaking (Section 6.2, C.) or a full rulemaking (Section 6.2, D.)

6.9 Measures to Control Fishing Capacity, Including Permits and Licenses

[6.1.1 Permits, Licenses, and Endorsements]

Permits and licenses are used to enumerate participants in an industry and, if eligibility requirements are established or the number of permits is limited, to restrict participation. Participation in the Washington, Oregon, and California groundfish fishery was partially limited beginning in 1994 when the Federal vessel license limitation program was implemented (Amendment 6). Subsequently, Amendment 9 further limited participation in the fixed-gear sablefish fishery by establishing a sablefish endorsement. (Chapter 11 describes the groundfish limited entry program in detail.) In December 2003, NMFS reduced participation in the limited entry trawl fleet by buying the fishing rights to 91 limited entry trawl vessels and the Federal and state permits associated with those vessels. There is currently no Federal permit requirement for other commercial participants (fishers or processors) or recreational participants (private recreational or charter). The Council may determine that effective management of the fishery requires accurate enumeration of the number of participants in these sectors and may establish a permit requirement to accomplish this. In addition, some form of limitation on participation may be necessary in order to protect the resource or to achieve the objectives of the FMP.

[6.1.9 Other Forms of Effort Control]

Other forms of effort control commonly used include vessel length endorsements, restrictions on the number of units of gear, or restrictions on the size of trawls, or length of longlines, or the number of hooks or pots. ~~These measures~~ Effort restrictions related to gear may also be useful in reducing bycatch.

[6.5.2.4 Reporting Requirements]

Permit applications for the domestic groundfish fishery, including, but not limited to exempted fishing permits, are authorized by this FMP. Such applications may include vessel name, length, type, documentation number or state registration number, radio call sign, home port, and capacity; owner and/or operator's name, mailing address, telephone number, and relationship of the applicant to the owner; type of fishing gear to be used, if

any; signature of the applicant, and any other information found necessary for identification and registration of the vessel.

6.9.1 General Provisions For Permits

[6.5.1.1 Permits]

Federal permits may be required for individuals or vessels that harvest groundfish and for individuals or facilities (including vessels) that process groundfish or take delivery of live groundfish. In determining whether to require a harvesting or processing permit, and in establishing the terms and conditions for issuing a permit, the Council may consider any relevant factors, including whether a permit:

1. Will enhance the collection of biological, economic, or social data.
2. Will provide better enforcement of laws and regulations, including those designed to ensure conservation and management and those designed to protect consumer health and safety.
3. Will help achieve the goals and objectives of the FMP.
4. Will help prevent or reduce overcapacity in the fishery.
5. May be transferred, and under what conditions.

Separate permits or endorsements may be required for harvesting and processing or for vessels or facilities based on size, type of fishing gear used, species harvested or processed, or such other factors that may be appropriate. The permits and endorsements are also subject to sanctions, including revocation, as provided by section 308 of the MSA.

In establishing a permit requirement, the Council will follow the full-rulemaking procedures in Section 6.2, D.

6.9.1.1 Commercial Fisheries Permits

[6.5.2.1 Permits (General)]

All U.S. commercial fishing vessels are required by state laws to be in possession of a current fishing or landing permit from the appropriate state agency in order to land groundfish in the Washington, Oregon, and California area. Federal limited entry permits authorize fishing within limits and restrictions specified for those permits. ~~Nonpermitted vessels~~ Vessels without such permits are also subject to the specified limits and restrictions for the open access fishery. Federal permits also may be required for groundfish processors. In the event that a Federal fishing or access permit is required, failure to obtain and possess such a Federal permit will be in violation of this FMP.

6.9.1.2 Recreational Fisheries Permits

[6.5.3.1 Permits (General)]

All U.S. recreational fishermen are required by state laws to obtain a recreational permit or license in order to fish for groundfish. In the event that a Federal license or permit is required, failure to obtain and possess such Federal permit will be in violation of this FMP.

6.9.2 Sector Endorsements

The Council may establish sector endorsements, such as with the limited entry fixed gear sablefish fishery. Sector endorsements would limit participation in a fishery for a particular species or species group to persons, vessels, or permits meeting Council-established qualifying criteria. Participants in a sector-endorsed fishery may be subject to sector total catch limit management. A sector endorsement, whether it is applied to vessels

that already hold limited entry permits or to those in the open access or recreational fisheries, is a license limitation program.

6.9.3 Individual Fishing Quota Programs

Under the MSA, "an 'individual fishing quota' means a Federal permit under a limited access system to harvest a quantity of fish, expressed by a unit or unites representing a percentage of the total allowable catch of a fishery that may be received or held for exclusive use by a person." The Council may establish IFQ programs for any commercial fishery sector. IFQ programs would be established for the purposes of reducing fishery capacity, minimizing bycatch, and to meet other goals of the FMP. Participants in an IFQ fishery may be subject to individual total catch limit management (Section 6.7.1).

6.9.4 Facilitating Public-Private Partnerships to Reduce Capacity

If consistent with the goals and objectives of this FMP, the Council may facilitate and encourage private purchases of groundfish limited entry permits and corresponding vessels that would result in reduced fleet capacity. As with the Federally-sponsored 2003 groundfish trawl buyout program, such private purchases would have to permanently foreclose the future use of subject permits and vessels in West Coast groundfish fisheries. Aside from any socioeconomic benefits, reducing fleet fishing capacity can mitigate adverse impacts of fishing to groundfish EFH to the degree that fishing activity with adverse consequences is reduced. Contracts for the purchase of groundfish limited entry permits and/or vessels may contain conditions, specifying that the execution of the contract is contingent on the implementation of other measures to mitigate the adverse impacts of fishing on groundfish EFH. At the same time, the Council will take into account impacts on the segment of the fishing industry and fishing communities that are not a party to such contracts, and also take into account related FMP objectives 13, 15, 16, and 17 (Section 2.1). Mitigation measures may be contingent on Council action or recommendations, and the Council will strive to conduct its decision-making in such a way as to facilitate the private negotiation of such contract conditions. If contingent mitigation measures include establishing new areas closed to bottom trawl, or the modification of the location and extent of existing areas, the habitat conservation framework described in Section 6.2.4 may be used to implement such areas by regulatory amendment, using the procedures described under, Section 6.2, D.

6.9.5 Capacity Reduction Data Collection

[6.5.8 Access Limitation and Capacity Reduction Programs]

The current condition of the groundfish fisheries of the Washington, Oregon, and California region is such that further reduction of the limited entry fleet may be required in the near future. Research and monitoring programs may need to be developed and implemented for the fishery so that information required in a capacity reduction program is available. Such data should indicate the character and level of participation in the fishery, including (1) investment in vessel and gear; (2) the number and type of units of gear; (3) the distribution of catch; (4) the value of catch; (5) the economic returns to the participants; (6) mobility between fisheries; and (7) various social and community considerations.

6.10 Fishery Enforcement and Vessel Safety

The enforceability of fishery management measures affects the health of marine resources and the safety of human life at sea. When considering new management measures or reviewing the current management regime, the Council will consider the fishery and its characteristics, assess whether the measures are sufficiently enforceable to accomplish the objective of those management measures, and describe measures to be taken to reduce risks to the measures' enforceability. For example, the Council introduced depth-based management (See RCAs at Section 6.8.3) in 2003 to protect overfished groundfish species with areas closed to fishing. The Council's subsequent recommendation to implement VMS requirements improved the enforceability of the closed areas so that the closed areas could accomplish the Council's management objective of reducing overfished species catch by preventing vessels from fishing in areas where overfished species are more abundant.

If new management measures are under development, the Council will determine whether requirements are needed to facilitate the enforcement of new management measures.

During the development of new management measures, the Council will consider what measures are also needed to facilitate enforcement. When assessing if the measures are sufficiently enforceable, information should be obtained from:

- Fish tickets inspections and audits
- Enforcement reports
- Discussions with State and Federal fisheries agents and officers
- USCG input
- Observer program reports
- Stakeholder input
- Other relevant information suggested by the Enforcement Consultants and the public

When assessing if the measures are sufficiently enforceable, consideration should be given to enforcement risks from:

- Regulations that are complex and difficult to understand: Regulations that are clear in meaning and devoid of exemptions allow little interpretation of their meaning, making it clear to fishers what they can or cannot do.
- Catch limit evasion: This describes the potential for operators to either not declare, under-declare or report catch as other species or species groups on fish tickets; the potential for fishing vessels to offload to unauthorized processing or tending vessels at sea.
- Obscure chain of possession: Required documentation and labeling requirements make the fish distribution system more transparent. The ability to track a product back from the distributor to the harvester gives enforcement officers a powerful tool. It also promotes voluntary compliance by distributors and harvesters alike.
- Unaccounted for bycatch: This describes the potential for vessels to high grade their catch (discard undesirable sizes or species of fish in order to retain desirable sizes or species) in a manner that increases bycatch mortality.
- Unauthorized fishing: This describes the potential for operators to fish undetected in closed areas, in restricted areas with unauthorized gear, or during closed seasons.

6.10.1 Managing Enforcement Risks

The objective of enforcement is to ensure, in a cost effective way, that all fishing is conducted in accordance with fishery regulations. During the development of new management measures, the Council will consider what measures are also needed to facilitate enforcement. When managing the enforcement risks, consideration should be given to:

- Complexity: Complexity in a management regime can reduce enforceability by making the regime confusing to both fishery participants and enforcement agents. When the Council is developing new management measures, it shall evaluate those measures for their complexity to determine whether management complexity is necessary and whether there are ways to reduce the complexity of new management recommendations.

- Availability and adequacy of surveillance, monitoring, and inspections: What fishery surveillance, monitoring, and inspection methods are available from Federal and State agencies? Are these methods adequate to enforce the measure or measures under Council consideration?
- Compliance behavior: Are the proposed measures adequately enforceable such that they will change fisher behavior in a way that achieves intended results? Are the proposed measures adequately enforceable such that fishers who attempt to evade detection of illegal behavior are not reducing fishing opportunities for those fishers who comply with management measures?
- Unintended consequences: The Council should evaluate the range of behaviors and possible effects that could result if regulations were not adequately enforceable, including: collusion between processors and harvesters, high-value catch recorded as low-value catch, direct sales to retailers without fish tickets being recorded, offloading at-sea to unauthorized vessels, etc.
- Educational programs for public: How does the Council plan to educate the public on new management measures and requirements? Do Council public education efforts, in combination with Federal, State, and Tribe efforts allow adequate time for fishery participants to be made aware of changes to regulations?
- Officer training: Have Federal and State enforcement agents and officers been adequately trained in new fishery management regulations? Does the EC or the Council have training recommendations to ensure that new regulations are clearly understood by those enforcing the regulations?
- Consistent regulations: To the extent possible, similar management measures across the Pacific Council's FMPs, and between State and Federal jurisdictions, should be implemented through a consistent and common regulatory structure.

6.10.2 Vessel Safety

[6.5.1.4 Vessel Safety Considerations]

The Council will take safety issues into account in developing management recommendations, although some safety issues may not be under Council control. For example, the Council may set a fishing season such that participants are able to choose when they participate, but the Council cannot assure that weather conditions will be favorable to all participants throughout that season. The Council will review any new regulatory or management measures recommendations it makes to determine whether such recommendations:

- Improve the safety of fishing conditions for fishery participants.
- Offer new safety risks for fishery participants that could be remedied with revisions to the proposed requirements that would not otherwise weaken the effects of those requirements.

On safety issues, the Council shall consult with its EC and the public, and particularly with the U.S. Coast Guard on any search-and-rescue issues that might arise through proposed regulatory requirements.

6.10.3 Vessel and Gear Identification

[6.5.2.5 Vessel Identification]

The FMP authorizes vessel and gear identification requirements, which may be modified as necessary to facilitate enforcement and vessel recognition. Vessel marking requirements are described in Federal regulations at 50 CFR 660.305 and generally require that each vessel be clearly marked with its vessel number, such that it may be identified from the air or from approaching rescue/enforcement vessels at sea. Vessels may also be identified via transmissions of their position locations under a VMS program. Federal requirements implementing the Council's VMS program are found in regulation at 50 CFR 660.312. Gear identification requirements are described in Federal regulations at 50 CFR 660.382 and 660.383 and generally require that fixed gear be marked with the associated vessel's number so that the gear's owner may be identified.

6.10.4 Prohibitions and Penalties

[11.7 Prohibitions]

Fishery participants are subject both to Federal prohibitions that apply nationwide and to those that apply just to participants in the West Coast groundfish fisheries. Federal regulations on nationwide fishery prohibitions are found at 50 CFR 600.725. Federal regulations on fishery prohibitions specific to the West Coast groundfish fisheries are found at 50 CFR 660.306. Participants in the West Coast groundfish fisheries are also subject to vessel operation and safety requirements of the U.S. Coast Guard (see Federal regulations at Titles 33 and 46).

[11.9 Penalties]

Federal regulations at 50 CFR 600.735 state “Any person committing, or fishing vessel used in the commission of a violation of the MSA or any other statute administered by NOAA and/or any regulation issued under the MSA, is subject to the civil and criminal penalty provisions and civil forfeiture provisions of the MSA, to this section, to 15 CFR part 904 (Civil Procedures), and to other applicable law.”

7.0~~6.6~~ ESSENTIAL FISH HABITAT

[6.6 Essential Fish Habitat]

7.1 How This FMP Addresses Provisions in the MSA Relating to Essential Fish Habitat

[6.6.1 MSA Directives Relating to Essential Fish Habitat]

The MSA (as amended by the Sustainable Fisheries Act) requires FMPs to "describe and identify essential fish habitat…, minimize to the extent practicable adverse effects on such habitat caused by fishing, and identify other actions to encourage the conservation and enhancement of such habitat" (§303(a)(7)). The MSA defines EFH as "those waters and substrate necessary to fish for spawning, breeding, feeding, or growth to maturity." NMFS interpreted this definition in its regulations as follows: "waters" include aquatic areas and their associated physical, chemical, and biological properties that are used by fish, and may include areas historically used by fish where appropriate; "substrate" includes sediment, hard bottom, structures underlying the waters, and associated biological communities; "necessary" means "the habitat required to support a sustainable fishery and the managed species' contribution to a healthy ecosystem"; and "spawning, breeding, feeding, or growth to maturity" covers the full life cycle of a species. For the purposes of identifying groundfish EFH, artificial structures are excluded from the definition of substrate unless designated a habitat area of particular concern (HAPC) in this FMP (Section 7.3); notwithstanding other criteria, HAPC are part of groundfish EFH under the descriptive criteria listed in Section 7.2 of this FMP.

The description and identification of EFH must include habitat for an individual species, but may be designated for an assemblage of species, if appropriate to the FMP. Regulations at 50 CFR 600, Subpart J provides further guidance on these required FMP contents. These guidelines recommend that FMPs identify HAPC, which are specified areas of EFH meeting the criteria described in Section 7.3 of this FMP.

In addition to requiring FMPs to include practicable measures to minimize to the extent practicable the adverse effects of fishing, the MSA also provides a mechanism for NMFS and the Council to address nonfishing impacts to EFH.

These requirements are addressed as follows:

- Section 7.2 provides a succinct description of groundfish EFH. Appendix B to this FMP provides detailed descriptions of EFH for groundfish FMU species, including maps showing EFH for individual groundfish species/lifestages.

- Section 7.3 describes the groundfish HAPC that have been identified by the Council, including the criteria used to identify those areas. Appendix B to this FMP provides additional specification of HAPC.

- Section 7.4 provides an overview of the management measures available to the Council for minimizing the adverse impacts of fishing to EFH. Measures adopted by the Council are described in the appropriate sections of Chapter 6. Appendix C describes an assessment methodology for the effects of fishing on Pacific Coast groundfish EFH. This provides the basis for determining the need for management measures.

- Section 7.5 describes how Federal agencies must consult with NMFS and/or the Council about any ongoing or proposed action they may authorize, fund, or undertake that may adversely affect any EFH. If the action would adversely affect EFH, NMFS will provide recommendations to conserve EFH. In support of these consultations, Appendix D describes nonfishing effects on EFH and recommended conservation measures.

- Section 7.6 describes how the Council will support habitat-related monitoring and research activities through the ongoing management program. Such programs will help close the substantial knowledge gap about many Pacific Coast groundfish species' habitat needs. In support of appropriate monitoring and research, Appendix B identifies many of those data gaps and makes suggestions regarding future research efforts, including needed research on fishing and nonfishing impacts to groundfish EFH.

Protecting, conserving, and enhancing EFH are long-term goals of the Council, and these EFH provisions of the FMP are an important element in the Council's commitment to a better understanding, and conservation and management, of Pacific Coast groundfish populations and their habitat needs.

7.2 Description and Identification of Essential Fish Habitat for Groundfish

[6.6.2 Definition of Essential Fish Habitat for Groundfish]

The Pacific Coast Groundfish FMP manages 80-plus species over a large and ecologically diverse area. Information on the life histories and habitats of these species varies in completeness, so while some species are well-studied, there is relatively little information on certain other species. Information about the habitats and life histories of the species managed by the FMP will certainly change over time, with varying degrees of information improvement for each species. For these reasons, it is impractical for the Council to include descriptions identifying EFH for each life stage of the managed species in the body of the FMP. Therefore, the FMP includes a description of the overall area identified as groundfish EFH and describes the assessment methodology supporting this designation. Life histories and EFH identifications for each of the individual species are provided in Appendix B, which will be revised and updated to include new information as it becomes available. Such changes will not require FMP amendment. This framework approach is similar to the Council's stock assessment process, which annually uses the SAFE document to update information about groundfish stock status without amending the FMP. Like the SAFE document, any EFH updates will be reviewed in a Council public forum.

The overall extent of groundfish EFH for all FMU species is identified as all waters and substrate within the following areas:

- Depths less than or equal to 3,500 m (1,914 fathoms) to mean higher high water level (MHHW) or the upriver extent of saltwater intrusion, defined as upstream and landward to where ocean-derived salts measure less than 0.5 ppt during the period of average annual low flow.
- Seamounts in depths greater than 3,500 m as mapped in the EFH assessment GIS.
- Areas designated as HAPC not already identified by the above criteria.

This EFH identification is precautionary because it is based on the currently known maximum depth distribution of all life stages of FMU species. This precautionary approach is taken because uncertainty still exists about the relative value of different habitats to individual groundfish species/life stages, and thus the actual extent of groundfish EFH. For example, there were insufficient data to derive habitat suitability probability (HSP) values for all species/life stages. Furthermore, the data used to determine HSP values is subject to continued refinement. While recognizing these limitations, the 100% HSP area, all of which occurs in depths less than 3,500 m, is identified as a part of groundfish EFH, recognizing that the best scientific information demonstrates this area is particularly suitable groundfish habitat. While precautionary, groundfish EFH still constitutes an area considerably smaller than the entire West Coast EEZ.

Figure 7-1 shows the extent of this EFH identification.

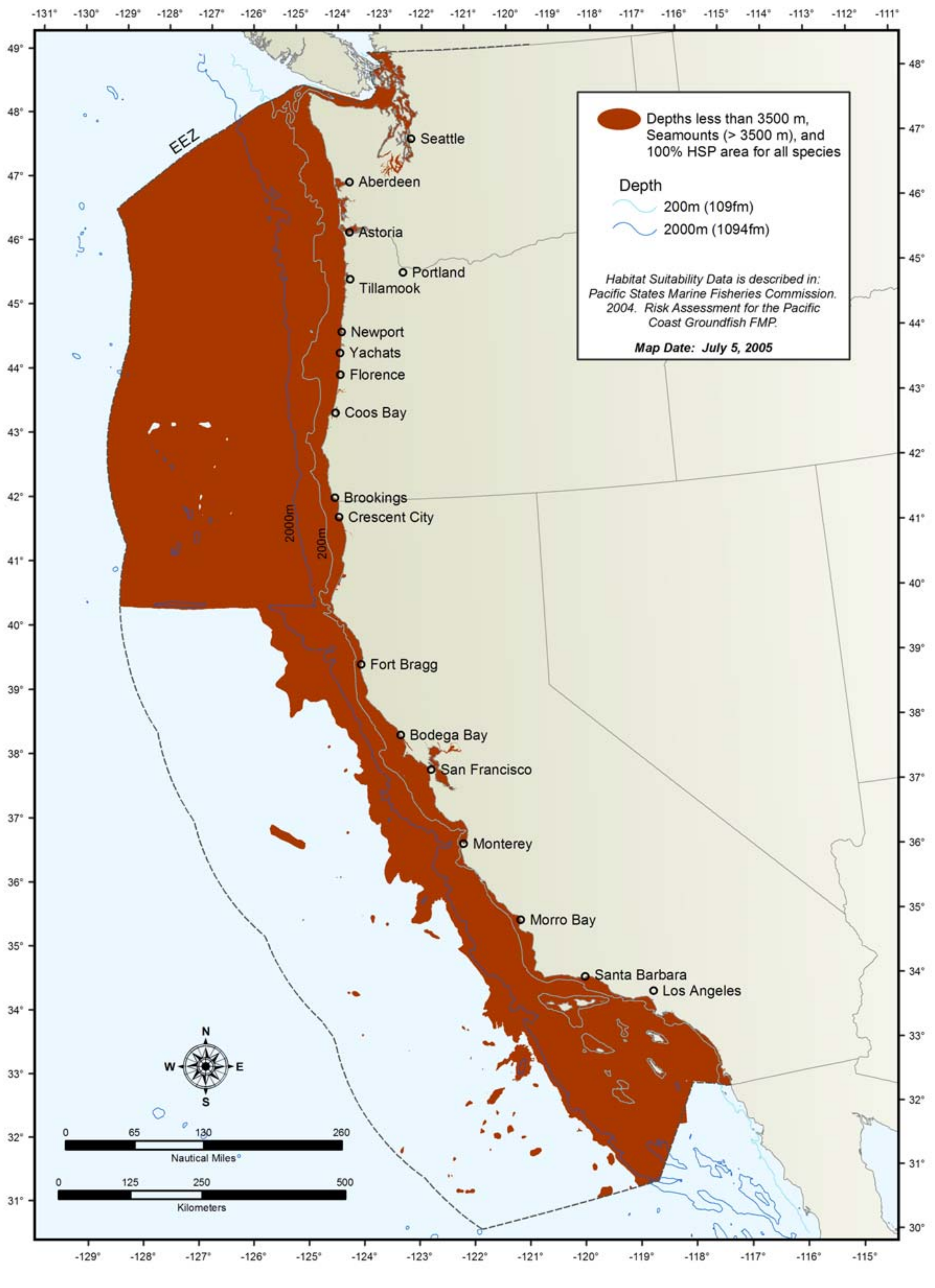

Figure 7-1. Groundfish EFH

7.2.1 Use of Habitat Suitability Probability to Identify EFH

The HSP, mentioned above, provides more evaluative detail about EFH for groundfish species. It was developed by NMFS and their outside contractors through a modeling and assessment process (MRAG Americas Inc., *et al*. 2004). This assessment differs slightly from the approach in these guidelines to organize the information necessary to describe and identify EFH. The guidelines recommend organizing the information by kind of data, and then suggest describing EFH based on the highest level of data. The HSP approach is a much more sophisticated method to analyze the information and provides a better way to scientifically analyze the information used to describe and identify EFH. The model considers basic pieces of information used to describe and identify EFH: location, depth, and substrate. It then determines areas used by the different life stages of groundfish, provides profiles for individual species by life stage, combines them in a GIS analysis into an ecosystem level set of fish assemblages, and predicts groundfish habitat. By using this approach to analyzing the information, HSP provides a better method to analyze the EFH information and develop the description and identification of EFH than the method outlined in the guidelines at 50 CFR 600.815. This is because it is takes advantage of computer analyses of a large amount of information that is organized in such a way that it provides a clear understanding of the relationship between groundfish and habitat. The EFH Model used to develop HSP values for individual groundfish species/life stage is further described in Appendix B.

The assessment consolidates the best available ecological, environmental, and fisheries information into various databases, including a geographic information system (GIS) and the habitat use database (HUD). The following types of data were used in this process to identify groundfish EFH:

- Geological substrate (GIS)
- Estuaries (GIS)
- Canopy kelp (GIS)
- Seagrass (GIS)
- Structure-forming invertebrate information
- Bathymetric data (GIS)
- Latitude (GIS)
- Information on pelagic habitat
- Data quality (GIS and other databases)
- Information on the functional relationships between fish and habitat (including a literature review consolidated in the HUD).

Ideally, EFH would be defined by delineating habitat in terms of its contribution to spawning, breeding, feeding, growth to maturity, and production; however, comprehensive data on these functions are not available. Because of these data limitations, a model was developed to predict an overall measure of the suitability of habitat in particular locations for as many groundfish species as possible. This model uses available information on the distribution and habitat-related density of species. Where possible, the suitability of habitat was measured using the occurrence of fish species in NMFS trawl survey catches. For species not well represented in the trawl catches, information from the scientific literature was used.

The model characterizes habitat in terms of three variables: depth, latitude, and substrate (both physical and biogenic substrate, where possible). For the purposes of the model, these three characteristics provide a reasonable representation of the essential features of habitat that influence the occurrence of fish. Depending on these characteristics and the observed distributions of fish in relation to them, each location (a parcel or polygon of habitat in the GIS) is assigned a suitability value between zero and 100%. This is the HSP, which was calculated for as many species and life stages in the FMU as possible, based on available data. These scores and the differences between scores for different locations are then used to develop a proxy for the areas that can be regarded as "essential." The higher the HSP, the more likely the habitat is suitable for the habitat needs of a given groundfish species.

The EFH assessment model provides spatially explicit estimates of HSP for 160 groundfish species/life stage combinations, including the adults of all FMU species. Distribution ranges for depth and latitude were derived where possible from in-situ observations of occurrence in NMFS trawl survey catches. Where survey data were insufficient, depth and latitude ranges were extracted from reports and papers in the scientific literature. Preferences for substrate types were also taken from the scientific literature. The HSP values for each habitat polygon are mapped using GIS software. EFH regulations at 50 CFR 600, Subpart J suggest that inferences may be made about the extent of EFH, through appropriate means, where data are lacking to determine EFH for each species and life stage. Such is the case for the current EFH identification, which infers that no groundfish species/life stage will occupy EFH beyond the currently-known maximum depth for groundfish species, the basis for identifying EFH out to a maximum depth of 3,500 m. This inference is based on the supposition that the life history characteristics of species for which information is unavailable are sufficiently similar to the characteristics of those species for which information is available such that the identified groundfish EFH encompasses all species.

HSP values, assigned to discrete areas represented by the polygons in the GIS, can be used to better understand where favorable groundfish habitat occurs. The EFH identification described above, all waters and bottom areas in depths less than 3,500 m, is a precautionary approach encompassing the maximum range of groundfish species within the management area, based on the best scientific information. As noted above, this precautionary identification has been adopted because there is not enough information to determine the relative value of different habitats for all groundfish species/life stages. Therefore, EFH for all groundfish is identified in a manner that provides the greatest opportunity to apply conservation measures. Within this precautionary EFH identification it is recognized that HSP values provide additional information about groundfish EFH. For this reason all areas assigned an HSP value greater than 0% for any given species are included as a subset of this broader, precautionary identification of groundfish EFH. The model and resulting HSP values also can be used to support future habitat-related management decisions, which may involve considering tradeoffs between management effects on different habitats. These tradeoffs could be compared with respect to the suitability (HSP value) of different areas potentially affected by the management action, for example.

In addition to supporting the description and identification of EFH for the individual species and life stages, these assessment-related techniques can be used as a basis for an ecosystem approach to management. For example, the HSP profiles for individual species/life stages can be combined by GIS analyses into ecosystem-level fish assemblages to investigate and predict environmental consequences of proposed projects.

As new data become available, they can be incorporated into the assessment to refine and improve HSP modeling. The Council supports and coordinates this effort through its standing committees and any ad hoc committees that may be formed for this purpose.

7.3 Habitat Areas of Particular Concern

EFH guidelines published in Federal regulations identify habitat areas of particular concern as types or areas of habitat within EFH that are identified based on one or more of the following considerations:

- The importance of the ecological function provided by the habitat.
- The extent to which the habitat is sensitive to human-induced environmental degradation.
- Whether, and to what extent, development activities are or will be stressing the habitat type.
- The rarity of the habitat type.

(50 CFR 600.815(a)(8))

Based on these considerations, the Council has designated both areas and habitat types as HAPC. In some cases, HAPC identified by means of specific habitat type may overlap with the designation of a specific area. The HAPC designation covers the net area identified by habitat type or area. Designating HAPC facilitates the consultation process described in Section 7.5 by identifying ecologically important, sensitive, stressed or rare habitats that should be given particular attention when considering potential nonfishing impacts. Their identification is the principal way in which the Council can address these impacts.

HAPC based on habitat type may vary in location and extent over time. For this reason, the mapped extent of these areas offers only a first approximation of their location. Defining criteria of habitat-type HAPC are described below, which may be applied in specific circumstances to determine whether a given area is designated as groundfish HAPC. HAPC include all waters, substrates, and associated biological communities falling within the area defined by the criteria below.

Figure 7.2 is a map showing the location of these HAPC. For HAPC defined by habitat type, as opposed to discrete areas, this map offers a first approximation of their location and extent. The precision of the underlying data used to create these maps, and the fact that the extent of HAPC defined by key benthic organisms (canopy kelp, seagrass) can change along with changes in the distribution of these organisms, means that at fine scales the map may not accurately represent their location and extent. Defining criteria are provided in the following descriptions of HAPC, which can be used in conjunction with the map to determine if a specific location is within one of these HAPC. The areas of interest HAPC and oil platform HAPC are defined by discrete boundaries. The coordinates defining these boundaries are listed in Appendix B.

7.3.1 Designated HAPC

Figure7-2 shows the location and extent of the HAPC described below.

7.3.1.1 Estuaries

Estuaries are protected nearshore areas such as bays, sounds, inlets, and river mouths, influenced by ocean and freshwater. Because of tidal cycles and freshwater runoff, salinity varies within estuaries and results in great diversity, offering freshwater, brackish and marine habitats within close proximity (Haertel and Osterberg 1967). Estuaries tend to be shallow, protected, nutrient rich, and are biologically productive, providing important habitat for marine organisms, including groundfish.

<u>Defining characteristics</u>: The inland extent of the estuary HAPC is defined as MHHW, or the upriver extent of saltwater intrusion, defined as upstream and landward to where ocean-derived salts measure less than 0.5 ppt during the period of average annual low flow. The seaward extent is an imaginary line closing the mouth of a river, bay, or sound; and to the seaward limit of wetland emergents, shrubs, or trees occurring beyond the lines closing rivers, bays, or sounds. This HAPC also includes those estuary-influenced offshore areas of continuously diluted seawater. This definition is based on Cowardin, et al. (1979)

7.3.1.2 Canopy Kelp

Of the habitats associated with the rocky substrate on the continental shelf, kelp forests are of primary importance to the ecosystem and serve as important groundfish habitat. Kelp forest communities are found relatively close to shore along the open coast. These subtidal communities provide vertically-structured habitat throughout the water column: a canopy of tangled blades from the surface to a depth of ten feet, a midwater, stipe region, and the holdfast region at the seafloor. Kelp stands provide nurseries, feeding grounds, and 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 (Bond, *et al.* 1998). Their net primary production is an important component to the energy flow within food webs. 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 as living tissue on attached plants, as drift in the form of whole plants or detached pieces, and as dissolved organic matter exuded by attached and drifting plants (Foster and Schiel 1985).

GIS data for the floating kelp species, *Macrocystis* spp. and *Nereocystis* sp., are available from state agencies in Washington, Oregon, and California. These data have been compiled into a comprehensive data layer delineating kelp beds along the West Coast. The kelp source data were provided for each state by Washington Department of Natural Resources, Oregon Department of Fish and Wildlife, and California Department of Fish and Game. Source data were collected using a variety of remote sensing techniques, including aerial photos and multispectral imagery. Because kelp abundance and distribution is highly variable, these data do not necessarily represent current conditions. However, data from multiple years were compiled together with the assumption that these data would indicate areas where kelp has been known to occur. Washington State has the most comprehensive database, covering ten years (1989-1992, 1994-2000) of annual surveys of the Straits of Juan de Fuca and the Pacific Coast. Oregon conducted a coastwide survey in 1990 and then surveyed select reefs off southern Oregon in 1996-1999. A comprehensive kelp survey in California was performed in 1989 and additional surveys of most of the coastline occurred in 1999 and 2002.

<u>Defining characteristics</u>: The canopy kelp HAPC includes those waters, substrate, and other biogenic habitat associated with canopy-forming kelp species (e.g., *Macrocystis* spp. and *Nereocystis* sp.).

7.3.1.3 Seagrass

Seagrass species found on the West Coast of the U.S. include eelgrass species (*Zostera* spp.), widgeongrass (*Ruppia maritima*), and surfgrass (*Phyllospadix* spp.). These grasses are vascular plants, not seaweeds, forming dense beds of leafy shoots year-round in the lower intertidal and subtidal areas. Eelgrass is found on soft-bottom substrates in intertidal and shallow subtidal areas of estuaries and occasionally in other nearshore areas, such as the Channel Islands and Santa Barbara littoral. Surfgrass is found on hard-bottom substrates along higher energy coasts. 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).

Despite their known ecological importance for many commercial species, seagrass beds have not been as comprehensively mapped as kelp beds. Wyllie-Echeverria and Ackerman (2003) published an excellent coastwide assessment of seagrass that identifies sites known to support seagrass and estimates of seagrass bed areas; however, their report does not compile existing GIS data. GIS data for seagrass beds were located and compiled as part of the groundfish EFH assessment process.

Eelgrass mapping projects have been undertaken for many estuaries along the West Coast. These mapping projects are generally done for a particular estuary, and many different mapping methods and mapping scales have been used. Therefore, the data that have been compiled for eelgrass beds are an incomplete view of eelgrass distribution along the West Coast. Data depicting surfgrass distribution are very limited—the only GIS data showing surfgrass are for the San Diego area.

Defining characteristics: The seagrass HAPC includes those waters, substrate, and other biogenic features associated with eelgrass species (*Zostera* spp.), widgeongrass (*Ruppia maritima*), or surfgrass (*Phyllospadix* spp.).[4]

7.3.1.4 Rocky Reefs

Rocky habitats are generally categorized as either nearshore or offshore in reference to the proximity of the habitat to the coastline. Rocky habitat may be composed of bedrock, boulders, or smaller rocks, such as cobble and gravel. Hard substrates are one of the least abundant benthic habitats, yet they are among the most important habitats for groundfish.

Defining characteristics: The rocky reefs HAPC includes those waters, substrates and other biogenic features associated with hard substrate (bedrock, boulders, cobble, gravel, etc.) to MHHW. A first approximation of its extent is provided by the substrate data in the groundfish EFH assessment GIS. However, at finer scales, through direct observation, it may be possible to further distinguish between hard and soft substrate in order to define the extent of this HAPC.

7.3.1.5 Areas of Interest

Areas of interest are discrete areas that are of special interest due to their unique geological and ecological characteristics. The following areas of interest are designated HAPC:

- Off of Washington: All waters and sea bottom in state waters shoreward from the three nautical mile boundary of the territorial sea shoreward to MHHW.
- Off of Oregon: Daisy Bank/Nelson Island, Thompson Seamount, President Jackson Seamount.
- Off of California: all seamounts, including Gumdrop Seamount, Pioneer Seamount, Guide Seamount, Taney Seamount, Davidson Seamount, and San Juan Seamount; Mendocino Ridge; Cordell Bank; Monterey Canyon; specific areas in the Federal waters of the CINMS; specific areas of the Cowcod Conservation Area.

The Washington State waters HAPC encompasses a variety of habitats important to groundfish, including other HAPC such as rocky reef habitat supporting juvenile rockfish (primarily north of Grays Harbor) and estuary areas supporting numerous economically and ecologically important species, including juvenile lingcod and English sole. Sandy substrates within state waters (primarily south of Grays Harbor) are important habitat for juvenile flatfish. A large proportion of this area is also contained within the Olympic Coast National Marine Sanctuary and three offshore national wildlife refuges, which provide additional levels of protection to these sensitive nearshore coastal areas.

Seamounts and canyons are prominent features in the coastal underwater landscape, and may be important in rockfish management because "rockfish distributions closely match the bathymetry of coastal waters" (Williams and Ralston 2002).

Seamounts rise steeply to heights of over 1,000 m from their base and are typically formed of hard volcanic substrate. They are unique in that they tend to create complex current patterns (Lavelle, *et al.* 2003; Mullineaux and Mills 1997) and have highly localized species distributions (de Forges, *et al.* 2000). Seamounts have relatively high biodiversity and up to a third of species occurring on these features may be endemic (de Forges, *et al.* 2000). Because the faunal assemblages on these features are still poorly studied,

4 The extent and effect of non-native species in seagrass HAPC, such as *Zostera japonica*, may be considered in conservation recommendations NMFS makes to other Federal and state agencies (see Section 7.5)

and species new to science are likely to be found, human activities affecting these features need careful management. Currents generated by seamounts retain rockfish larvae (Dower and Perry 2001; Mullineaux and Mills 1997) and zooplankton, a principal food source for rockfish (Genin, *et al.* 1988; Haury, *et al.* 2000). Several species observed on seamounts, such as deepsea corals, are particularly vulnerable to anthropogenic impacts (Monterey Bay National Marine Sanctuary 2005).

Canyons are complex habitats that may provide a variety of ecological functions. Shelf-edge canyons have enhanced biomass due to onshore transport and high concentrations of zooplankton, a principal food source of juvenile and adult rockfish (Brodeur 2001). Canyons may have hard and soft substrate and are high relief areas that can provide refuge for fish, and localized populations of groundfish may take advantage of the protection afforded by canyons and the structure-forming invertebrate megafauna that grow there (Monterey Bay National Marine Sanctuary 2005). A canyon in the North Pacific was observed to have dense aggregations of rockfish associated with sea whips (*Halipteris willemoesi*), while damaged sea whip “forests” had far fewer rockfish (Brodeur 2001).

Daisy Bank is a highly unique geological feature that occurs in Federal waters due west of Newport, Oregon and appears to play a unique and potentially rare ecological role for groundfish and large invertebrate sponge species. The bank was observed in 1990 to support more than 6,000 juvenile rockfish per hectare; a number thirty times higher than those observed on adjacent banks during the same study period. The same study also indicated that Daisy Bank seems to support more and larger lingcod and large sponges than other nearby banks (Mark Hixon, pers. comm., August 2004).

Discrete areas at Cordell Bank and the Channel Island National Marine Sanctuary, and the Cowcod Conservation Areas, are designated HAPC because they are afforded high levels of protection through their inclusion in a National Marine Sanctuary and/or designation as an ecologically important closed area (see Section 7.4). These designations both reflect and enhance their value as groundfish habitat.

<u>Defining characteristics</u>: As noted above, the shoreward boundary of the Washington State waters HAPC is defined by MHHW while the seaward boundary is the extent of the three-mile territorial sea. The remaining area-based HAPC are defined by their mapped boundaries in the EFH assessment GIS. The coordinates defining these boundaries may be found in Appendix B to this FMP.

7.3.1.6 Oil Production Platforms

Waters and substrate associated with the platform jackets of 13 specified oil production platforms in Southern California waters are designated groundfish HAPC. (See Table 7-1 for the names and locations of these platforms.) Surveys demonstrate that high concentrations of groundfish have been observed in association with these platforms, including overfished species such as bocaccio and cowcod (Love, *et al.* 2003). In addition to providing suitable habitat, most of these structures are not fished and act as de facto reserves. The platforms rise steeply from the bottom and provide unique high-relief habitat.

<u>Defining characteristics</u>: The HAPC area is defined by a circle around each platform whose center is the published location given by latitude-longitude coordinates with a radius 1.5 times the maximum published platform jacket dimension (U.S. Department of the Interior, Minerals Management Service, OCS Pacific Region).

Table 7-1: Oil production platforms designated as groundfish HAPC.

Name	Location (Latitude, Longitude)
Platform A	34° 19.91317’ N, 119° 36.74817’ W

Platform B	34° 19.94050' N, 119° 37.29217' W
Platform C	34° 19.97550' N, 119° 37.84600' W
Edith	33° 35.74717' N, 118° 8.441167' W
Gail	34° 7.504830' N, 119° 24.01300' W
Gilda	34° 10.94050' N, 119° 25.11383' W
Grace	34° 10.77433' N, 119° 28.06967' W
Habitat	34° 17.19700' N, 119° 35.28567' W
Harvest	34° 28.14817' N, 120° 40.84900' W
Hermosa	34° 27.30500' N, 120° 38.78333' W
Hidalgo	34° 29.70083' N, 120° 42.13733' W
Hondo	34° 23.44383' N, 120° 7.231833' W
Irene	34° 36.62516' N, 120° 43.76567' W

7.3.2 Process for Modifying Existing or Designating New HAPC

Recognizing that new scientific information could reveal other important habitat areas that should be designated HAPC, the Council may modify or eliminate an existing HAPC or designate a new HAPC through the process described below. This process allows organizations and individuals to petition the Council at any time to consider a new designation and ensures, provided they submit the required information described below, their proposal will be considered by the Council. The process includes the following elements, which may be described in more detail in Council Operating Procedures:

1. A petitioner submits a proposal to eliminate or modify an existing HAPC, or designate a new HAPC, by letter to the Chairman and Executive Director of the Council. Proposals must include a description of: (a) for new HAPC, the location of the HAPC, defined by specified geographic characteristics such as coordinates, depth contours, or distinct biogeographic characteristics; (b) for new HAPC, how the HAPC meets the criteria specified in regulations at 50 CFR 600.815 (a)(8) or for changes to existing HAPC how such a change would better meet these criteria; and (c) a preliminary assessment of potential biological and socioeconomic effects of the proposed change or new designation.

2. Council/NMFS staffs determine whether the proposal contains the mandatory components outlined in step one. If this technical review determines that the proposal is inadequate, staff return it to the petitioner for revision and resubmission. If it is determined adequate, staff forward it to the Council for full consideration over three Council meetings as described below.

3. At the first meeting, the Council establishes a timeline for consideration, including merit review by the EFH OC and the SSC.

4. At the second meeting, the EFH OC and SSC provide their merit review to the Council. Depending on the results of this review, the Council directs staff to begin developing any documentation necessary for implementation. The proposal is also be forwarded to other advisory bodies for additional review.

5. At the third meeting the Council receives advisory body reports, reviews implementing documentation, and decides whether to approve an FMP amendment for Secretarial review.

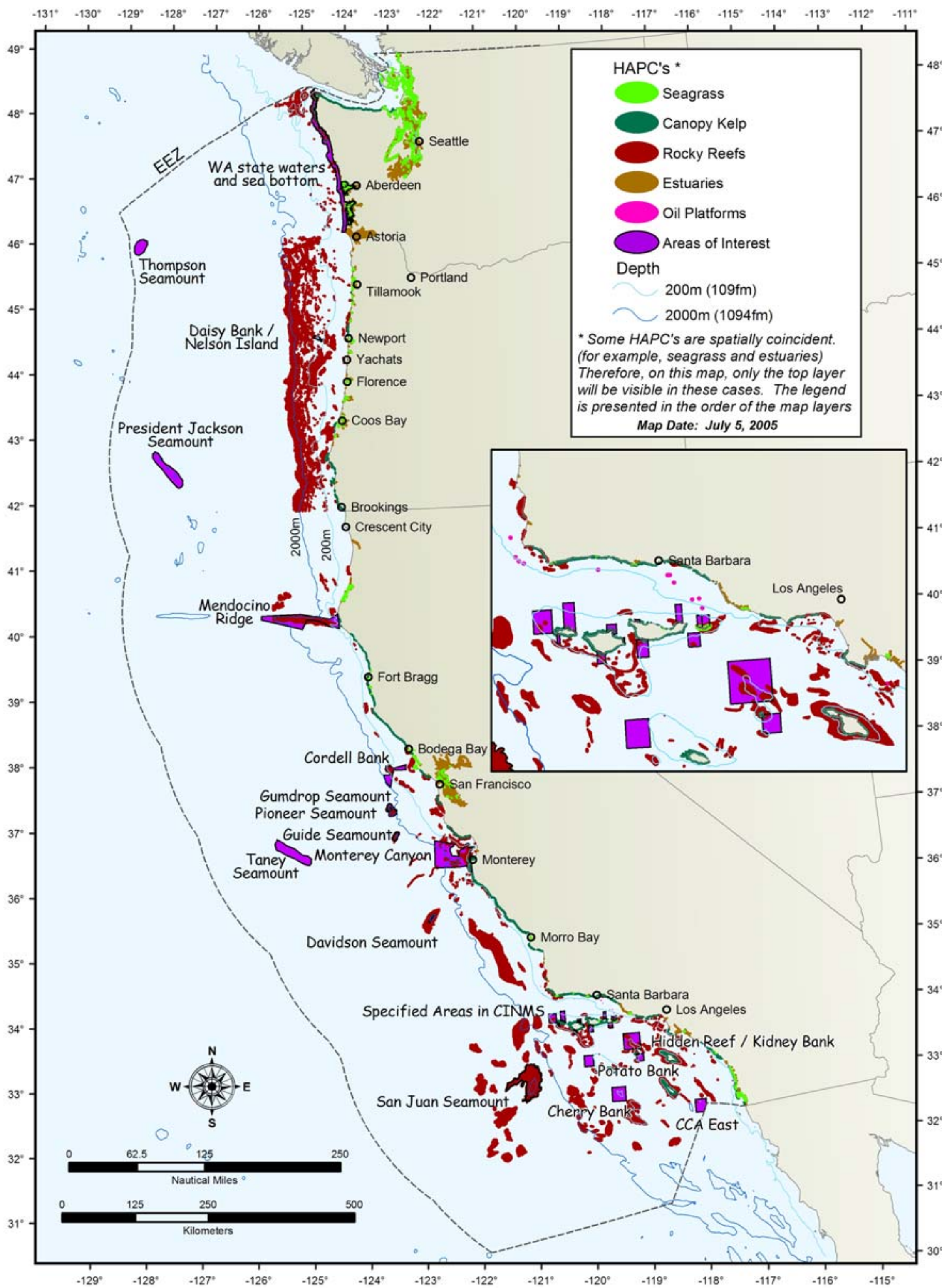

Figure 7-2. Groundfish HAPC

7.4 Management Measures To Minimize Adverse Impacts on Essential Fish Habitat from Fishing

[6.6.3 Management Measures To Minimize Adverse Impacts on Essential Fish Habitat from Fishing]

Chapter 6 describes the range of measures available to the Council for managing groundfish fisheries. These include measures with permanent effect and those that may be periodically adjusted in concert with the specification of harvest levels described in Chapter 5. Management measures are typically established through Federal rulemaking, using one of the procedures described in Section 6.2. Some of the management measures described in Chapter 6 have been implemented specifically to mitigate adverse impacts to EFH while others may have another primary purpose (such as bycatch reduction) but may have a corollary mitigating effect on adverse impacts to EFH. Those measures specifically intended to conserve EFH are summarized below by reference to the relevant section in Chapter 6.

Three broad categories of management measures are recognized as being effective for mitigating adverse impacts to EFH: gear modifications, closed areas, and overall reductions of fishing effort (National Research Council 2002). Section 6.6 defines legal groundfish gear and describes restrictions on their use. The Council has established several prohibitions and restrictions on gear to mitigate adverse impacts to EFH. These include restrictions on trawl footrope size, and prohibition of the use of dredges and beam trawls in the management area. Section 6.8 describes time/area closures, including the trawl footprint closure and ecologically important habitat closures, implemented to mitigate adverse impacts to EFH. The bottom trawl footprint closure prohibits the use of bottom trawl gear in depths greater than 700 fathoms, preventing the expansion of the use of this gear type into where its historical use has been limited. Additional ecologically important habitat areas are also closed to specified gear types shoreward of the trawl footprint boundary. These are areas that are thought to be especially ecologically important or vulnerable to the effects of fishing based on information about substrate type, topography, and the occurrence of biogenic habitat. Section 6.9 describes the range of measures available to control fishing capacity. Reductions in fishing capacity, which may be loosely defined as the number, size, and configuration of vessels participating in a fishery, may reduce overall fishing effort. Reducing fishing effort is relevant to mitigating the effects of fishing on EFH if the areal or temporal extent of gear contact with EFH is reduced. Although the rationale for measures that result in capacity reduction may be to prevent overfishing, reduce bycatch, or increase economic efficiency, they may have a corollary mitigating effect for EFH impacts. The Council will consider any such mitigating effects when developing capacity reduction programs or measures.

In determining whether it is practicable to minimize an adverse effect from fishing, the Council will consider whether, and to what extent, the fishing activity is adversely affecting EFH, the nature and extent of the adverse effect on EFH, and whether management measures are practicable. The Council will consider the long-term and short-term costs and benefits to the fishery and to EFH, along with any other factors consistent with national standard 7.

As described in Section 6.2.5, Indian treaty rights apply in U AND A grounds of the Makah, Hoh, and Quileute Tribes, and the Quinalt Indian Nation. In recognition of the sovereign status and co-manager role of these Indian tribes over shared Federal and tribal fishery resources, the regulations at 50 CFR 660.324(d) establish procedures that will be followed for the development of regulations regarding tribal fisheries within the U AND A grounds. They state that the agency will develop regulations in consultation with the affected tribe(s) and insofar as possible, with tribal consensus. Application of management measures intended to mitigate the adverse impacts of fishing on EFH within U AND A grounds will be subject to these procedures.

7.5 EFH Coordination, Consultation, and Recommendations

[6.6.1 MSA Directives Relating to Essential Fish Habitat]
[11.10.5 Consultation Procedures—Nonfishing Impacts]

The MSA (§305(b)) also provides a mechanism for NMFS and Council to address nonfishing impacts to EFH. Federal agencies are required to consult with NMFS on all activities, and proposed activities, authorized, funded, or undertaken by the agency that may adversely affect EFH, whether it occurs within or outside EFH. (For example, certain terrestrial activities may adversely affect EFH.) NMFS must provide recommendations to conserve EFH to Federal agencies undertaking such activities. Federal agencies must respond within 30 days of receiving conservation recommendations from NMFS, describing measures to avoid, mitigate, or offset the impact of the proposed action on EFH. If the response is inconsistent with NMFS's conservation recommendations, the agency will explain why it did not follow them.

NMFS must also provide recommendations to conserve EFH to state agencies if it receives information on their actions. However, they are not required to initiate consultation with NMFS, nor are they required to respond to any recommendations provided by NMFS.

The Council may provide recommendations on actions that may affect habitat, including EFH. Such recommendations may include measures to avoid, minimize, mitigate, or otherwise offset adverse effects on EFH resulting from actions or proposed actions authorized, funded, or undertaken by that agency. The Council will encourage Federal agencies conducting or authorizing work that may adversely affect groundfish EFH to minimize disturbance to EFH. The Council must provide recommendations if the action is likely to substantially affect salmon habitat or EFH.

Whenever possible, EFH consultations will be combined with other interagency consultations and environmental review procedures, which may be required under the Endangered Species Act, Clean Water Act, National Environmental Policy Act, Fish and Wildlife Coordination Act, Federal Power Act, Rivers and Harbors Act, or other statutes. EFH consultation may be either programmatic (concerning agency programs or policies) or project-specific. Programmatic consultations involve broad Federal actions as defined under NEPA (40 CFR 1502.4(b)), such as the adoption of new programs or policies. Programmatic actions may encompass several project-specific actions sharing common geographic scope, project elements, or timing. When appropriate, NMFS will use programmatic consultations to consider related projects, thereby eliminating repetitive discussions and helping to focus on the appropriate level of analysis. Considering the broad geographic scope of groundfish EFH, this approach can help address a wide variety of related development activities while also considering their cumulative effects.

7.6 Review and Revision of Essential Fish Habitat ~~Definitions and~~ Description~~s~~ and Identification

[6.6.4 Review and Revision of Essential Fish Habitat Definitions and Descriptions]

The Council will~~ periodically~~ review the ~~available information on~~ EFH descriptions and identification, HAPC designations, and information on fishing impacts and nonfishing impacts included in this FMP at least every five years. ~~and include n~~New information may be included in the annual SAFE document or similar document and, if necessary, the FMP may be amended. ~~A review and update of available information will be conducted at least once every five years as appropriate, but t~~The Council may schedule more frequent reviews in response to recommendation by the Secretary or for other reasons.

7.7 Habitat-related Research and Monitoring

The five-year review cycle described above accommodates progress in scientific understanding of marine habitat. New data on the habitat needs of groundfish species will improve the assessment model described in Section 7.2.1. Better information about the location, function, and consequences of human activity on habitat underpins efforts to conserve EFH and could enable more precise quantification of adverse impacts to EFH resulting from human activities, including fishing. The Council supports the use of existing research and monitoring programs to increase scientific understanding about EFH. Where practicable, these programs may be supplemented or modified to gather habitat-related information.

Currently, groundfish limited entry trawl vessels are required to record information on the time and location of fishing activities, along with estimates of catch composition, in a logbook. Some of these data are entered into the Pacific Fisheries Information Network (PacFIN) data system and may be accessed by managers. Information on fishing location has proved invaluable to managers. These data show the spatial distribution of fishing effort, which can be used to evaluate what EFH area may be adversely affected by fishing. The Council supports expansion of the logbook program to cover other fishery sectors besides groundfish limited entry trawl, where practicable. The Council also supports entering more of the existing information gathered by means of logbooks, such as the haul-back position of trawl tows, into the data system.

This FMP authorizes the use of VMS programs (see Section 6.4.2). As of 2004, specified groundfish limited entry permitted vessels were required to carry VMS transceivers in order to enforce the RCAs. Because the bottom trawl footprint closure and ecologically sensitive area closures (see Sections 7.4 and 6.8) apply to vessels beyond those holding groundfish limited entry permits, the Council will consider expansion of this requirement to other fishery sectors, as appropriate, to effectively enforce habitat-related closed areas. VMS data also could be valuable in continuing efforts to assess the effects of fishing on EFH if information on track lines of trawl or fixed gear sets could be accessed for research purposes.

Establishing research sites, unaffected by fishing, could be used in comparative studies to better understand the effects of fishing on habitat. Area closures established to manage bycatch, promote stock rebuilding, protect habitat, and for other reasons, offer opportunities to measure the length of time needed for habitat features and function to recover. Over time, these sites could also be compared with sites where fishing is ongoing in order to research the effects of fishing. The Council will support, through the work of its advisory bodies, such as the Habitat Committee, efforts to identify discrete sites within closed areas in order to focus research efforts. By encouraging research at identified sites, results can be more easily compared. Such a system or research sites should include a representative sample of habitat types in order to allow comparison of the effects of fishing across these different types.

~~7~~8.0 EXPERIMENTAL FISHERIES

~~Among the objectives of this FMP is to provide for the orderly development of the domestic groundfish fisheries, including promotion of new domestic fisheries, or otherwise contribute to effective management of the stock. In order to accomplish this objective, it is desirable to permit limited domestic experimental fishing (recreational or commercial) for groundfish species covered by this plan. This provision is intended to promote increased utilization of underutilized species, realize the expansion potential of the domestic groundfish fishery, and increase the harvest efficiency of the fishery consistent with the MSA and the~~

Experimental fisheries may be useful to the Council in allowing members of the public to work with government agencies to bring new fishery management ideas into the Council process. For example, there may be some modification to current gear types that will reduce the effects of that gear on habitat, or reduces bycatch rates with that gear in otherwise closed areas. The Council supports the use of EFPs to promote public and agency innovation in furthering the FMP's fishery management ~~goals of this FMP~~goal and objectives. Experimental fishing will be conducted under Federal EFPs issued under Section 303(b)(1) of the MSA.

The Regional ~~Director~~Administrator may authorize, for limited experimental purposes, the direct or incidental harvest of groundfish managed under this FMP ~~which~~that would otherwise be prohibited. No experimental fishing may be conducted unless authorized by an EFP issued by the Regional ~~Director~~Administrator to the participating vessel in accordance with the criteria and procedures specified in this section. EFPs will be issued without charge. EFPs may be issued to Federal or state agencies, marine fish commissions, or other entities, including individuals. An applicant for an EFP need not be the owner or operator of the vessel(s) for which the EFP is requested. Nothing in this section is intended to inhibit the authority of the Council or any other fishery management entity from requesting that the Regional ~~Director~~Administrator consider issuance of EFPs for a particular experiment in advance of the Regional ~~Director's~~Administrator's receipt of applications for EFPs to participate in that experiment.

EFPs that would result in the directed or incidental take of groundfish should be reviewed through the Council process prior to application to NMFS. The Council review process allows the Council determine whether portions of the harvest specifications of any groundfish species or species group would need to be set aside for harvest expected to be taken under EFPs. EFP proposals must contain a mechanism, such as at-sea fishery monitoring, to ensure that the harvest limits for targeted and incidental species are not exceeded and are accurately accounted for. Also, EFP proposals must include a description of the proposed data collection and analysis methodology used to measure whether the EFP objectives will be met.

EFP applicants may have their proposals reviewed through the Council process in accordance with Council Operating Procedure #19, Protocol for Consideration of EFPs for Groundfish Fisheries. This protocol includes requirements for EFP submission, proposal contents, review and approval, and progress reporting. The Council will give priority consideration to those EFP applications that:

1. Emphasize resource conservation and management with a focus on bycatch reduction (highest priority).
2. Encourage full retention of fishery mortalities.
3. Involve data collection on fisheries stocks and/or habitat.
4. Encourage innovative gear modifications and fishing strategies to reduce bycatch.
5. Encourage the development of new market opportunities.
6. Explore the use of higher trip limits or other incentives to increase utilization of underutilized species while reducing bycatch of non-target species.

Criteria and procedures for the issuance of EFPs ~~are:~~ apply nationwide and are found in Federal regulations at 50 CFR 600.745 ***[current as of January 1, 2005]***:

1. Applicants must submit a completed application in writing to the Regional ~~Director~~Administrator at least 60 days prior to the proposed effective date of the permit. The application must include, but is not limited to, the following information:

   a. The date of the application;
   b. The applicant's name, mailing address, and telephone number;
   c. A statement of the purposes and goals of the ~~experiment~~exempted fishery for which an EFP is needed, including ~~a general description of the arrangements for disposition of all species harvested under the EFP;~~
   ~~d.~~ ~~Valid~~ justification for ~~why~~ issuance of the EFP ~~is warranted;~~
   ~~e. A statement of whether the proposed experimental fishing has broader significance than the applicant's individual goals;~~
   ~~f.~~.d For each vessel to be covered by the EFP:
      ~~(1) vessel name;~~
      ~~(2)~~ (1) A copy of the USCG documentation, state license, or registration of each vessel, or the information contained on the appropriate document;
      (2) The current name, address, and telephone number of owner and master;
      ~~(3) Coast Guard documentation, state license, or registration number;~~
      ~~(4) home port;~~
      ~~(5) length of vessel;~~
      ~~(6) net tonnage;~~
      ~~(7) gross tonnage;~~
   ~~g. A description of the~~
   e. The species (target and incidental) expected to be harvested under the EFP ~~and~~, the amount(s) of such harvest necessary to conduct the ~~experiment; h.~~ exempted fishing, the arrangements for disposition of all regulations species harvested under the EFP, and any anticipated impacts on marine mammals and endangered species.
   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; and
   i. The signature of the applicant.

   The Regional ~~Director~~Administrator may request from an applicant additional information necessary to make the determinations required under this section.

2. The Regional ~~Director~~Administrator will review each application and will make a preliminary determination whether or not the application contains all of the required information and constitutes a ~~valid experimental program~~n activity appropriate for further consideration. If the Regional ~~Director~~Administrator finds any application does not warrant further consideration, ~~he shall notify~~ both the applicant and the Council will be notified in writing of the reasons for ~~his~~the decision. If the Regional ~~Director~~Administrator determines that any application warrants further consideration, ~~he will publish a notice of~~notification receipt of the application will be published in the *Federal Register* with a brief description of the proposal, and ~~will give interested~~the intent of NMFS to issue an EFP. Interested persons ~~an~~will be given a 15-day to 45-day opportunity to comment and/or comments will be requested during public testimony at a Council meeting. The ~~notice~~notification may establish a cutoff date for receipt of additional applications to participate in the same or a similar ~~experiment~~exempted fishing activity.

The Regional ~~Director~~Administrator also will forward copies of the application to the ~~Pacific Fishery Management~~ Council, the United States Coast Guard, and the fishery management agencies of Oregon, Washington, California, and Idaho, accompanied by the following information:

a. ~~The current utilization of domestic annual harvesting and processing capacity (including existing experimental harvesting, if any) of~~The effect of the proposed EFP on the target and incidental species, including the effect on any OY;
b. A citation of the regulation or regulations ~~which~~that, ~~absent~~without the EFP, would prohibit the proposed activity; and
c. Biological information relevant to the proposal~~.~~, including appropriate statements of environmental impacts, including impacts on marine mammals and threatened or endangered species.

3. At a Council meeting following receipt of a complete application, the Regional ~~Director~~Administrator may choose to consult with the Council and the directors of the state fishery management agencies concerning the permit application. The Council shall notify the applicant in advance of the meeting, if any, at which the application will be considered and invite the applicant to appear in support of the application if the applicant desires.

4. As soon as practicable after receiving responses from the agencies identified above, or after consultation, if any, in paragraph 3 above, the Regional ~~Director~~Administrator shall notify the applicant in writing of his decision to grant or deny the EFP, and, if denied, the reasons for the denial. Grounds ~~to deny issuance~~for denial of an EFP include, but are not limited to, the following:

   a. The applicant has failed to disclose material information required, or has made false statements as to any material fact, in connection with his or her application; or
   b. According to the best scientific information available, the harvest to be conducted under the permit would detrimentally affect the well-being of the stock of any regulated species of fish, marine mammal, or threatened or endangered species in a significant way; or
   c. Issuance of the EFP ~~would inequitably allocate fishing privileges among domestic fishermen or~~ would have economic allocation as its sole purpose; or
   d. Activities to be conducted under the EFP would be inconsistent with the intent of ~~this section~~national goals for MSA implementation or the management objectives of this FMP;~~ or~~
   e. The applicant has failed to demonstrate a valid justification for the permit; or
   ~~e.~~f. The activity proposed under the EFP could create a significant enforcement problem.

5. The decision of a Regional Administrator to grant or deny an EFP is the final action of NMFS. If the permit~~ is granted, the Regional Director will publish a notice~~, as granted, is significantly different from the original application, or is denied, NMFS may publish notification in the *Federal Register* describing the ~~experimental~~exempted fishing to be conducted under the EFP or the reasons for denial.

6. The Regional ~~Director~~Administrator may attach terms and conditions to the EFP consistent with the purpose of the ~~experiment~~exempted fishing, including, but not limited to:

a. The maximum amount of each regulated species ~~which~~that can be harvested and landed during the term of the EFP, including trip limitations, where appropriate;

b. The number, size(s), ~~names~~name(s), and identification ~~numbers~~number(s) of the ~~vessels~~vessel(s) authorized to conduct fishing activities under the EFP;

c. The time(s) and place(s) where ~~experimental~~exempted fishing may be conducted;

d. The type, size, and amount of gear ~~which~~that may be used by each vessel operated under the EFP;

e. The condition that observers, a vessel monitoring system, or other electronic equipment be ~~allowed aboard~~carried on board vessels operated under an EFP~~;~~, and any necessary conditions, such as predeployment notification requirements;

f. Reasonable data reporting requirements;

g. ~~Such other~~Other conditions as may be necessary to assure compliance with the purposes of the EFP consistent with the objectives of this FMP and other applicable law; and,

h. ~~provisions~~Provisions for public release of data obtained under the EFP~~.~~ that are consistent with NOAA confidentiality of statistics procedures. An applicant may be required to waive the right to confidentiality of information gathered while conducting exempted fishing as a condition of an EFP.

~~6~~7. Failure of a permittee to comply with the terms and conditions of an EFP shall be grounds for revocation, suspension, or modification of the EFP with respect to all vessels conducting activities under that EFP. Any action taken to revoke, suspend, or modify an EFP shall be governed by ~~50 C.F.R. Part 621, Subpart D~~ Federal regulations.

~~8.0~~9.0 SCIENTIFIC RESEARCH

No changes to the text in this chapter.

10.0 PROCEDURE FOR REVIEWING STATE REGULATIONS

10.1 Background

There are and will continue to be state regulations affecting groundfish fisheries off the West Coast, which are in addition to Federal regulations. This potential extends to waters off all three West Coast states, to all gear types, and to both the commercial and recreational fisheries. In some cases, it may be desirable to ensure consistency between state and Federal regulations by implementing Federal regulations that complement state regulations. In other cases, the Council may determine that Federal regulations are not necessary to complement state regulations, but wish to assure a state that its regulations are consistent with the FMP insofar as they are applied to vessels registered in that state when fishing in the EEZ. ~~Amendment 4 addresses this need by establishing a~~ Section 10.2 describes the framework review process by which any state may petition the Council to initiate a review of its regulations, determine consistency with the FMP~~,~~ and~~, if~~ national standards to ensure that the state regulations are enforceable. If appropriate, ~~recommend the implementation of complementary Federal regulations.~~

~~For example, current regulations implementing the FMP prohibit the use of setnets (gill and trammel nets) to catch groundfish in waters north of 38(N latitude. The purpose of this regulation is to prevent the incidental take of salmon. South of 38(N latitude, setnet gear is used primarily by small vessel fishermen to catch California halibut, white croaker, and rockfish. Only rockfish are included in the groundfish fishery management unit. Fishing for these species, which mainly are taken inshore, is regulated by the State of California. Thus, some of the setnet fisheries regulated by the state harvest species of groundfish which are also managed under this FMP.~~

~~When the FMP was developed and approved by the Secretary, the Council acknowledged the State of California was regulating the set net fishery off central and southern California. It was the Council's desire that state regulations regarding setnets also be applicable to vessels fishing in the EEZ to the extent that each state regulation was consistent with the goals of the FMP and the national standards of the MSA. The Council realized that it would be difficult to apply state regulations to non-California registered vessels in the EEZ. However, this was not considered a significant problem because most vessels in the fishery were registered in the State of California and were subject to its regulations even when fishing in the EEZ. Federal regulations were not considered necessary.~~

~~For a variety of reasons, California setnet regulations have changed several times over the years. However none of these changes have been formally reviewed to determine if they remain consistent with the FMP and the national standards of the MSA. A system is required to determine consistency of state regulations with the FMP and the national standards to ensure that the regulations continue to be enforceable against vessels fishing in the EEZ.~~

~~Amendment 4 establishes a framework process by which any state may obtain a determination that its regulations are consistent with the FMP and the national standards. As necessary,~~ the Council may also recommend to the NMFS that duplicate or different Federal regulations be implemented in the EEZ. While the Council retains the authority to recommend Federal regulations be implemented in the EEZ, the preference is to continue to rely on state regulations in that area as long as they are consistent with the FMP.

10.2 Review Procedure

Any state may propose that the Council review a particular state regulation for the purpose of determining its consistency with the FMP and the need for complementary Federal regulations. Although this procedure is directed at the review of new regulations, review of existing regulations affecting the harvest of groundfish managed by the FMP also will utilize this process. The state making the proposal will include a summary of the regulations in question and concise arguments in support of consistency.

Upon receipt of a state's proposal, the Council may make an initial determination whether or not to proceed with the review. If the Council determines that the proposal has insufficient merit or little likelihood of being found consistent, it may terminate the process immediately and inform the petitioning state in writing of the reasons for its rejection.

If the Council determines sufficient merit exists to proceed with a determination, it will review the state's documentation or prepare an analysis considering, if relevant, the following factors:

1. How the proposal furthers or is not otherwise inconsistent with the objectives of the FMP, the MSA, and other applicable law.

2. The likely effect on or interaction with any other regulations in force for the fisheries in the area concerned.

3. The expected impacts on the species or species group taken in the fishery sector being affected by the regulation.

4. The economic impacts of the regulation, including changes in catch, effort, revenue, fishing costs, participation, and income to different sectors being regulated as well as to sectors which might be indirectly affected.

5. Any impacts in terms of achievement of quotas or HGs, maintaining year-round fisheries, maintaining stability in fisheries, prices to consumers, improved product quality, discards, joint venture operations, gear conflicts, enforcement, data collection, or other factors.

The Council will inform the public of the proposal and supporting analysis and invite public comments before and at the next scheduled Council meeting. At its next scheduled meeting, the Council will consider public testimony, public comment, advisory reports, and any further state comments or reports, and determine whether or not the proposal is consistent with the FMP and whether or not to recommend implementation of complementary Federal regulations or to endorse state regulations as consistent with the FMP without additional Federal regulations.

If the Council recommends the implementation of complementary Federal regulations, it will forward its recommendation to the NMFS Regional Director for review and approval.

The NMFS Regional Director will publish the proposed regulation in the *Federal Register* for public comment, after which, if approved, he will publish final regulations as soon as practicable. If the Regional Director disapproves the proposed regulations, he will inform the Council in writing of the reasons for his disapproval.

~~12.0~~11.0 GROUNDFISH LIMITED ENTRY

No changes to the text in this chapter, except headings are renumbered.

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GUIDE TO APPENDICES

In the July 1993 version of the FMP the Appendices appeared as Chapter 11.0. Section 11.10 was added by Amendment 11 in 1998. Sections 11.1–11.9 contain descriptive material about stocks, fisheries, habitat, and other applicable laws, which under the proposed revision will become Appendix A. Prior to the currently proposed amendments, this material was moved out of a chapter format to a separate volume, causing the remaining chapters in the FMP to be renumbered. The Appendices contain descriptive information in support of the management program. This material may be updated without the need for a formal FMP amendment process. Language to this effect is added to Chapter 1 of the FMP. The appendices incorporated into the FMP by Amendment 19 are described below.

APPENDIX A: Information in Support of the Management Program

- Biological and Environmental Characteristics of the Resource
- Description of the Fishery
- Social and Economic Characteristics of the Fishery
- History of Management
- History of Research
- Weather-Related Vessel Safety
- Relationship of this FMP to Existing Laws and Policies
- Management and Enforcement Costs

APPENDIX B: Pacific Coast Groundfish Essential Fish Habitat

1. Description of the EFH Assessment model
2. Groundfish life history descriptions (McCain, et al.)
3. Habitat Use Database output of species/life stage distribution/associations
4. HSP maps for individual groundfish species/lifestages
5. Detailed specification of HAPC (maps, coordinates, text, as appropriate)
6. Reference to website URL for HSP maps/HAPC maps/interactive map server (when available)
7. Research needs
    - FMP Section 11.10.6 (to be revised)
    - Risk Assessment Section 5.3, Data Gaps Analysis

APPENDIX C: The Effects of Fishing on West Coast Groundfish Essential Fish Habitat and Current Conservation Measures

1. Description of the Impacts Model
2. MRAG Americas, Inc. 2004. *The effects of fishing gears on habitat: West Coast perspective* (Draft 6). Portland: Pacific States Marine Fisheries Commission. July 28, 2004.
3. Conservation measures (i.e., detailed specification of closed areas)

APPENDIX D: Nonfishing Effects on West Coast Groundfish Essential Fish Habitat and Recommended Conservation Measures

Hanson, J., M. Helvey, and R. Strach (eds.). 2003. *Nonfishing Effects on West Coast Groundfish Essential Fish Habitat and Recommended Conservation Measures* (Version 1). National Marine Fisheries Service. August 2003.

Agenda Item H.6.a
Attachment 2
November 2005

Draft Work Plan Excerpt: Amendment 18 Implementation Measures For Consideration in the 2007-2008 Biennial Specifications Process

Based on the discussion above, the following sector catch limits will be evaluated as part of the 2007-2008 harvest specifications EIS and rulemaking:

Sectors	Species
• Non-whiting limited entry trawl vessels. • At-sea Pacific whiting catcher-processors. • Limited entry trawl vessels delivering to at-sea Pacific whiting motherships. • Limited entry trawl vessels delivering Pacific whiting to shore-based processing plants.	• Canary rockfish • Darkblotched rockfish • Widow rockfish
Limited entry fixed gear vessels, including separately or in combination: • Sablefish-endorsed permit holders • Permit holders without the sablefish endorsement	• Canary rockfish • Yelloweye rockfish
• Recreational subsectors as defined as part of the harvest specifications process	• Canary rockfish • Lingcod • Yelloweye rockfish

Note: Supplemental Tribal Comment from the March 2005 Council meeting states "treaty fisheries would not be an appropriate sector for total catch limits on overfished or other bycatch species." Subject to further Council discussion, the tribal sector is not identified for the use of sector total catch limits at this time.

Similar to OYs, total catch limits would be established for each year in the two-year management period. Establishing catch limits is contingent on an accurate, sufficiently real-time catch accounting system for participating sectors. The projected status of catch accounting for the 2007-2008 period will be part of the evaluation. The risk of overages—total catch above projections—in sectors not assigned catch limits will also have to be evaluated. A policy for dealing with overages will have to be developed. Related to this, an evaluation would consider whether catch limits can be changed during the year (the limit period). The ability to change limits would anticipate inaccuracies in the catch projections upon which the limits were based, which would result in overages. On the other hand, if fishery participants thought the limit could be adjusted upward, such a policy could weaken the fishers' incentive to adopt bycatch-reducing practices.

Agenda Item H.6.a
Supplemental Attachment 3
November 2005

PRELIMINARY DISCUSSION DRAFT

Practicability Analysis for Amendment 18: Bycatch Mitigation and Standardized Total Catch Reporting Methodologies

NMFS Northwest Region – October 2005

Background

The Magnuson-Stevens Fishery Conservation and Management Act (Magnuson-Stevens Act) requires that fishery management plans "establish a standardized reporting methodology to assess the amount and type of bycatch occurring in the fishery, and include conservation and management measures that, to the extent practicable and in the following priority – (A) minimize bycatch; and (B) minimize the mortality of bycatch which cannot be avoided." 16 U.S.C. § 1853(a)(11). The Magnuson-Stevens Act defines the term bycatch to mean "fish which are harvested in a fishery, but which are not sold or kept for personal use, and includes economic discards and regulatory discards. Such term does not include fish released alive under a recreational catch and release fishery management program." 16 U.S.C. § 1802(2).

Amendment 13 to the West Coast Groundfish Fishery Management Plan (FMP) was initially intended comply with Magnuson-Stevens Act requirements on bycatch monitoring and minimization. However, in Pacific Marine Conservation Council v. Evans, 200 F.Supp.2d 1194 (N.D. Calif. 2002) [hereinafter PMCC,] the court found that Amendment 13 had failed to establish an adequate bycatch reporting methodology and that NMFS did not comply with the requirement to minimize bycatch and bycatch mortality. The court remanded Amendment 13 to the agency.

In response to the court's order in PMCC, NMFS completed a final environmental impact statement (FEIS) on a bycatch mitigation program for the West Coast groundfish fisheries in September 2004 (NMFS, 2004). Amendment 18 to the FMP is intended to modify the FMP to include the Council's preferred alternative from that FEIS. Amendment 18 is intended to bring the Council's actions leading up to the completion of the FEIS and its plans for future bycatch minimization programs together within the FMP to clearly articulate the Council's bycatch minimization program and philosophy, and to provide comprehensive direction for its current and future bycatch minimization efforts within Pacific Coast groundfish management. As a result, much of Chapter 6 of the FMP, which has historically addressed fishery management measures, will be completely re-written through Amendment 18's focus on bycatch mitigation.

Amendment 13 to the Northeast Multispecies FMP, from the New England Fishery Management Council, dealt with bycatch and EFH considerations for the New England groundfish fisheries. That FMP amendment defined "practicable" as a measure that is "reasonable and capable of being done in light of available technology and economic considerations." The court upheld this definition in Oceana v. Evans, No. 04-0811 (ESH)(Mar. 9, 2005.)

Because technology and economic considerations change over time, the practicability of different management measures also changes over time. Amendment 18 is intended to not only minimize bycatch to the extent practicable at this time, but also to foster fishery management programs that will expand the array of management measures that are practicable in the future. For example, management tools that might not now be available to the fleet because their cost to vessels exceeds the value of the fishery may become available in the future if NMFS is able to implement a management program, like an individual fishing quota program, that allows vessel owners to optimize their revenue returns from their groundfish harvest. As demonstrated below, development of such a program is complex and will take time.

The guidelines for the Magnuson-Stevens Act's National Standard 9 (bycatch minimization) at 50 CFR 600.350(d)(3) recommends consideration of the following factors in determining whether a "conservation and management measure minimizes bycatch or bycatch mortality to the extent practicable, consistent with other national standards and maximization of net benefits to the Nation:"

- population effects for the bycatch species;
- ecological effects due to changes in the bycatch of that species (effects on other species in the ecosystem);
- changes in the bycatch of other species of fish and the resulting population and ecosystem effects;
- effects on marine mammals and birds;
- changes in fishing, processing, disposal, and marketing costs;
- changes in fishing practices and behavior of fishermen;
- changes in research, administration, and enforcement costs and management effectiveness;
- changes in the economic, social, or cultural value of fishing activities and non-consumptive uses of fishery resources;
- changes in the distribution of benefits and costs; and
- social effects.

This practicability analysis examines the practicability of implementing Amendment 18's bycatch monitoring and minimization regime under the ten factors provided in 50 CFR 600.350(d)(3). In this analysis, the meaning of "practicable" is consistent with that adopted in Amendment 13 to the Northeast Multispecies FMP: *reasonable and capable of being done in light of available technology and economic considerations.* In the analysis of the National Standard 9 guideline factors on practicability, this document also addresses the four bycatch reduction measures cited by the court in PMCC as needing further consideration. The final bycatch mitigation program EIS addresses the range of bycatch minimization alternatives in detail (NMFS, 2004).

Since Amendment 13 to the FMP, NMFS has implemented two major fleet/effort reduction programs: the 2001 Amendment 14 to the FMP, which reduced the number of vessels participating in the limited entry fixed gear sablefish fishery by about 45 percent; the 2003 trawl permit/vessel buyback program, which reduced the number of vessels participating in the limited entry trawl fleet by about 35 percent. The major fleet/effort reduction facilitated for bycatch reduction by Amendment 18 is a trawl individual fishing quota (IFQ) program. The practicability of implementing an IFQ program for bycatch minimization (and other) purposes is examined in this document under the National Standard 9 guideline socio-economic factors.

Since Amendment 13, NMFS has also implemented via regulation numerous large-scale marine area closures, known collectively as Groundfish Conservation Areas (GCAs). Amendment 18 would bring the GCAs into the FMP as a required bycatch minimization tool. Amendment 19, on EFH designation and protection, will bring an even more far-reaching set of marine protected areas into the FMP for the purposes of EFH protection. Although EFH-related closures may have bycatch minimizing effects, this practicability analysis is primarily concerned with Amendment 18 and area closures intended to minimize bycatch. The practicability of implementing marine area closures for bycatch minimization is examined in this document under the National Standard 9 guideline biological factors. The costs of implementing a monitoring program for marine area closures are summarized in this document in the section on "available technology and economic considerations." Detailed discussions of the cost of implementing a vessel monitoring (VMS) system for the West Coast groundfish fleets are available in two NMFS Environmental Assessments (NMFS, 2003; NMFS, 2005 Draft). **Append with final Amendment 19 maps**

An incentive-based observer program, where higher landings limits are allowed to vessels that voluntarily carry and pay for observers is discussed below in the section on "population effects for bycatch species." Although this kind of program was discussed in the background materials for Amendment 13, subsequent NMFS and Council experience in developing a standardized total catch monitoring program and bycatch modeling capabilities show this sort of program to be impracticable when applied for voluntary participation on a large scale. Large scale applications are impracticable because incentive-based programs do not provide the quality and type of observer data that can be used to model the behavior of whole sectors of the fishing fleet

In 2004, NMFS first implemented overfished species bycatch limits for canary and darkblotched rockfish taken incidentally in the Pacific whiting fishery via emergency rule and inseason action (August 3, 2004, 69 FR 46448, and; October 6, 2004, 69 59816). The final rule for the 2005-2006 groundfish specifications and management measures implemented bycatch limits for canary and widow rockfish taken incidentally in the 2005 and 2006 Pacific whiting fisheries (December 23, 2004, 69 FR 77012.) These limits apply to the non-tribal whiting fishery, in which two of the three participating sectors have at least 100 percent observer coverage, the catcher-processor and mothership sectors. The shore-based whiting sector, which consists of catcher vessels that deliver their catch to processing plants on land, was managed in 2004 and 2005 under an EFP that required vessels to carry electronic monitoring (EM) systems. [1] On whiting catcherboats, EM systems were used to monitor whether vessels were retaining all of their catch or making discards, as this fishery is known to have relatively low bycatch levels, by weight, and is assumed to maximize its retention of all fish caught. EM systems are not capable of estimating species-specific discards for trawl fisheries. For the 2005 EFP, NMFS experimented with whether EM data could provide gross estimates of total discard weight, if any. The agency report from that experiment is not yet complete. Further use of and a cost summary for bycatch limits, or "discard caps," are discussed below in the section "available technology and economic considerations."

Biological Environment (National Standard 9 Practicability Factors 1-4)

The first four factors that 50 CFR 600.350(d)(3) recommends for consideration of whether practicable management measures have been taken or are being proposed to be taken for bycatch minimization are factors concerning the biological environment:

- population effects for the bycatch species;
- ecological effects due to changes in the bycatch of that species (effects on other species in the ecosystem);
- changes in the bycatch of other species of fish and the resulting population and ecosystem effects;
- effects on marine mammals and birds

In West Coast groundfish management, bycatch minimization measures focus on reducing the incidental catch and discard of finfish species. Marine mammals and seabirds are sometimes incidentally caught in the West Coast groundfish fisheries, although their occurrence as bycatch species is of relatively low frequency. Washington, Oregon, and California groundfish fisheries are listed as Category III fisheries under the Marine Mammal Protection Act (MMPA,) meaning that annual mortality and serious injury to marine mammals in those fisheries is less than or equal to 1 percent of the Potential Biological Removal level of regional marine mammal stocks. The West Coast Groundfish Observer Program (WCGOP) has been collecting data on seabird encounters in the West Coast groundfish fisheries and NMFS has been discussing with the U.S. Fish and Wildlife Service (USFWS) whether an Endangered Species Act (ESA) Section 7 consultation may be needed on the effects of the groundfish fisheries on seabird

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[1] Electronic monitoring (EM,) which Amendment 18 brings into the FMP, is an integrated assortment of electronic components combined with a software operating system. An EM system typically includes one or more video cameras, a CPU with removable hard drive, and software that can integrate data from other components of a vessel's electronic equipment. The system autonomously logs video and vessel sensor data during the fishing trip without human intervention. When the vessel returns to port, the video and other data are transferred to a separate computer system for analysis. Video records are typically reviewed by human samplers on shore, but electronic techniques are being developed to automate some of this activity.

populations. No sea turtle takes have been observed or reported in the groundfish fisheries. Therefore, the bycatch species of primary concern in this fishery are finfish, such as groundfish and salmon species.

Population Effects for Bycatch Species:

In recent years, West Coast groundfish management has been primarily concerned with and shaped by the Magnuson-Stevens Act requirement to rebuild the eight overfished groundfish species. The FMP and its implementing regulations need to continue to meet the overfished species rebuilding requirements of the Magnuson-Stevens Act. Amendment 18 is intended to work in concert with the overfished species rebuilding plan amendments, Amendments 16-1, 16-2, and 16-3, to minimize bycatch of overfished groundfish species to the extent practicable. Amendment 16-1 set the requirement for an observer program into the FMP and WCGOP has been in operation since August 2001. Amendment 18 brings into the FMP the NMFS/Council three-part strategy to meet the Magnuson-Stevens Act's bycatch-related mandates: (1) gather data through a standardized total catch reporting methodology; (2) use the Council's federal/state/tribal agency partners to assess these data through bycatch models that estimate when, where, and with which gear types bycatch of varying species occurs; and (3) develop management measures that minimize bycatch and bycatch mortality to the extent practicable.

NMFS has documented the use of WCGOP data in implementing the first two parts of this three-part strategy in the preambles to the proposed rules for the groundfish harvest specifications and management measures in 2003, 2004, and 2005-2006 (68 FR 936, January 7, 2006; 69 FR 1380, January 8, 2004; 69 FR 56550, September 21, 2004.) The agency's initial goal was to provide adequate coverage for the limited entry trawl fishery, so as to generate bycatch estimates for this high-volume fishery as quickly as possible. NMFS then continued trawl observations, but also moved to the next highest volume sector of the fleet, limited entry fixed gear participants in the primary sablefish fishery. More recently, NMFS has been expanding coverage to portions of the open access groundfish fisheries, and publishing reports from more specialized WCGOP data, such as salmon and halibut bycatch estimates (Hastie, 2005; Wallace and Hastie, 2005.)

Amendment 18 builds on the requirements of the overfished species rebuilding plan amendments by updating the FMP to more fully describe the requirement for a standardized total catch (landed catch + discard) reporting methodology. For the non-whiting commercial groundfish fisheries, WCGOP is a primary component of the standardized total catch reporting methodology. WCGOP's observer coverage plan is designed to sample portions of the different commercial fishing fleets, with the intention of populating a bycatch model with data on discard rates for different species taken along the length of the West Coast and at different fishing depths. Observer coverage rates vary between fleets and times of year, but the trawl fleet is generally monitored so that 20-25 percent of the non-whiting groundfish catch (by weight) is observed. Data from the observed portion of the fleet is extrapolated to estimate bycatch rates for the fleet as a whole.

One potential bycatch reduction tool contemplated in Amendment 13, but not implemented by Amendment 18, is a regulatory incentive program that would allow higher landings limits for vessels that voluntarily carry observers. Amendment 16-1 put a mandatory observer program into the FMP. Federal regulations at 50 CFR 660.314(c)(2) state "When NMFS notifies the vessel owner, operator, or permit holder, or the vessel manager of any requirement to carry an observer, the vessel may not take and retain, possess, or land any groundfish without carrying an observer." An incentive program wherein vessels that voluntarily carry an observer are permitted to access higher landings limits than otherwise allowed could undermine NMFS's observer sampling plan.

Observers that are required to be carried onboard vessels as part of a statistical sampling program are observing vessels behaving within the framework of regulations that apply to the fleet as a whole. As explained above, this type of observer sampling plan allows data from the observed portion of the fleet to be expanded to provide bycatch estimates for the whole fleet. Limited applications of incentive-based observer programs have been used in exempted fisheries permits (EFPs) programs, such as the Washington State EFP to review bycatch-reducing fishing techniques in the arrowtooth flounder trawl fishery. The at-sea whiting fleet observer coverage is subject to an incentive program wherein at-sea processing vessels that voluntarily carry and pay for a second observer (beyond the required first observer) are permitted to either convert their bycatch into fish mince, meal, or oil, or to donate the bycatch to a hunger-relief organization. For this small sector (<10 vessels) of the groundfish fleet, the incentive program provides supplemental observer data beyond that already provided by the required 100 percent observer coverage. With the required 100 percent observer coverage and an incentive designed to alter discard retention behavior, rather than fishing behavior, additional incentive-based observer data supplements, rather than jeopardizes the sampling plan for this sector.

Observers carried on a portion of the fleet under and incentive program that allows vessels to operate outside of the normal regulatory framework do not generate data that is useful to modeling the whole fleet's behavior. Thus, while an incentive-based observer program may be beneficial to the particular participating vessels, it is not necessarily beneficial, and could even be harmful, to NMFS's strategy for using a statistically-valid sampling program to provide bycatch data that supports bycatch modeling on the groundfish fisheries. For these reasons, an incentive-based observer program is not a practicable management measure in terms of improving the accuracy of estimates of the population effects of bycatch rates on bycatch species.

Amendment 18 also articulates the third part of the three-part bycatch minimization strategy by calling for a management agenda that uses WCGOP and at-sea whiting observer data to restructure the fisheries. Specifically, Amendment 18 requires in Section 6.5.1 that "*...Management measures will be designed taking into account the co-occurrence ratios of target stocks with overfished stocks. To protect overfished species and minimize bycatch through reducing incidental catch of those species, the Council will particularly use, but is not limited to: catch restrictions detailed in Section 6.7 to constrain the catch of more abundant stocks that commingle with overfished species; in* *times and areas where higher abundance of overfished species are expected to occur; the appropriate time/area closures detailed in Section 6.8 and designed to prevent vessels from operating during times when or in areas where overfished species are most vulnerable to a particular gear type or fishery; and gear restrictions described in Section 6.6, where that gear restriction has been shown to be practicable in reducing overfished species incidental catch rates."* Management measures of the type required by Amendment 18 have already contributed to improvements in stock status for bycatch species, as discussed below in this section. These measures have also contributed to improvements in stock status for co-occuring species such as halibut and other groundfish, as discussed below in this section and in the section on population effects of change in the bycatch of non-bycatch species.

NMFS is obliged to meet competing mandates in managing the fishery to minimize bycatch, rebuild overfished species, minimize the effects of fishing on EFH, and take into account the needs of fishing communities, while also achieving optimum yield (OY) on a continuing basis. The Magnuson-Stevens Act defines "optimum yield" as follows:

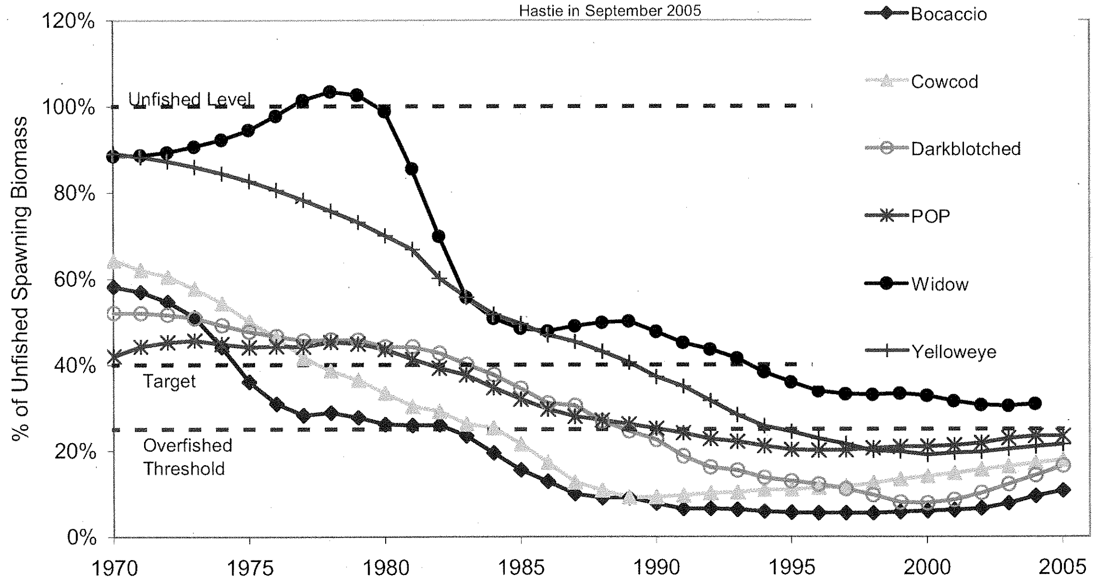
> *The term "optimum," with respect to the yield from a fishery, means the amount of fish which – (A) will provide the greatest overall benefit to the Nation, particularly with respect to food production and recreational opportunities, and taking into account the protection of marine ecosystems; (B) 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 (C) in the case of an overfished fishery, provides for rebuilding to a level consistent with producing the maximum sustainable yield in such fishery.*

Since the first overfished species rebuilding measures went into place in 2000, the West Coast groundfish fisheries have annually taken less of several of the more abundant groundfish species than was provided for in the OYs for those species.

For groundfish species, the population effects of implementing the bycatch minimization measures of Amendment 18 will be reflected over time in abundance levels of those species. Most West Coast groundfish species, particularly rockfish, are long-lived and slow to mature. Thus, it will be many years before the full population effects of the bycatch minimization programs associated with Amendment 18 will be known. Early results from the Council's bycatch minimization measures are promising, however. The fastest maturing of the overfished groundfish species is lingcod. Lingcod was one of the first of three groundfish species to be declared overfished, with the first lingcod bycatch minimization measures going into effect January 1, 2000. In a 1999 stock assessment for lingcod, the coastwide stock had been estimated to be at 10 percent of its unfished biomass level. This abundance level has steadily increased until, in the 2005 stock assessment, the stock's 2005 abundance was estimated to be at 60 percent of its unfished biomass coastwide (Jagielo and Wallace, 2005.) Overfished rockfish species have also seen increasing abundance levels, although abundance changes have not been as dramatic as for the more fecund lingcod.

NMFS presented Figure 1 at the September 2005 Council meeting as part of a summary of the results of 2005 stock assessments. Not all overfished species were included because the Council was not scheduled to review the stock assessments for canary rockfish and lingcod until its November 2005 meeting. Changes in stock status for overfished rockfish are modest, but trends are positive. Rockfish tend to be long-lived and slow to mature, so NMFS expects steady, but not rapid, increases in overfished species abundance throughout their rebuilding periods.

Figure 1: Overfished Species Spawning Biomass Trends Over Time, as presented by Hastie in September 2005



In addition to its Magnuson-Stevens Act obligations, NMFS is also obliged under the ESA to monitor and reduce incidental take of evolutionarily significant units (ESUs) of salmon listed as threatened or endangered. Most Pacific salmon species swim at higher levels in the water column than groundfish species. Chinook salmon, the largest of the salmon species, tends to feed and swim lower in the water column and is more susceptible to bottom fishing gear than other salmon species. Salmon of the same species are only separable into individual river- and run time-specific ESUs by genetic testing. Therefore, fishery regulations focus on reducing the incidental take of all salmon of all species and, where possible, on reducing the incidental take of particular ESUs where possible. For example, Amendment 18 brings into the FMP the Klamath and Columbia River Conservation Zones, areas closed to fishing for Pacific whiting that are intended to protect particular ESUs.

Salmon bycatch in the groundfish fisheries is managed to meet the requirements of the ESA as well as the Magnuson-Stevens Act. Not all salmon that are caught incidentally in the groundfish fisheries come from evolutionarily significant units of salmon that have been listed as threatened or endangered under the ESA. However, since listed stocks mix with and are caught in common with non-listed stocks, groundfish management measures to reduce salmon bycatch focus on all salmon stocks, not just listed salmon stocks. Salmon bycatch data from WCGOP supplement observer total catch data that have been collected from the at-sea Pacific whiting fisheries since 1991. NMFS recently completed an analysis of salmon bycatch in the non-whiting groundfish fisheries, based on WCGOP data: http://www.nwfsc.noaa.gov/research/divisions/fram/observer/.

In winter 2005-2006, the agency will be developing a plan for using these observer data to evaluate salmon bycatch in the groundfish fisheries. While the groundfish fisheries must be managed to reduce salmon bycatch, the number of salmon incidentally caught annually in the groundfish fisheries is too small to have much, if any, population effect on the salmon stocks in question. West Coast salmon stocks, both listed and non-listed are taken in a vast array of commercial, recreational, and tribal fisheries, in a network of hydropower operations on western rivers, and in myriad human alterations to salmon habitat. One of the more challenging aspects of reducing salmon bycatch in the groundfish fisheries is that management measures that move the fleet away from fishing in times and areas where salmon may co-occur with groundfish can result in higher bycatch rates for overfished groundfish species, particularly the overfished slope rockfish species, darkblotched and Pacific ocean perch.

Every year, the International Pacific Halibut Commission (IPHC) sets halibut quotas for U.S. and Canadian waters. U.S. waters off the West Coast are referred to as IPHC Area 2A for purposes of halibut management. The overall halibut quota includes adult halibut landings plus estimated discards. Discards are deducted from the annual quota, and then directed fishery allocations are set on the remaining amount. The IPHC has an ongoing policy of pressuring each of its member countries to minimize halibut bycatch as much as possible. Because halibut is both a commercially valuable and recreationally desirable species, the directed halibut fisheries have also long been interested in both improving the quality of the annual halibut discard estimate, and reducing the amount of halibut discard. Management measures taken in the groundfish fisheries over the past five years have accomplished both of these goals: WCGOP data have significantly improved the quality of the halibut discard estimate, and management measures to protect overfished shelf rockfish have also reduced the bycatch of halibut in West Coast trawl fisheries. Wallace and Hastie (2005) report that the estimated halibut discard mortality (by weight) in the groundfish trawl fisheries has decreased by 75 percent between 1998 and 2004.

Ecological Effects Due to Changes in the Bycatch of Bycatch Species:

A direct effect of reducing the bycatch of a particular species may be reduced human-generated mortality for that species, while an indirect effect may be increased predation opportunities for species that feed on the bycatch species. Thus, in considering the ecological effects of changes in rates and levels of bycatch, we are weighing the indirect effects of reducing the bycatch of bycatch species on species that have ecological interactions with those bycatch species. As discussed above, while it is important to minimize the bycatch of salmon in groundfish fisheries in order to meet Magnuson-Stevens Act and ESA mandates, bycatch mortality of salmon in the groundfish fisheries is unlikely to have a measurable effect on salmon populations when considered against the wide range of activities that contribute to salmon mortality. Therefore, this section addresses the ecological effects of minimizing bycatch of groundfish and halibut in the groundfish fisheries.

Fisheries management has historically used single-species stock assessment models to look at the abundance of particular managed species. Off the West Coast, for example, managers might see stock assessments for lingcod and for a nearshore rockfish species without also having scientific information that connects the two species by showing lingcod as a predator of juvenile nearshore rockfish. Each single-species stock assessment is data intensive, requiring years of data from a variety of fishery-independent and fishery-dependent sources in order to show stock abundance trends over time. Models of multi-species interactions are even more data intensive, as they require not only similar abundance data to those used in single-species stock assessments, but also data on predator-prey and competitor-competitor interactions. NMFS's Alaska Fisheries Science Center (AFSC) relies on abundant food habits data to model predator-prey interactions and other direct inter-species relationships. AFSC collects and analyzes the contents of about 15,000 groundfish stomachs annually and their groundfish food habits database contains records of about 147,000 stomachs collected since 1981 (http://www.afsc.noaa.gov/refm/reem/overview_activities.htm).

NMFS's AFSC and Southwest Fisheries Science Center (SWFSC) have been developing multi-species ecological interactions models for the Bering Sea, Gulf of Alaska, and Northern California Current (NCC) ecosystems, in part to illustrate the place of groundfish species within those ecosystems. The populations of most overfished species are not significant enough to have ecological effects in the NCC ecosystem that are identifiable on a species-specific basis (Field, in press.) Most rockfish species, whether their populations are overfished or abundant, have populations that are characterized by slow growth, low mortality, and consequently low turnover when compared to more fecund fish like Pacific whiting or English sole. This means that, while the status of overfished rockfish stocks themselves can be measurably improved through reducing the bycatch of those stocks, improving the stock status of an individual rockfish stock is not likely to have measurable ecological effects on other species within the broader NCC ecosystem.

Figures 2 and 3 show the significant food webs of the Bering Sea (Aydin, et. al, 2002) and NCC (Field, et. al, in press) respectively. These figures are intended to broadly illustrate inter-species relationships in the two ecosystems. In both figures, particular species or species groups are shown in colored bars. The height of the bars is scaled to the size of the species or species group's standing biomass, while the width of the bars represents biomass flux of prey to predators. Thus, species or species groups that are more significant prey for a wide array of predator species will have relatively wider bars – for example, see copepods in both figures. What becomes apparent in comparing the figures for the two ecosystems is that the Bering Sea has a relatively small number of species that account for a substantial proportion of the species interactions and energy flow through the food web. The NCC ecosystem, by contrast, has a broader array of species interlinked within the food web, but most species or species groups in the NCC individually represent a more modest contribution to the overall energy flow in the ecosystem.

Figure 2: The significant food web of the Bering Sea (EBS = Eastern Bering Sea, WBS = Western Bering Sea.) Trophic level is along the y axis; the height of the boxes is scaled to the standing biomass; the width of the bars represents biomass flux of prey to predators, and; the colors represent benthic (red) and pelagic (blue) energy pathways (Aydin, et al, 2005.)

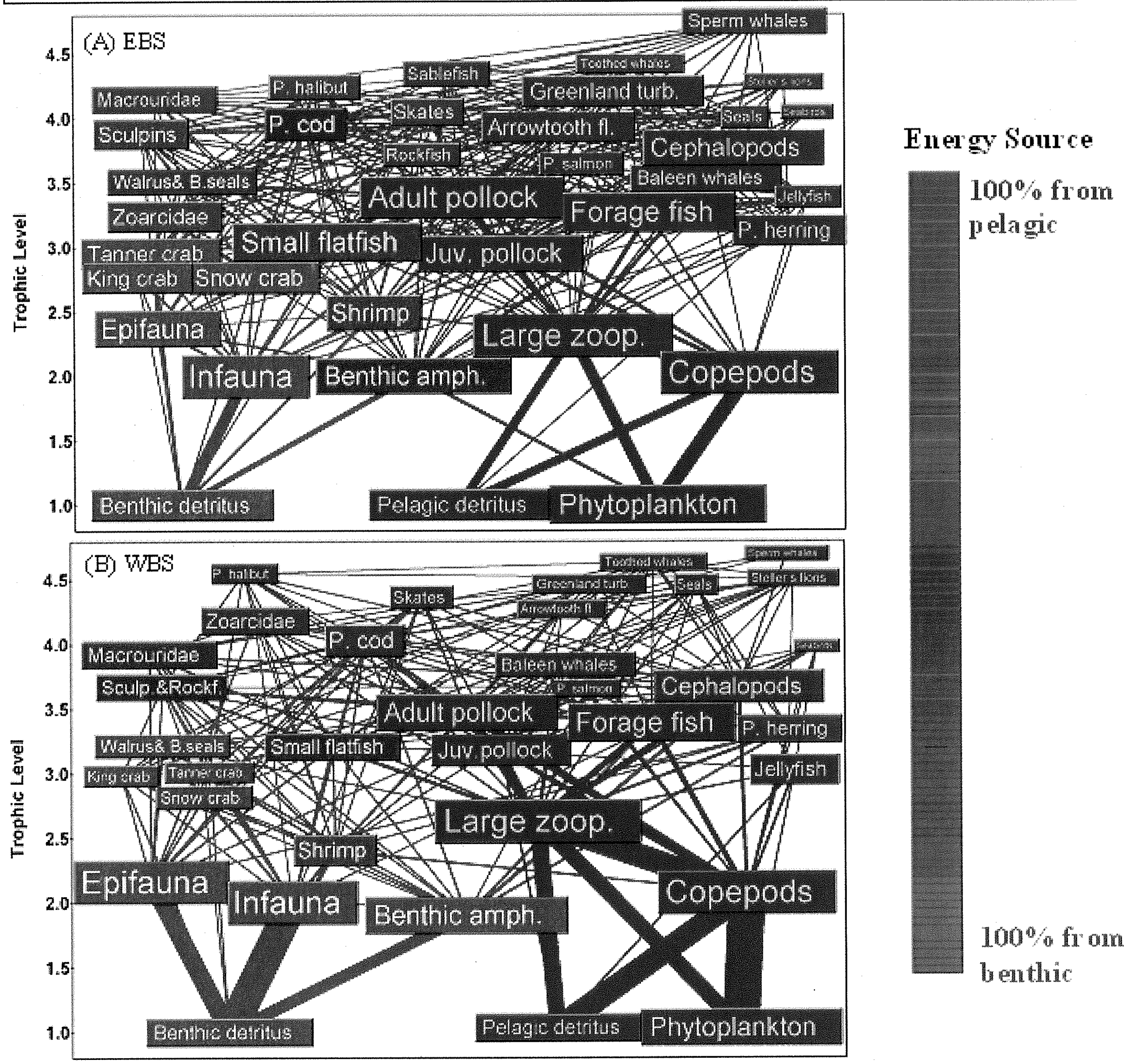
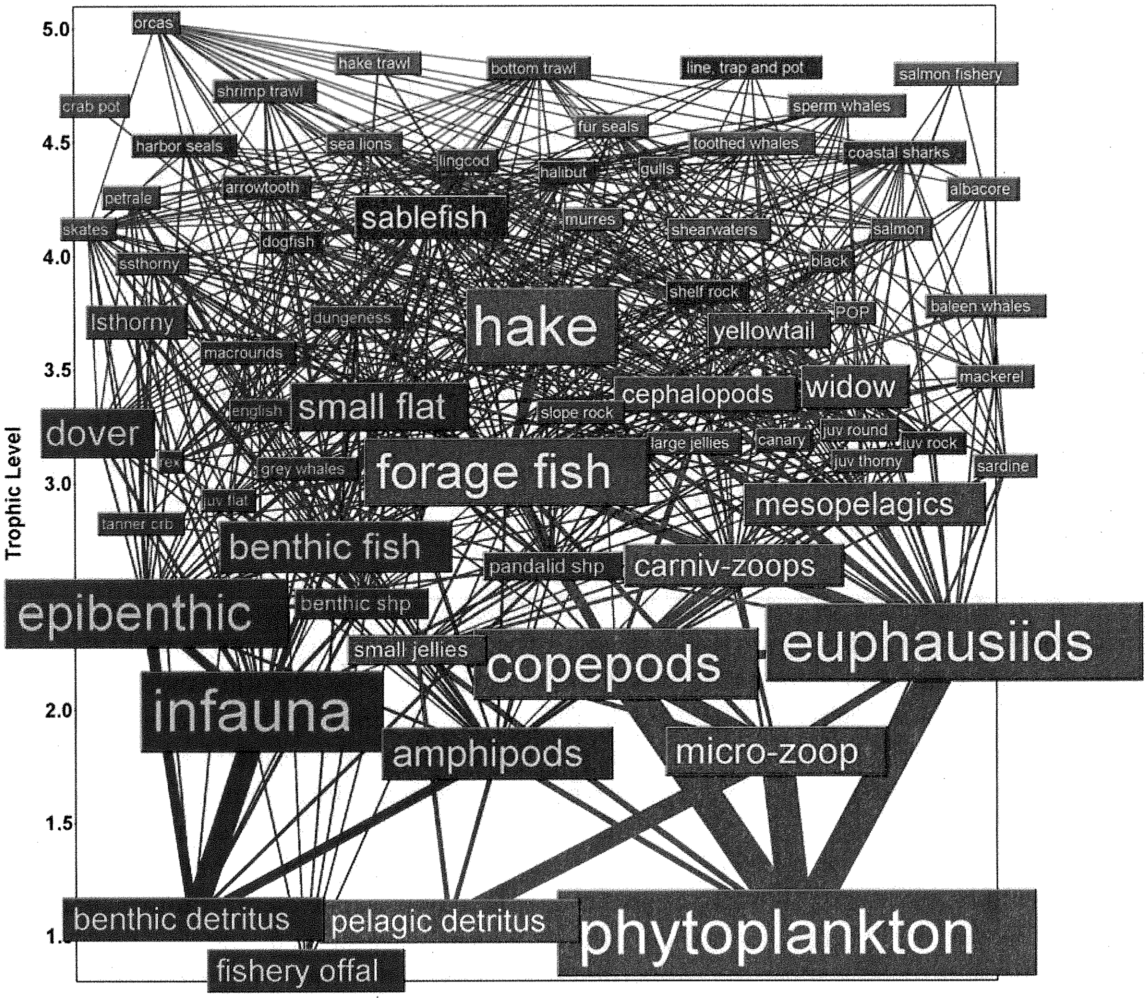


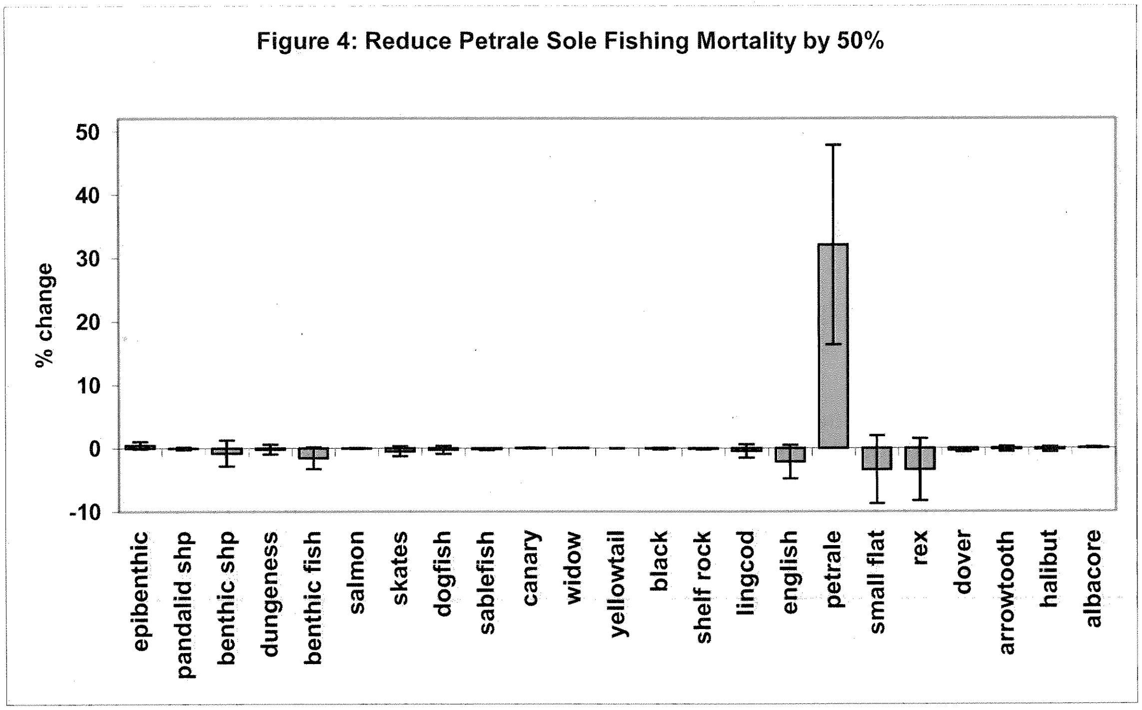
Figure 3: The significant food web of the Northern California Current. Trophic level is along the y axis; the height of the boxes is scaled to the standing biomass; the width of the bars represents biomass flux of prey to predators, and; the colors represent benthic (red) and pelagic (blue) energy pathways (Field, et al, in press.)

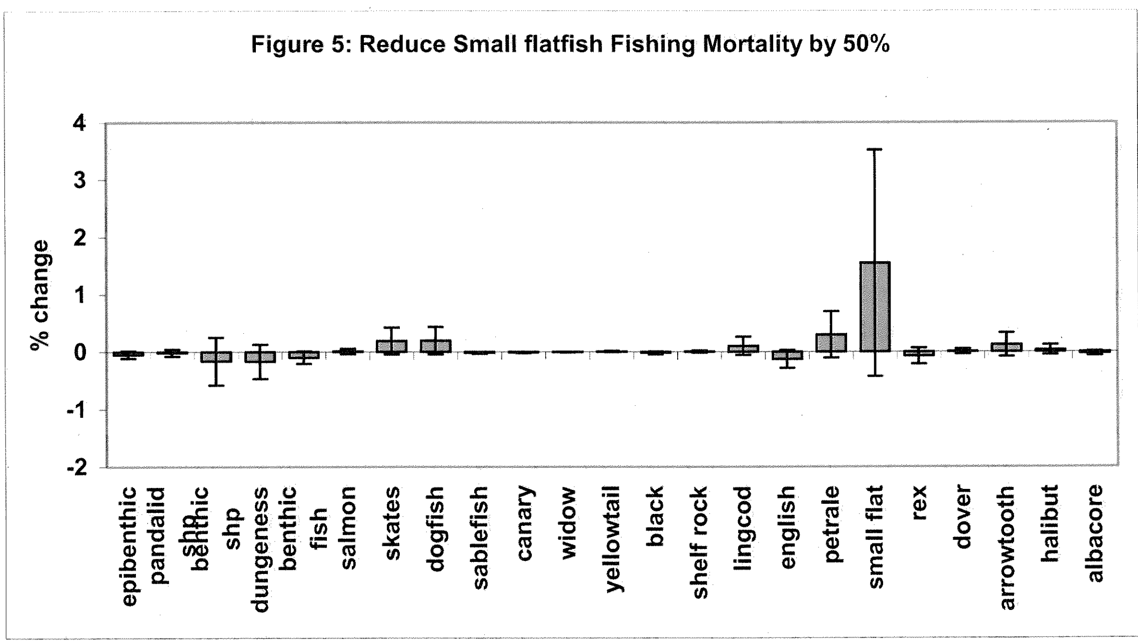


While minimizing bycatch of overfished groundfish and salmon may not have notable effects on other species within the NCC ecosystem, there may be measurable small-scale effects in particular areas. The more site-loyal rockfish species, cowcod and yelloweye rockfish, are higher-order predators and may have particular rockpiles where their local increased populations will affect other local populations of co-occurring species. Yoklavich et al. (2000) found that in rocky reef habitats subject to heavy fishing pressure, the abundance of smaller, faster growing, and early maturing rockfish species was considerably greater. By contrast, they found that isolated (and presumably lightly fished) reefs had higher concentrations of piscivores and much smaller numbers of fast-growing commercially unimportant species. Measuring potential effects of minimizing bycatch of site-loyal species requires an effort-intensive scientific program. The SWFSC is working with California academic institutions, California Department of Fish and Game, and other NOAA scientists to conduct an underwater survey in the Cowcod Conservation Areas off southern California (http://santacruz.nmfs.noaa.gov/ecology_branch/habitat_ecology/index.php). Initial data from this survey contributed to the 2005 cowcod stock assessment (Piner, 2005.)

In order to more simply characterize the roles of individual species within their ecosystems, the AFSC is beginning to model the simplified question: What would abundance levels of a variety of North Pacific species be if we were to either end all fishing on an individual species or to double the fishing mortality on that species? AFSC is finding that for species where fishing (either targeted or bycatch) mortality is a relatively high percentage of total mortality, then reducing the overall volume of fishing mortality can both increase the abundance of that stock and have ecological effects that alter the abundance of predator, prey, and competitor species. However, for species where predation mortality has a greater impact on total mortality than fishing mortality, reducing fishing mortality on that species tends to simply result in more of that population being eaten by non-human predators, rather than in that population itself noticeably increasing. (Gaichas, 2005 pers. comm.) SWFSC provided examples for this practicability analysis of how similar analyses might look for West Coast groundfish species (Field, 2005 pers. comm.)

Figures 4 and 5 show the effects on petrale sole and small flatfish, respectively, and the species that co-occur with petrale sole and small flatfish of reducing by 50 percent the fishing mortality rates on petrale sole or the small flatfish species (Pacific sanddabs, slender sole, sand sole, starry flounder, rock sole, and other minor species – does not include Dover, English, petrale, or rex soles.) In these figures, the shaded bars show estimated percentage change in abundance, while the thin lines in the centers of those bars indicate 95 percent confidence intervals when efforts are made to account for parameter uncertainty in model parameters (see Aydin et al. 2003 for methods). These figures should be viewed as showing expected trends in abundance change, rather than precise estimates. In Figure 4, petrale sole shows a clear increase in abundance resulting from a decrease in fishing mortality on petrale sole. This abundance increase is an expected trend for a species with a fishing mortality level that has a greater influence on total mortality than that species' natural mortality. Figure 4 also shows modest decreases in the abundance of petrale sole prey species, such as small flatfish. Figure 5, by contrast, shows that a similar reduction in the fishing mortality of small flatfish would likely only result in a small percentage change in small flatfish abundance (note the difference in units between the two figures.) Small flatfish serve as prey for a wide variety of species and human predation (fishing mortality) is a minor portion of that species group's total mortality.





As stated earlier in this section, while Amendment 18 directs groundfish management to continue to minimize bycatch, the diversity of the NCC ecosystem makes the ecological consequences of that bycatch minimization on the ecosystem either unclear or not significant enough to be measurable. Populations of higher-order bycatch species whose fishing mortality (whether direct mortality or bycatch mortality) is reduced are likely to respond with increased abundance in those populations and possible decreases in prey species' abundance. Populations of bycatch species that serve as prey for a broad range of non-human species whose fishing mortality is reduced are not likely to have notable population abundance increases and may or may not contribute to abundance increases in associated predator species. Improving the practicability of minimizing the ecological effects of groundfish fisheries' bycatch on the NCC ecosystem may best be served by: continuing to collect bycatch data to improve total catch (targeted + discard) estimates; increasing collection of data, like food habits data, that will support ecosystem modeling.

Changes in the Bycatch of Other Species of Fish and the Resulting Population and Ecosystem Effects:

Since the first three groundfish species were declared overfished in 1999 (bocaccio, lingcod, POP) the West Coast groundfish fisheries have been strictly curtailed in their allowable total (directed + bycatch) harvest of both overfished species and the more abundant stocks that co-occur with those overfished species. Management changes to protect and rebuild overfished species have severely affected the economic well-being of fishing communities. In 2001, the Secretary of Commerce declared the West Coast groundfish fishery a federal fishery disaster. Management measures to constrain incidental catch of overfished species have included: reduced harvest levels of healthy target stocks, coastwide fishing area closures, season closures, discard caps, and capacity reduction programs for both the limited entry trawl and fixed gear sectors. All of these measures combined have served to reduce not just bycatch and bycatch mortality, but total fishing mortality on groundfish and any non-groundfish species that have historically been taken with groundfish. As discussed above, although the groundfish trawl fishery has not been specifically managed to reduce halibut bycatch, halibut discards have declined dramatically since the late 1990s as a result of NMFS and Council efforts to constrain groundfish fishing, particularly on the continental shelf.

The prior section in this document discussed the diversity of the NCC ecosystem and the unlikelihood that the ecosystem effects of reducing the bycatch of particular overfished species could be measured beyond the particular species' stock size increases. This same principle applies to most species within the NCC ecosystem, with the possible exception of Pacific whiting, also known as hake. Recently completed 2005 groundfish stock assessments, however, do show that not only are overfished species abundance levels increasing, but abundance levels of the healthier stocks that co-occur with overfished species are also increasing. Although the ecosystem effects of rebuilding a particular overfished species may not be measurable, the population effects of the suite of rebuilding policies appear to be positive for both overfished and healthier groundfish stocks. However, because bycatch mortality is a relatively small proportion of overall fishing mortality, it would be more appropriate to attribute increased groundfish abundance levels to a reduction in total (directed + bycatch) fishing mortality than just to a reduction in bycatch mortality. Therefore, while Amendment 18 is intended to minimize bycatch in the groundfish fisheries to the extent practicable, the effects of that bycatch minimization on non-bycatch species are not measurable when considered within the larger context of total catch reductions.

Need Hastie graph of non-overfished groundfish species' biomass trends*

As the Council and NMFS implement Amendment 18, they will need to continue to monitor the effects of overfished species rebuilding policies not just on overfished species, but on other species as well. Most of the overfished species are continental shelf species, although darkblotched rockfish and POP are continental slope species. Eliminating most continental shelf fishing opportunities and severely curtailing slope fishing opportunities has encouraged some sectors of the fleet to increase their fishing activities in the nearshore area. Fishing in the nearshore area was historically more popular even before the rebuilding era, for the simple reason that it is more easily and safely accessed. The abundance of nearshore stocks will particularly need to be tracked in order to ensure that rebuilding policies for shelf and slope species do not inadvertently cause harm to nearshore species.

Effects on Marine Mammals and Birds:

As discussed above, NMFS is working with the USFWS to assess whether a Biological Opinion is needed on the effects of the groundfish fisheries on seabirds. Simultaneously, NMFS is also reviewing WCGOP data to determine whether a Biological Opinion is needed on the effects of groundfish fisheries on marine mammals. Preliminary WCGOP data show relatively minor levels of both lethal and non-lethal gear and vessel interactions with marine mammals and seabirds. From August 2001 through February 2005, WCGOP held approximately 7,100 observer sea days on trawl vessels, 1,800 observer sea days on hook-and-line gear vessels, and 700 observer sea days on pot vessels. Preliminary estimates from WCGOP data show fewer than 0.01 combined lethal and non-lethal interactions for either seabirds or marine mammals per observer sea day. (Cusick, pers. comm.) During the same observer sea days on which mammals and birds were observed having lethal and non-lethal interactions with fishing gear, numerous additional birds and mammals were observed in the vicinity of fishing vessels, but not in contact with either the observed vessel or its gear. Additional birds and mammals were either sighted near fishing vessels, or in the case of birds, landing on vessel decks to pause between flights.

As WCGOP has matured, more and different observer data from the groundfish fisheries have become available. During the development of Amendment 18, NMFS began to consider whether it needed to re-evaluate its Biological Opinion on salmon bycatch in the groundfish fisheries. Over the winter of 2005-2006, NMFS will be reviewing salmon, bird, and mammal bycatch data to determine whether management changes are needed to protect bird and mammal species. Amendment 18 includes an array of management measures that are applicable to both the reduction of bycatch of fish species and to the reduction of incidental take of marine mammals and birds.

Socio-Economic Environment (National Standard 9 Practicability Factors 5-10)

The remaining six factors that 50 CFR 600.350(d)(3) recommends for consideration of whether practicable management measures have been taken or are being proposed to be taken for bycatch minimization are factors concerning the socio-economic environment.

- changes in fishing, processing, disposal, and marketing costs;
- changes in fishing practices and behavior of fishermen;
- changes in research, administration, and enforcement costs and management effectiveness;
- changes in the economic, social, or cultural value of fishing activities and non-consumptive uses of fishery resources;
- changes in the distribution of benefits and costs; and
- social effects

As is evident from this list, the National Standard 9 guidelines on the socio-economic effects of the practicability of implementing bycatch minimization measures primarily look at changes in costs and value. In order to illustrate the practicability of implementing Amendment 18 from a socio-economic factors perspective, this section considers the National Standard 9 guidelines under a scenario of moving the limited entry trawl fleet from its current bi-monthly management regime to an individual fishing quota program. In this section, we focus on the use of IFQs as a tool to bring about a decrease in bycatch and use IFQs as a vehicle to discuss various issues of practicability. IFQs were chosen as an example due to the relatively large amount of literature exploring this regulatory tool in general and the in-depth discussions and preliminary analysis that have occurred already through the Council process. However, comparative information is provided below on the current costs of monitoring and projected costs of bycatch sector caps if applied to the rest of the trawl fleet based on the costs currently paid by the at-sea whiting sectors.

The Council has begun to consider an IFQ program for the trawl fleet, in accordance with its groundfish Strategic Plan, which calls for use of IFQ programs to reduce fleet capacity, where appropriate. Amendment 18 brings the Strategic Plan's capacity reduction goal into the FMP: *Achieve a level of harvest capacity in the fishery that is appropriate for a sustainable harvest and low discard rates, and which results in a fishery that is diverse, stable, and profitable. This reduced capacity should lead to more effective management for many other fishery problems.*

IFQs can have varying degrees of impacts on the human environment depending on the rules that define the program. For purposes of discussion, we assumed several rules for the IFQ program. The IFQ program under consideration for the West Coast groundfish fishery initially would apply only to the limited entry trawl fleet. Other sectors may be incorporated into the program later. In general, the IFQ program would allow individuals with limited entry trawl permits and annual quota pounds to catch groundfish. An initial allocation process would distribute quota shares or a portion of the total species-specific trawl quota to individuals based at least partially on landings history of the permit owner. At the beginning of each fishing year, the quota share would be converted into quota pounds. The quota owner would then be able to fish for the species he has quota pounds for anytime during the fishing season. The quota owner would also be able to sell and buy quota pounds and shares. In addition, the IFQ program would:

- allocate species-specific quota for various species (including overfished species);
- allow for transferability of shares and annual quota pounds;
- Require 100 percent at-sea observer coverage.

The specific rules that define an IFQ program determine the effectiveness and practicability of the program in decreasing bycatch. In this fishery, some of the ways that IFQs rules that can potentially decrease discards include:

- A program that allocates species-specific quota for several species (including overfished species), requires 100 percent observer coverage, and subtracts fish that are both discarded and retained from an individual's quota pounds will eliminate the option to discard without individual accountability. This type of rule is expected to decrease discard levels from that which occurs under the current trip limit management regime, but is expected to require 100 percent observer coverage of the trawl fleet.
- A rule that allows for transferability of quota share and quota pounds creates flexibility for the fishermen and enables them to land catch that would otherwise have to be discarded. Giving fishermen the flexibility to better match their allowed catch or landings limits to the mix of fish they have actually caught reduces both total and discard mortality. Allowing quota transferability has also been shown to decrease the number of vessels participating in a fishery, which can reduce the overall number of discard occasions.

Changes in Fishing, Processing, Disposal, and Marketing Costs

Fishing costs: A decrease in overcapitalization, increase in timing flexibility, increase in gear flexibility, increase in economies of scale and increase in economies of scope is expected to result in a decrease in fishing costs to the West Coast groundfish fleet.

<u>Decrease in overcapitalization</u>. One of the major benefits of IFQs for other fisheries has been that it promotes efficiency by eliminating incentives for fishermen to apply excessive capital and labor inputs to a fishery (NRC, 1999). While the West Coast groundfish fishery may benefit from IFQs in this way, the effect is not expected to be as large as that experienced by some other fisheries. Current management of the groundfish stocks dictates bi-monthly vessel trip limits throughout the year, which prevents an intense "race to fish" in the non-whiting trawl groundfish fishery. In addition, the recent industry buyback of vessels and permits with a history of groundfish landings removed about 35 percent of the vessels permitted to participate in the limited entry trawl fleet.

However, the whiting fishery has an annual allocation, instead of bi-monthly trip limits. Therefore, the whiting sectors experience a race to fish that would largely be eliminated under an IFQ, as long as almost all species were allocated as IFQ. Catcher-processor sector participants manage themselves with a cooperative that eliminates the race to fish for whiting, but cannot address inter-sector competition for bycatch species limits. Whiting fishing costs influenced by timing flexibility would therefore decrease. Other fishing costs are expected to decrease for this fleet as well for the same reasons as those given above. Lack of sufficient data on harvester cost and earnings does not allow for quantitative analysis of harvesting costs under a system of IFQs. However, analytical work is being conducted to attempt to quantify the efficiency benefits of IFQs. In other fisheries, these methods have been used to show potential efficiency gains.

The tables at the end of this section present the costs currently paid by the at-sea whiting sectors for services that help manage their bycatch sectors caps and apply those costs to the shore-based whiting and other trawl sectors as an example of the costs that might apply if a bycatch sector caps was required.

Timing flexibility. The harvesting sector is expected to benefit from the change in timing flexibility that occurs with implementation of IFQs where IFQ owners are not restricted to catch their quota any particular time within a given season/year. Currently, fishermen are subject to bi-monthly trip limits that are lost if not used within a certain period of time. Timing flexibility would allow for fishermen to fish when input costs (ex: diesel, crew) are relatively favorable.

Gear flexibility. Gear flexibility options also create the potential for fishermen to switch to relatively less costly gear.

Economies of scale. Changes in economies of scale are expected to decrease fishing costs. There are usually economies of scale in production when the cost per unit produced declines with the number of units produced. Under a system of IFQs, IFQ participants would have the opportunity to harvest more fish than under the current trip limits if they choose to purchase additional quota. In this way, some vessel owners will be able to decrease their costs per unit by harvesting more groundfish overall.

Economies of scope. Economies of scope mean that it is less costly to produce a set of goods with one vessel than it is to produce it with two or more vessels. Therefore, changes in economies of scope are expected to decrease fishing costs. Fleet participants may be able to spread the cost of maintaining one vessel over more activities.

In addition to these costs for the IFQ sector participants, there may be additional costs for non-IFQ sector participants. Non-IFQ sector participants may experience additional costs associated with transporting their catch to other ports if a processing facility they currently make deliveries to relocates or shuts down as a result of IFQ implementation. In addition, if IFQ fishermen are allowed gear flexibility, they may choose to supply fish of different species or quality than those currently supplied. The increase in supply to the new markets could result in price decreases and this could disadvantage non-IFQ fishery participants.

Processing costs: The potential impacts of IFQs on the processing sector is largely unknown. In looking at the experience of other fisheries with IFQ programs within the U.S., one study commissioned by the state of Alaska to examine the experience of processors in the halibut and sablefish fisheries concluded that the IFQ program significantly negatively affected processors. However, GAO (2002) reviewed this report and questioned its validity. Other programs in Iceland and New Zealand have clearly benefited from IFQ implementation resulting from increases in product value and expansion of domestic fishing operations.

Although there is some uncertainty with regard to changes in processing costs as a result of IFQ implementation in the West Coast groundfish fishery, costs incurred by processors could potentially decrease as a result of changes in timing flexibility, economies of scale, and economies of scope. In the whiting fishery, there may be some equipment and labor that would no longer be useful following IFQ implementation. In the long run, this is a decrease in cost for the processor. In the short-run, this could be viewed as "stranded capital", or capital that is no longer useable or saleable. Lack of data on processing cost and earnings does not allow for comprehensive quantitative analysis of processing costs under a system of IFQs.

Disposal and marketing costs: If full retention or retention requirements are made as part of the IFQ system, disposal costs could be significant depending on the extent to which retention is imposed. However, IFQs may provide incentives for fishermen to find ways to reduce disposal costs or offset disposal costs by converting more of the harvestable fish into saleable products. Also, a reduction in race to fish tendencies may reduce waste and therefore reduce disposal costs. The change to marketing costs resulting from IFQ implementation is unknown.

Changes in fishing practices and behavior of fishermen

End to the "race to fish" - Harvest activity is spread out over a longer time period: A major benefit of IFQs touted in the literature is the management system's ability to end the race for fish. Implementation of IFQs usually creates a situation where IFQ species can be harvested with more flexibility over when that harvest occurs. In other fisheries that have implemented IFQs, fishermen spread their harvesting effort over a longer period of time than under traditional management systems. This often resulted in an increase in safety at sea and a decrease in overcapitalization in the form of electronics and other machinery that could be used to increase harvest within a set period of time.

Depending on how the IFQ system is designed, the Pacific groundfish trawl fishery for whiting has the potential to experience some of these benefits. If the IFQ program developed for the Pacific Groundfish trawl fishery incorporates a wide array of species targeted or species limiting harvest of targeted species, the whiting fishery is expected to experience a decrease in the race to fish. Current management, particularly the use of bycatch trip limits, have reduced the race to fish. Management regulations allow for a spreading out of the harvest over the year through two-month vessel specific trip limits, whereas the whiting fishery is managed through annual sector allocations of the target species and sector limits of bycatch species. However, the non-whiting groundfish fishery will be better able to time their harvest with favorable market conditions. The timing flexibility may also allow for fishermen and processors to fill custom orders.

Changes in behavior resulting from greater resource stewardship: One of the primary potential benefits of implementation of individual transferable quotas is the increase in resource stewardship on the part of the harvester. The NRC (1999) reports, "The allocation of permits to harvest a portion of the TAC is a management tool with high potential for efficiency and stewardship in a given fishery". The NRC report provides examples of increases in stewardship from several fisheries including some in New Zealand, Nova Scotia, and the U.S. Wreckfish fishery. In New Zealand, quota holders in several fisheries formed companies that fund research "to determine biomass and sustainability yields, to conduct fisheries enhancement projects, and to promote voluntary TAC reductions to enhance conservation of the resource". Wreckfish quota holders have voluntarily underfished the TAC since IFQ implementation. In Nova Scotia, McCay et al. (1995) note an increase in co-management through greater involvement by industry in problem definition and research. However, the NRC (1999) also acknowledge that they received testimony that IFQs do not promote stewardship.

Changes in behavior resulting from specific IFQ program design features – 100 percent at-sea observer or compliance monitor coverage: The British Columbia (BC) Groundfish Trawl IVQ was a fishery closely resembling the Pacific coast groundfish fishery in species mix harvested and use of specific management regulations prior to individual vessel quota (IVQ) implementation. The regulations identified for inclusion in an IFQ program for the West Coast groundfish fishery are similar to those currently used in the BC IVQ, including 100 percent observer coverage. Branch et al. (2005) have found that the observer coverage along with prohibiting discarding has resulted in changes in target behavior and consequent changes in species catches so that they aligned more closely with TACs. For example, fishermen are making a short, sample tow to assess the suitability of the mix of species when entering a new area, and are investing in gear that allows for selective harvesting (Jones, 2003).

Changes in research, administration, and enforcement costs and management effectiveness

Enforcement and Monitoring Costs: NRC (1999) writes that IFQs may raise special enforcement issues including quota busting and poaching. There may be a greater incentive for these under IFQs due to the system's ability to increase profitability. The level of increase in enforcement activity will be a major determinant to the change in enforcement costs that could be expected under an IFQ system. The NRC (1999) reports on a survey of IFQ programs completed by the Organization of Economic Cooperation and Development in 1997 that stated "Higher enforcement costs and/or greater enforcement problems occurred in 18 fisheries compared to five that experienced improvements". However, NRC (1999) states "Higher enforcement costs are not, by themselves, particularly troubling because they can be financed from the enhanced profitability of the fishery".

In the Pacific groundfish trawl fishery, monitoring costs are expected to increase significantly for the Pacific groundfish trawl fishery under IFQ management. Greater monitoring costs are expected to result from the use of several potential tools: 100 percent at-sea observer coverage or compliance monitoring requirements, implementation of a real-time electronic landings system, and data entry and analysis. These costs are shown and discussed in the "Available Technology and Economic Considerations" section.

Administrative costs: Changes in administrative costs may result from changes in the need for certain types of inseason management, the increase in observer coverage, and from restrictions on ownership and transfer rules. For example, administrative costs associated with tracking quota transfers, use and control as well as the need to review observer/compliance data is expected to significantly increase.

Research costs: In general, several other research costs could increase due to a greater push for collection of economic data and more scientific research due to an increase in feelings of stewardship under an IFQ program.

Management effectiveness: Depending on the management tools used in conjunction with the individual quota program, IFQs for the Pacific Groundfish trawl fishery have the potential to increase management effectiveness by better enabling the fishery to stay within the total allowable catch and reduce bycatch (thereby increasing landings and economic use of the resource). Several IFQ design features and management tools are key to attaining these goals including development of methods for better enabling fishermen the ability to match their catch with individual quota. Without the ability for fishermen to match catch to quota in a multispecies fishery, the resource could suffer from underutilization of several species and exceedance of other species' TACs. Such design features and management tools might include: full transferability of quota; flexibility with regard to when and how often quota can be transferred; 100 percent at-sea observer or compliance monitoring coverage to ensure data reliability and to discourage discarding; a real time landings information and tracking system that would alert quota holders of exceedance; adequate penalties for catching more than one has quota for; allowances for rollover of unused individual quota for use the following year, and; allowances for subtraction of quota exceedance in the current year from the following year's individual allocation.

Changes in the economic, social, or cultural value of fishing activities and non-consumptive uses of fishery resources

Economic Value - Product Value: In some IFQ fisheries, the value of the fish harvested increases as a result of IFQ implementation due to quality improvements or changes in product form (ex: a switch from frozen to fresh fish). This is sometimes a result of the decrease in the race to fish. Non-whiting Pacific coast groundfish are already typically sold as a fresh product. Increases in value of groundfish could potentially result from at least two actions: a) increases in targeting of custom markets by processors, b) increase in fish flesh quality due to changes in gear used to harvest groundfish[2], and 3) new product development.

Economic Value – Aggregate Value of the Fishery: Overall value of the resource could also increase as a result of: 1) changes in the output mix of species being landed, 2) increases in the TAC, and 3) a decrease in the number of fishing vessels. Changes in the output mix may occur due to the ability of fishermen to transfer quota or change gear usage. Increases in the TAC could result from a decrease in discarding. A decrease in discarding could result from the ability of fishermen to transfer quota and the change in regulations that specify trip limits. A decrease in fishing vessels due to consolidation would result in an overall decrease in fishing costs.

Economic Value – Asset Values: Following IFQ implementation, assets in the form of fishing vessels, permits, and quota share may change. If consolidation occurs in a short period of time, several vessels may be up for sale at the same time resulting in a decrease in vessel sale prices. Permit values may increase due to the expected increase in the value of the fishery following IFQ implementation. Among other things, expectations of an increase in permit and quota values could be based on beliefs about the future health of the ecosystem, stability of landings, increases in product value, or confidence in management of the resource. The value of quota share often increases over the first few years following implementation of an IFQ system as people gain more information about the new management system and the nature of the asset.

Social and Cultural Value: Changes in the social value of fishing activities following IFQ implementation, among other factors, could result from consolidation of quota shares and greater stability of landings. Consolidation of quota shares could result in decreases in employment, resulting in greater incidence of criminal activity and domestic violence. Greater stability of landings could result in greater job and financial stability and security for those who remain in the fishery. The overall change in employment is likely to impact the local tax base of communities and the ability of communities to fund public education and libraries, cultural activities (seafood and other festivals), make repairs to infrastructure and provide social services.

Non-Consumptive Uses of Fishery Resources: Non-consumptive users of the resource are expected to benefit through a potentially higher existence value and bequest value resulting from a better managed fishery.

Changes in the distribution of benefits and costs

[2] This could occur if quota owners or holders were allowed to use gear other than trawl such as hook and line or fish traps.

Among other things, a change in the distribution of benefits and costs resulting from IFQ implementation can result from initial allocation, specific program rules, and geographic shifts or exit of seafood processing facilities and harvesters. Depending on the rules regarding who is considered for initial allocation and the formula used, some current fishery participants may receive quota while others may not. Due to the potential for quota to increase in value, the long term benefits of the IFQ could go largely to quota owners who can sell their quota at a value theoretically equal to the future profits the quota allows for over several years. Geographic shifts in seafood processing delivery sites and fishery participants can result from consolidation of quota.

Initial Allocation and Program Rules: Initial allocation is usually based on an individual or vessel owner's landings history. In this way, crew, communities, processors, and support industries are often excluded from quota allocation. While initial allocation can exclude some, IFQ program rules can be designed such that crew and other individuals can obtain IFQ, or regulations can be written such that some benefits of an IFQ flow to communities, support industries, processors, etc. For example, the regulations can allow ownership of IFQ by any U.S. citizen. In this way, entities can purchase IFQ following initial allocation. Another tool for distribution of benefits to those without landings history is through creation of a program that distributes a portion of the TAC to them and then allows for communities to lease the quota to community residents. Other regulations can restrict landings to particular ports in an effort to maintain the flow of benefits to particular communities.

Geographic shifts: Consolidation of quota ownership or control of quota can sometimes be a cause for geographic relocation of processing facilities and other fishery participants. Among other factors, the type and restrictiveness of ownership and control limits placed on aggregation of quota within the fishery will determine the maximum level of consolidation of quota that occurs. Consolidation in IFQ fisheries has sometimes been significant. For example, the number of quota owners has changed over time in the Scallop and Ocean Quahog fishery. The number of ITQ shareholders decreased from 49 in 1992 when the program was implemented to 25 in 1996 (NRC, 1999). According to GAO (2002, p. 3) the three U.S. IFQ programs that they reviewed experienced some consolidation of quota holdings, the extent of which was affected by the program's rules. Consolidation can potentially impact communities when processing plants shut down by depriving the local economy they leave of jobs[3] and municipal revenues from use of utility services, use of port facilities, and sometimes from rental of dockside buildings. The community could also experience a loss of tax base and a need to increase the supply of social services to individuals left jobless. The community to which the processing plant relocates gains from the shift. Gear groups not included in the IFQ and which deliver to the same processor as IFQ participants could potentially lose delivery access to

[3] Declines in employment in the clam fishery has resulted from the decrease in the number of vessels and a decline in the bargaining power of crew and captains, "symbolized and to some degree exacerbated by changes in the share system of returns to owners and crew" (NRC, 1999, p. 65).

a processor when a processor closes or relocates. This loss could occur if the IFQ fishing sector provides the processing facility with a greater portion of revenue than the non-IFQ sectors. This factor is a potential concern with implementing a trawl IFQ program, since the limited entry trawl fleet delivers a significant majority of commercial groundfish landings. Support industries could also relocate with the IFQ fleet if the IFQ sector is their largest source of revenue.

Some consolidation of ownership is expected and can result in efficiency improvements that can yield aggregate benefits to particular fishing operations, particular communities, the fishery, and the Nation. However, the recent buyback reduced the number of people wanting to leave the fishery. Therefore, consolidation may not occur as quickly as it has in other IFQ fisheries with no buyback occurring prior to IFQ implementation. In addition, caps on ownership and other IFQ program design elements have been proposed to limit redistribution of benefits.

Social effects

The social impact to communities of IFQ implementation is influenced by how dependent the communities are on the fishery. Many Icelandic and Alaskan communities in particular are heavily dependent on the fishing industry. West Coast communities, in general, are perceived as being relatively less dependent on fishing. However, in particular communities, IFQ implementation could result in significant impacts. Literature on the social impacts of IFQs discusses changes in social equity, the social structure of communities and families, the loss of professional expertise and knowledge, and activation of claims made by native peoples.

Social equity: McCay (1995) writes about the social implications of ITQs in fisheries including job losses, changing social relationships of production, changing social structures within communities, and increased concentration of rights, power and wealth within an industry. McCay (1995) discusses several areas of social concern including the change in the payment system between the quota owner, captain and crew before and after IQ implementation.

> *Where captains and crew are rewarded for their work through shares of the catch, the sharing formula often changes under ITQs reflecting the shift in power, so that the owner retains a larger portion of the total. There may also be a movement toward wages instead of shares. Moreover, buyers such as fish processors are likely to want to acquire a direct stake in ITQs in order to maintain consistent supply, reducing the risks of temporal variability and product perishability. This may clash with the wish of vessel owners to maintain control of ITQ to maintain bargaining position, or for other reasons as well as public concern about the effects of absentee ownership. Generally, the ITQ systems power will be transferred to ITQ holders, reducing the negotiating power of those who work for them.*

Changing social structures within communities and families: Changes to fishery-dependent communities as a consequence of ITQs can be profound depending on ITQ design. McCay (1995) discusses research in Nova Scotia reporting "...strains posed upon a close-knit community and egalitarian culture by the rise of 'fish lords' controlling ITQs". In small communities, tension can be generated between those who participate in an ITQ program and those who don't, to the extent that the conflict generated can interfere with community interactions on school boards, in churches, and town councils (McCay, 2000).

Additional problematic issues have included: the rising value of ITQs, retirement, and succession within a family business. When succession does occur, the family can experience socio-cultural shifts and loss of fishing rights for those not directly involved in fishing (ex: wives and daughters). McCay (1995) also notes that death and divorce can also "force the exit of otherwise healthy firms from the fishery, as people find themselves forced to sell fishing rights to meet inheritance taxes or divorce settlements". In these ways, family fishing businesses may be particularly vulnerable to the now taxable exit process and more costly conditions of entry.

Loss of traditional culture, professional expertise and knowledge: McCay (1995) notes the potential for a loss of a traditional culture of fishing on families and communities. This can occur when ITQs lead to large-scale sell outs where individuals who leave the fishery may not be marginal or inefficient but simply not have access to and control of the new form of property rights required to remain in the fishery. The removal of these participants from the fishery essentially removes the inherent knowledge they possess about the fishery from the fishery. This information is not likely to be passed down through familial generations or even through working relationships.

Activation of claims of native peoples to fishing rights: McCay (1995) discusses the consequence that ITQs have had on native people's claims to property rights or revenues from those rights in New Zealand and Alaska. Fishery-dependent coastal communities in Alaska have claimed rights to shares that have essentially resulted in community quota that is either fished by community members or "managed on behalf of the community" (McCay, 2000). At least in New Zealand, Maori claims to fishing rights came under consideration *after* an ITQ program had been implemented for a variety of fish species. A process for allocating U.S. West Coast tribal treaty rights to fishery resources has been in place for many years and four Washington coastal tribes have treaty fishing rights to groundfish – Makah, Quileute, Hoh, and Quinault. In addition to the co-management process established under U.S. v. Washington, the Magnuson-Stevens Act has established a Council seat for a tribal representative, and Executive Order 13175 requires coordination and consultation with tribal officials in the development of Federal policies with tribal implications. Although accounting for treaty fishing rights may make designing groundfish ITQ programs more complex, that complexity is vastly reduced over a situation where native fishing rights are not taken in to account until after quota shares have been fully allocated to non-treaty fishery participants.

Available Technology and Economic Considerations

As discussed in the Background section of this document, we view the concept of "practicable" as a management program that is "reasonable and capable of being done in light of available technology and economic considerations." While implementing an IFQ program may be a practicable management program in the future, it cannot be implemented immediately because the Council and fishing industry must consider and confer upon the design of the program and analyze the effects of implementing such a program under the requirements of various national laws. There are technologies, such as electronic catch monitoring via camera, that may be adequate for monitoring whether a vessel retains all of its catch on a given trip, but inadequate to determine the species composition of that catch or any discard. Amendment 18 is intended to both reduce bycatch to the extent currently practicable, and to broaden the scope of what is practicable in the future. Management measures that are currently out of the reach of the groundfish fleet because of their cost, such as 100 percent observer coverage, may become practicable if fleet revenues are increased via IFQ program implementation.

The following tables present status quo costs for various monitoring tools (Table 1), costs for various monitoring tools under several potential scenarios other than status quo (Table 2) and detailed cost information for some of the cost categories in Table 2 (Tables 3- 5). The information in most of the tables has been gathered from available documents. In some cases, individuals were contacted with data and information requests. The reader should be aware that these tables do not report on all costs associated with the described scenarios. These tables provide currently available cost information only. In order to report on a total cost for each of the cost categories and scenario mixes in the tables, it was necessary to make some assumptions. These assumptions are stated in the footnotes for each table. The footnotes explain what regulations apply under each of the scenarios as well as what is included in each of the cost categories. Tables 3 – 5 present more detailed cost information for some of the major cost categories.

Practicability—Funding Implications Catch and Bycatch Monitoring Programs

The Bycatch FEIS described the management and enforcement effects of the preferred alternative in Section 4.4.7.9:

> Alternative 7 would be expected to notably increase management and enforcement costs for initial start up and over the long term. The sector allocations required by this alternative would take two to four years to develop, analyze, and implement through the Council and NMFS management processes. In addition, human costs associated with inseason catch projections would be greatly increased in order to track multiple sectors inseason. As catch limits were allocated over an increasing number of sectors, NMFS would be required to manage increasingly small blocks of fish. It would be necessary to obtain precise and reliable estimates of the quantities of target and non-target catches within each sector. In the short term under Alternative 7, the PacFIN quota species monitoring

(QSM) program would have to be revised to track each sector's landings independently. Catches of overfished species would be projected based on landings of target species; each sector would likely have different assumed bycatch rates. If sectors are open, meaning vessels would be free to move from one to another without warning, catch monitoring could become even more complex and difficult. Over time, as observer coverage and associated infrastructure improves (at additional cost), sectors may be managed in real time. This would increase the pressure on observer data whenever new information indicated increased bycatch rates. An expanded port/field sampling program could improve inseason estimates of recreational catch. It would also be necessary to have adequate observer coverage of every sector's vessels to ensure the effectiveness of sector caps.

As discussed above in the analysis of the economic effects on commercial harvesters, the costs of expanded observer coverage would be borne mostly by industry, unless NMFS provided all observers at no cost to vessels. Federal funds for expansion of the observer program have not been identified. In addition, the increase in the number of observers and its associated increase in the amount of data collected is expected to raise overall annual costs of the groundfish observer program. This budgetary increase can be attributed to additional staffing and augmented spending for data entry contracts. To monitor the catch of each vessel requires the use of increasingly sophisticated catch-monitoring tools, such as electronic reporting. Computerized systems of electronic reporting and data management increase the quantity, quality, and timeliness of the information available for fisheries management. However, they also increase the demands on management staff to effectively make use of a larger and more complex data system. These additional costs to the observer program have not been estimated.

An expanded port/field sampling program to improve estimates of recreational catch would entail a larger budget for the state and federal agencies currently involved in data collection. The current program recently received additional funds so that its 2004 total budget is about \$3.4 million (\$2.2 million in federal dollars and \$1.2 million from Oregon, Washington and California). However, it estimated that the program would require an additional \$1 million to develop a comprehensive coastwide marine recreational fisheries data system.

Table 1 shows current 2005 federal, state, tribal and industry funding of the major Catch and Bycatch Monitoring Programs used for managing groundfish. These programs are described in detail in section 3.4.10 the FEIS. Note that the RecFIN and PacFIN programs provide information on all species of fish, not just groundfish. Estimates in Table 1 are rough and are based on information available at this time. Many of the funding estimates used are associated with specific appropriations and may not reflect the contributions of federal, state, and tribal agencies out of base or general budgetary funds.

Table 1: Estimates of 2005 Expenditures on Major Monitoring Systems Used for Groundfish Management, In $Millions (Preliminary estimates, some may need confirmation).

Programs	Fisheries	Total	Federal	State & Tribal	Industry
RecFIN	Shorebased – all species – all modes	4.4	2.2	2.2	
PacFIN	Shorebased – all species – all gears	4.6	2.5	2.1	
WCGOP	At-sea groundfish, excluding hake – LE & OA fleets	4.8	4.8	0	
Hake Monitoring	At-sea observers, camera, shore monitoring	0.7	0.4	0.1	0.3
VMS	Groundfish LE trawl and fixed gear	1.1	0.3	0	0.8

Federal Funding – Table 1 shows that almost all of these programs rely heavily on federal funding. The picture for 2006 and beyond is not clear, as Congress is still making appropriation decisions. Funding trends for the major catch and monitoring systems used for groundfish (PacFIN, RecFIN, and WCOP) have been stable for several years. Given current federal spending issues, including Hurricane Katrina, the presumption is that for 2006 these programs will be funded at levels similar to where they have been in 2005 and prior years

State and Tribal Funding – The State and Tribal Funding estimates are primarily based on PacFIN and RecFIN presentations given at the 2005 Pacific States Marine Fisheries Commission's Annual Meeting (http://www.psmfc.org/content/view/115/218/) and a review of information associated with the Shoreside Hake Observer Program. Discussions with Tribal representatives have not been completed. A preliminary presumption is that state and tribal fishery budgets catch monitoring will not be increasing in the future.

Industry Funding – These estimates are estimates of at-sea observer costs, VMS payments (VMS estimate includes the one time equipment cost and estimate for annual communications cost.) and information associated with the Shoreside Hake Observer Program. In terms of future funding, the presumption is that industry willingness to take on additional costs will be the result of expectations of increased revenues and/or reduced operating costs. A quick comparison of Washington State fuel prices collected by the PSMFC indicated that fuel prices in October 2006 are about 40% higher than October 2005 prices. In addition, in September 2005, NMFS started collecting fees from the groundfish trawl, state crab and pink shrimp fisheries for purposes of paying back the industry loan that associated with the Pacific Groundfish Buyback Program. For example, a 5 percent fee is now being applied to groundfish trawl and California Pink shrimp ex-vessel revenues.

Practicability—Revenue and Income Perspectives

Commercial Groundfish – The current PSMFC PacFIN estimate of 2004 groundfish ex-vessel revenues earned collectively by all Sectors is about $61 million. This compares to average 1981-2003 ex-vessel revenues adjusted for inflation of $98 million. However, the last six years of this trend are the lowest of the series, reflecting declines in fishing opportunity associated with the overfished species regime of 1999-present. The annual estimates associated with the 1987-1992 and 1995-1997 periods range from $109 million to $131 million. (See Table 8-1c, PFMC's 2005-2006 GF Specifications EIS (October 2004)). These estimates suggest that if all overfished species and target species are harvested at sustainable levels, perhaps commercial revenues could be restored to levels of $120 million annually. These revenues are not only important to fishermen but to the communities, processors, and allied industries that support the groundfish fishery. Using a rough multiplier of 1.8, $120 million in exvessel revenues translates into $216 million in personal income to fishing communities. (This multiplier is derived from on information found in the PFMC's 2005-2006 GF Specifications EIS.)

Recreational Groundfish – PFMC staff estimate that about 1,300 of the 4,400 angler private and charter boats trips taken annually where groundfish is a targeted species or caught incidentally. Thus it appears that groundfish is a significant portion of the West Coast Groundfish sport fishery and of the $238 million generated by 2003 West Coast Ocean Recreational fishery (Table 8-26, 2005-2006 GF Specifications EIS). PFMC states: "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." (PFMC, 2004.)

All West Coast Fisheries – A review of the Council's "Bycatch Scorecard" shows that overfished species appear as bycatch in almost all of the West Coast's major commercial and recreational fisheries. In terms of 2003 estimates, thus, groundfish management decisions directly or indirectly affect a major portion of the approximately $300 million in ex-vessel revenues earned annually and close to $600 million in personal income generated by the West Coast Commercial fleet and the $238 million in personal income generated by the West Coast private and charterboat fleet (PFMC, 2004.)

Table 2. Conceptual Estimates of Various Monitoring Tools

	Scenario 1: Status Quo[4]	Scenario 2: Sector Bycatch Caps[5]	Scenario 3: IFQs[6]	Scenario 4: IFQs with Restrictions[7]
At-sea observers (groundfish fleet only)[8]	$4,500K	$13,300K	$13,300K	$7,500K
VMS[9]	$1,078K	$609K	$609K	$609K
Enforcement[10]	$2,234K	> $2,234K	$3,745K	< or = to $3,745K
Electronic (video) monitoring[11]	$260K	$260K	$260K	$260K

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[4] Scenario 1 assumes costs associated with 2005 regulations.

[5] Scenario 2 assumes costs associated with 100% observer coverage, Sea State Services extended to the shore based whiting and LE non-whiting trawl fleet, and one FTE to accomplish administrative tasks.

[6] Scenario 3 assumes quota allocation of several species including overfished species, full transferability of quota share and pounds, 100% observer coverage, and current vessel numbers. For simplification, we assume no consolidation of quota share or pounds resulting in a decrease in vessel numbers. Therefore, this estimate likely resembles some of the costs associated with an ITQ with restrictions on transferability for the first couple years.

[7] Scenario 4 has the same assumptions as Scenario 3 but also includes: 1) regulations stating that all vessels participating in limited entry bottom trawl or at-sea hake mid-water trawl activities must carry an observer when fishing and 2) regulations that aid in reducing the cost of observer coverage. If 100% of vessels are to be covered and bottom trawl vessels can fish at any time, the number of observers will have to match the number of vessels able to fish. This results in a very high number of observers to be on call under Scenario 3. However, if fishing restrictions are put in place that limit the number of vessels able to fish at any given time, the number of observers on call can be reduced, thereby reducing cost. An example would be to place all bottom trawl vessels in one of two or three groups, each of which can only fish at one time, thereby reducing the number of observers on call. The cost of monitoring the limited entry fixed gear fleet at current levels is also included. The administrative cost does not include at-sea observer data transmission; it assumes post-trip transmission of observer data. Industry formation of coops may negate the need for the groups described above.

[8] See At-Sea Observer table below for details.

[9] Average per vessel costs were estimated for transceiver unit and installation, annual per unit replacement cost, maintenance cost, and transmission fees. These values were combined to estimate the per unit cost. This value was multiplied by the current number of vessels with VMS units (310) and added to federal costs in 2005 (about $296,000) for the Status Quo scenario. All per unit values are based on data provided in Socioeconomic Environment Cost tables in *Expanded Coverage of the Program to Monitor Time-Area Closures in the Pacific Coast Groundfish Fishery – Draft Environmental Assessment, Regulatory Impact Review & Regulatory Flexibility Analysis.* When a range of costs was provided, an average of the minimum and maximum values was used. Federal costs include the cost for employees, supplies and travel. This does not include initial hardware and software costs in 2003 amounting to about $80,000. See VMS table in this document for further details. In subsequent scenarios, the total cost is lower than the Status Quo scenario due to the assumption that new units have already been purchased and only replacement costs are being paid for the transceiver unit. All other costs continue to apply. See VMS table below for details.

[10] See Enforcement table below for details.

Sea-State services[12]	$25,000	$52,821	$25,000	$25,000

[11] This category displays the cost associated with the Electronic Monitoring Pilot Study implemented for the shore-based whiting fishery only. The cost listed here includes the cost of leasing units, installation of units, data collection, unit removal, data analysis, and a final report. This estimate also includes the cost to NWFSC staff to oversee the contract, participate in outreach, resolve any conflicts, review and add content to the report.

[12] Sea State is a private company offering services to the non-tribal at-sea whiting sectors. In particular, Sea State provides the fishery participants with information on whiting and bycatch status in the form of maps and analysis, holds meetings for skippers at the beginning of the season and throughout the season on a need basis, and attends Council meetings as needed. Under the Status Quo scenario, costs apply to the non-tribal at-sea whiting sector only. Costs are based on payments made to Sea State in 2004. Under the Sector Bycatch Limits scenario, we assume expansion of Sea State services to the LE trawl, LE fixed gear, and shore based sectors. The $25,000 value was divided by total whiting landings in 2004 for the non-tribal at-sea whiting sectors to estimate the cost per metric ton of whiting landed paid by the sectors to Sea State. This price per metric ton was then multiplied by the total landings for LE trawl, LE fixed gear, and shore-based whiting sectors to estimate potential costs to industry of purchasing Sea State services under a scenario with sector bycatch limits. We assume that sector bycatch limits would not exist under the IFQ scenarios (3 and 4) except for the at-sea whiting fishery. We realize that costs may not be assessed on a per pound basis if services are extended to the non-whiting groundfish fleet since service costs may vary and the types of service may differ. However, without additional information and data, the above methods were used to make rough cost estimates.

Table 3. Groundfish At-Sea Observer Costs.

	Scenario 1: Status Quo (see footnote 1)	Scenario 2: Sector Bycatch Caps (see footnote 2)	Scenario 3: IFQs (see footnote 3)	Scenario 4: IFQs with fishing restrictions (see footnote 4)
At-Sea Observer Coverage	25% bottom trawl; 100% at-sea hake; variable coverage for other GF vessels	100% bottom trawl and at-sea hake	100% bottom trawl and at-sea hake	100% for bottom trawl and at-sea hake
Total fixed administrative cost (see footnote 6)	$1,000K	$1,300K	$1,300K	$1,300K
Cost for observers (see footnote 7)	$3,500K	$12,000K	$12,000K	$6,200K
Total Estimated Cost	$4,500K	$13,300K	$13,300K	$7,500K

1. The "Status Quo" scenario includes observer coverage for a portion of the open access sector targeting groundfish, but does not include the cost for coverage of the shrimp or prawn or shore-based hake vessels. The open access sector includes Oregon and California nearshore groundfish, California sablefish and California halibut trawl. Status Quo is based on current levels of observer coverage which range from 1-100% depending on the sector. The current cost to the at-sea hake industry for procuring observers is included in these estimates.
2. The "Sector Bycatch Caps" scenario assumes 100% observer coverage of the limited entry bottom trawl and at-sea hake mid-water trawl fleets ONLY. This does not include the cost of covering any other vessels. The administrative cost does not include at-sea observer data transmission; it assumes post-trip transmission of observer data.
3. The IFQs scenario assumes implementation of an IFQ fishery for the limited entry bottom trawl fleet and the at-sea hake mid-water trawl fleet requiring 100% observer coverage. For simplicity, we assume no consolidation of quota and no efficiency improvements that would decrease the number of days at sea. Therefore, the number of vessels and season length remain the same as under status quo. We realize that these assumptions are somewhat unrealistic. However, simplifying assumptions are necessary and can be used as a starting point in assessing costs. The administrative cost does not include at-sea observer data transmission; it assumes post-trip transmission of observer data. The cost of scenarios 3 and 4 are the same as the observer program's functions will be the same in both.
4. The "IFQs with fishing restrictions" scenario is the same as the "IFQs" but also includes: 1) regulations stating that all vessels participating in limited entry bottom trawl or at-sea hake mid-water trawl activities must carry an observer when fishing and 2) regulations that aid in reducing the cost of observer coverage. If 100% of vessels are to be covered and bottom trawl vessels can fish at any time, the number of observers will have to match the number of vessels able to fish. This results in a very high number of observers to be on call under Scenario 3. However, if fishing restrictions are put in place that limit

the number of vessels able to fish at any given time, the number of observers on call can be reduced, thereby reducing cost. An example would be to place all bottom trawl vessels in one of two or three groups, each of which can only fish at one time, thereby reducing the number of observers on call. The cost of monitoring the limited entry fixed gear fleet at current levels is also included. The administrative cost does not include at-sea observer data transmission; it assumes post-trip transmission of observer data. Industry formation of coops may negate the need for the groups described above.

5. Administrative cost includes staff salary, benefits, travel, rents, utilities, printing, supplies, and equipment. Cost increases for this line are due to more data to be processed. The administrative cost does not include at-sea observer data transmission; it assumes post-trip transmission of observer data.
6. Cost for observers includes observer contractor overheads costs, observer salaries, benefits, travel, liability insurance, safety and communication equipment. The cost for observers is not just for days at sea, but additional land-based duties such as data entry, communication with vessels and travel to other ports.

Costs Associated with VMS

Federal Cost

Federal costs associated with the VMS program total approximately $296,000. This includes cost of employees, supplies, and travel. This does not include the initial costs associated with hardware and software purchases made in 2003.

Industry Cost

Table 5 presents industry costs as estimated in *Expanded Coverage of the Program to Monitor Time-Area Closures in the Pacific Coast Groundfish Fishery – Draft Environmental Assessment, Regulatory Impact Review & Regulatory Flexibility Analysis* (NMFS, October 2005).

Table 4. Estimated Burden, per Vessel, for the VMS Monitoring System (Industry costs)

	Basic VMS system with declaration reports (Status Quo) – one way communications
Transceiver unit with installation costs in Year 1	$1200-$2700
Replacement costs of transceiver units in subsequent years	$250-$625
Annual maintenance cost	$60-$160
Annual transmission fees	$192-$730

Use of VMS Data by States

Option 1
If the states were to install their own VMS system similar to the system maintained by NMFS, costs would be at least $73,000 each. This includes cost for computer servers, software and miscellaneous infrastructure costs. This does not include salaries for technicians to observe, analyze and interpret the data. It is estimated that one technician would be necessary to monitor every 300 vessels. Currently, 310 vessels are monitored. However, between 700 and 1000 vessels may be required to carry VMS units in the future.

Option 2
If the states had direct access to the NMFS servers through an internet connection and accessed the VMS data in this way, costs would be significantly less. States would have to have computers or laptops and some additional software. However, current state computer infrastructure may be sufficient. Additional technical help may be required by NMFS in order to answer the increased number of queries expected.

Table 5. Groundfish Enforcement Costs. *Source: Compiled by the TIQC Enforcement Team, 2004.*

	Scenario 1: Status Quo (FTEs)	**Scenario 3: IFQs[13] (FTEs) – with and without federal funding increase**
NMFS OLE NWR	6.3	15 (NA)
NMFS OLE SWR	7	13.1 (NA)
WA	1.5	3.5 (4.5)
OR	4	4 (6)
CA[14]	7.8	10 (15)
GCEL (NW/SW)	0.9	2 (NA)
TOTAL	**54.1**	**90.2 (98.2)**

[13] The costs to enforce an IFQ program assumes 100% at-sea and 100% shoreside monitoring, limited ports for landing, and full catch retention of quota species. As in the previous column, two FTE numbers are given in this category. The first number represents the FTEs given a federal increase above current levels. The second FTE number in parentheses represents the FTEs given no federal funding increase.
[14] Since we did not have CA salary and benefits information, an average of WA and OR salary and benefits information was used as a proxy ($97,095).

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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, HG, or allocation of groundfish, if any, unless such action is required by other applicable law.

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.

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. Encourage development of practicable gear restrictions intended to reduce regulatory and/or economic discards through gear research regulated by EFP.

Utilization.

Objective 9. Develop management measures and policies that foster and encourage full utilization (harvesting and processing) in accordance with conservation goals 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. Develop management programs that reduce regulations-induced discard and/or which reduce economic incentives to discard fish. ~~Strive to reduce the economic incentives and regulatory measures that lead to wastage of fish~~. 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. 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~~ 12. When conservation actions are necessary to protect a stock or stock assemblage, attempt to develop management measures that will affect users equitably.

Note: Objectives 14-18 renumbered accordingly in sequence.

UNITED STATES DEPARTMENT OF COMMERCE
National Oceanic and Atmospheric Administration
NATIONAL MARINE FISHERIES SERVICE
Northwest Region
7600 Sand Point Way N.E., Bldg. 1
Seattle, WA 98115

October 25, 2005

MEMORANDUM FOR: Pacific Fishery Management Council

FROM: Steve Freese, Acting Assistant Administrator for Sustainable Fisheries, NMFS

SUBJECT: Draft Amendment 18

We have reviewed the draft amendment and offer the following suggestions. We believe it is important to make more explicit and highlight the consideration of bycatch mitigation during the development of the biennial specifications and management measures, and during the adjustment of these measures throughout the year. Therefore we suggest this edit to the draft FMP language.

Page 39, in section 6.5.3, add the following paragraph after the first partial paragraph on the page:

An important element of the Council's bycatch mitigation program occurs every two years when the Council develops its biennial specifications and management measures. During the development of the biennial specifications and management measures, and throughout the year when measures are adjusted, the Council will take into account the co-occurrence rates of target stocks with overfished stocks, and will select measures that will minimize, to the extent practicable, bycatch. The Council may select appropriate measures listed in the FMP and any others that may be developed in the future.

Magnuson-Stevens Act FMP requirements on bycatch:

"establish a standardized reporting methodology to assess the amount and type of bycatch occurring in the fishery, and include conservation and management measures that, **to the extent practicable** and in the following priority – (A) minimize bycatch; and (B) minimize the mortality of bycatch which cannot be avoided." ." 16 U.S.C. 1853(a)(11)

What does “practicable” mean??

- No federal regulatory definition
- A few of the NMFS Regions have tried to define the term for their bycatch and EFH FMP amendments
- National Standard 9 (bycatch) guidelines require certain issues to be considered when looking at practicability.

New England's Northeast Multispecies FMP

"Practicable" means "reasonable and capable of being done in light of technology and economic considerations."

Amendment 18 is intended to not only bring tools into the FMP that the Council now uses and considers to be practicable, but which may become practicable at some future time given improved technology and economic considerations.

Draft Practicability Analysis Contents

Consideration of practicability of reducing bycatch under Amendment 18 using National Standard 9's ten factors. The first four factors are biological issues:

- population effects for the bycatch species;
- ecological effects due to changes in the bycatch of that species (effects on other species in the ecosystem);
- changes in the bycatch of other species of fish and the resulting population and ecosystem effects;
- effects on marine mammals and birds;

Draft Practicability Analysis Contents

The final six factors are socio-economic issues (IFQ used as example for discussion purposes):

- changes in fishing, processing, disposal, and marketing costs;
- changes in fishing practices and behavior of fishermen;
- changes in research, administration, and enforcement costs and management effectiveness;
- changes in the economic, social, or cultural value of fishing activities and non-consumptive uses of fishery resources;
- changes in the distribution of benefits and costs;
- social effects.

Draft Practicability Analysis Contents -- Available Technology and Economic Considerations

Practicability – Funding implications for catch and bycatch monitoring programs (Table 1)

Practicability – Revenue and income perspectives under current overfished species rebuilding regime and potential future revenues

Discussion tables with monitoring tool and enforcement costs (Tables 2-5)

Four Management Scenarios (See Table 2, p 32):

1. Status quo – costs associated with 2005 regulations
2. Sector bycatch caps – 100% observer coverage for LE trawl, SeaState-type services extended to shore-based whiting and limited entry trawl nonwhiting
3. IFQs – 100% observer coverage for LE trawl, transferability, no change in vessel numbers as a result of consolidation
4. IFQs with restrictions – same as #3, **and includes** restrictions on when vessels may participate in the fishery

GROUNDFISH ADVISORY SUBPANEL REPORT ON AMENDMENT 18 (BYCATCH) AND THE WORK PLAN PRACTICABILITY ANALYSIS

The Groundfish Advisory Subpanel (GAP) heard a report from Kit Dahl, Council Staff, on Amendment 18 with futher explaination provided by Yvonne deReynier, National Marine Fisheries Service (NMFS). The GAP identified three separate issues that require comment and our discussion focused on these three issues. These issues are the coupling of two plan amendments, the draft language of Amendment 18 itself, and the associated work plan that implements the fishery management plan (FMP). The GAP did not receive the Preliminary Discussion Draft of the Practicality Analysis for Amendment 18 in time to review and provide comments for this agenda item.

Decoupling FMP Amendments

The GAP believes that combining Amendment 18 and Amendment 19 has created significant confusion about the contents of the amendments and also blurs the time table for adopting the amendments. The GAP recommends that Amendment 18 be decoupled from Amendment 19 and proceed through the process seperately. In addition, the GAP strongly recommends that future amendments be taken up seperately.

Amendment 18 Draft Language

Amendment 18 was characterized by Council and NMFS staff as a "conceptual" document outlining the types of tools available to the Council to mitigate bycatch in the groundfish fisheries. The GAP believes that Amendment 18 can serve as a good document detailing the conceptual nature of possible tools in the Council's tool box. However, members of the GAP have concerns over some of the definitions that are contained within the document.

For example, on page 40 of Agenda Item H.6.a, Attachment 1, the first full sentence on the page states, "Once a total catch limit is attained, all vessels in the sector MUST cease fishing until the end of the limit period, unless the total catch limit is increased by the transfer of an additional limit amount" (emphasis added). This language is in a section describing how a Sector-specific Total Catch Limit Program could work. GAP members are concerned that hardwiring this type of specific language into an FMP greatly limits the Council's flexibility and creativity when attempting to actually implement a workable plan.

Implementation Work Plan

The GAP's comments in this area focus on the "pilot program" concept contained in the workplan implementation process. The GAP agrees with the Groundfish Management Team (GMT) statement from September 2005, that "current monitoring porgrams are not suficient to monitor harvest against sector total catch limits and that the necessary enhancement will not occur prior to the 2007-2008 cycle."

The GAP does not, however, endorse the GMT recommendation to implement a pilot program for sector bycatch limits on one sector of the industry in order to evaluate the capablilities and constraints within our current management structure. The GAP is unable to broadly endorse the pilot program concept without knowing more about the proposed program.

The GAP has two major concerns: 1) too many pilot programs have the propensity to become permenant; and 2) placing hard caps on a single sector of the fishery would unfairly disadvantage that particular sector without allowing management to realize the overall benefits of a hard cap program.

While the GAP is very supportive of developing hard bycatch caps for all sectors of the industry, placing hard caps on a single sub-sector would put that portion of the sector at a distinct disadvantage from other sectors and potentially at the risk of a permanent program.

PFMC
11/02/05

Agenda Item H.6.c
Supplemental Public Comment
November 2005

October 25, 2005

Delivered via facsimile: (503) 820-2299 / (206) 526-6426 and email: pfmc.comments@noaa.gov

Mr. D. Robert Lohn, Regional Administrator
NOAA Fisheries
7600 Sand Point Way NE
BIN C15700, Bldg. 1
Seattle, WA 98115-0700

RECEIVED
OCT 25 2005
PFMC

Mr. Donald Hansen, Chairman
Pacific Fishery Management Council
7700 NE Ambassador Place, Suite 200
Portland, OR 97220-1384

RE: Agenda Item H-6: Amendment 18

Dear Mr. Lohn and Mr. Hansen:

The undersigned organizations submit these comments concerning the public review draft of Amendment 18 (Bycatch Mitigation Program). While we support and have advocated for some of the tools discussed in the public review draft (please see our previous correspondence), we continue to have concerns that this amendment does little to minimize bycatch and fails to establish an adequate standardized reporting methodology.

Magnuson-Stevens Act

As you know, any fishery management plan (FMP) and any regulation promulgated to implement an FMP must be consistent with the ten National Standards specified in section 301 of the Magnuson Stevens Act (MSA). Of particular relevance to Amendment 18 is National Standard 9, which requires that:

> Conservation measures shall, to the extent practicable, (A) minimize bycatch, and (B) to the extent bycatch cannot be avoided, minimize the mortality of such bycatch. 16 U.S.C. 1851(a)(9).

The MSA further requires that fishery management plans must:

> establish a standardized reporting methodology to assess the amount and type of bycatch occurring in the fishery, and include conservation and management measures that, to the extent practicable and in the following priority – (A) minimize bycatch; and (B) minimize the mortality of bycatch which cannot be avoided. 16 U.S.C. 1853(a)(11).

Congress required these legal obligations to be met by October 1998.

PMCC Litigation

Earlier attempts to comply with these legal mandates through Amendment 13 to the groundfish FMP failed. See *Pacific Marine Conservation Council v. Evans*, 200 F.Supp.2d 1194 (N.D. Calif. 2002) ("PMCC"). The court in *PMCC* rejected Amendment 13 because, among other things, it failed to include an adequate assessment methodology and failed to minimize bycatch and bycatch mortality. Amendment 18 is supposed to remedy these legal defects. Throughout the development of the Programmatic Bycatch Environmental Impact Statement, we have repeatedly raised concerns that the Council and agency were failing to (1) disclose and analyze current bycatch data; (2) adopt measures to minimize bycatch to the extent practicable; and (3) implement a standardized reporting methodology. The draft FMP language amplifies these concerns as it amounts to a catalogue of potential management measures available to the Council, with no concrete plan or timeline to meet statutory duties.

Bycatch Minimization is Mandatory

Rather than clearly requiring the Council to take specific measures to minimize bycatch, the draft FMP is full of merely permissive language. See, e.g., Groundfish FMP Amendment 18/19 at p. 36: "The Council may initiate new and practicable management measures to reduce groundfish bycatch in the groundfish fisheries…." In order to meet legal mandates, the FMP amendment must contain clear language mandating measures to minimize bycatch.

Focus On Overfished Species

Bycatch of overfished species is certainly a problem that deserves some focus. However, the MSA's bycatch requirements do not differentiate between overfished species and other marine life. Therefore, a bycatch mitigation plan that focuses solely on overfished species does not meet the legal mandate set out in the Act.

Our proposal to count and minimize bycatch in the Pacific Groundfish Fishery (submitted to the Council in December 2004) emphasized bycatch minimization of overfished species, but also accounted for bycatch of non-overfished groundfish and other marine life. The FMP amendment must include specific measures to minimize bycatch of all marine life.

Timeline

The draft FMP amendment includes no timeline for implementation of any bycatch mitigation measures. The June 2005 Groundfish Bycatch Mitigation Program Work Plan suggests possible implementation of "comparatively modest interim measures," (or interim sector total catch limits) during the 2007-2008 biennial management cycle, with the implementation of "more comprehensive limits," suggested for 2009-2010. The work plan also states that a vessel-specific total catch limit program "could be" developed for implementation beginning in 2011. At the September meeting, the Council declined to adopt even these wholly inadequate timelines.

Congress required implementation of bycatch mitigation measures by October 1998. It is now late into 2005, and further delay is unacceptable. At a minimum, total mortality limits for all overfished species must be implemented by the next management cycle, and the Council must adopt a clear schedule to implement bycatch minimization measures for all species in this amendment.

Standardized Reporting Methodology

One of the deficiencies we identified in the Bycatch EIS is the failure to analyze bycatch reporting methodologies and bycatch types and amounts in the various sectors of the groundfish fishery. The public review draft of Amendment 18 similarly fails to implement a robust standardized reporting methodology. For example, with regard to observers, the FMP amendment merely references future development and implementation of an observer program, with no timeline or definition of purpose. The FMP amendment must include a robust standardized reporting methodology, rather than the promise to do something in the undefined future.

As we have before, we urge the Council to add clear language to Amendment 18 that will implement bycatch accounting and minimization of overfished species and other marine life as soon as possible as required by the Magnuson-Stevens Act.

Sincerely,

Jim Ayers
Oceana

Mark Powell
Mark Powell
The Ocean Conservancy

Karen Garrison
Karen Garrison
Natural Resources Defense Council

Peter Huhtala
Peter Huhtala
Pacific Marine Conservation Council

Agenda Item H.6
Situation Summary
November 2005

AMENDMENT 18 (BYCATCH) AND WORK PLAN PRACTIBILITY ANALYSIS

The National Marine Fisheries Service (NMFS) published the Pacific Coast Groundfish Fishery Management Plan (FMP) Bycatch Mitigation Program Final Environmental Impact Statement (Bycatch Mitigation Program FEIS) in September 2004, containing the Council's preferred alternative for this action. At their September 2005 meeting, the Council reviewed a draft amendment package and directed staff to revise Objective 9 in Chapter 2 of the FMP and to incorporate the changes to Section 6.4.1.1 proposed by the Groundfish Management Team (GMT), as described in their supplemental report. Staff has also made some non-substantive editorial changes. They approved the modified text for release as a public review draft, which was made available as an electronic document on the Council's website on September 27, 2005, and is included here as Attachment 1.

As noted at the September meeting, Amendment 18, addressing bycatch, and Amendment 19, addressing essential fish habitat (EFH), are on the same timeline. Because of this and the fact that there is substantial overlap between the parts of the FMP these two amendments address, a combined document, incorporating both Amendment 18 and Amendment 19 changes, is provided.

The Council's task is to review the portions of the public review draft relevant to Amendment 18 and take final action to approve the text with any additional changes. The amendment package, with any revisions, will then be submitted to NMFS for the Secretarial review process described in §304(a) of the Magnuson-Stevens Act. If approved, the text will then be incorporated into the groundfish FMP.

At the September meeting the Council also reviewed a draft work plan, which is intended to help the Council plan future bycatch mitigation activities and inform the public about the Council's intentions. In their report at the September meeting, the GMT did not recommend implementing the elements of the work plan proposing sector total catch limits as part of the 2007-2008 groundfish harvest specifications and management measures process. (Attachment 2 excerpts the section of the work plan containing these proposals.) Instead, they recommended "a total catch limit program applied to a sub-sector, such as a target-strategy sub-sector, could serve as a pilot program in 2007-2008, to evaluate the capabilities and constraints in our current program structure in preparation for eventual broader implementation." One of the reasons the GMT did not recommended sector total catch limits at this time is because they believe current monitoring programs are not sufficient to monitor harvest against sector total catch limits, and the necessary program enhancements will not occur for the 2007-2008 cycle.

The Council may wish to discuss the future disposition of the work plan. The document provided at the September meeting was labeled draft, and no revisions have been made, pending Council direction on this matter. It should be noted that the work plan also discusses other action items for future years, such as implementing vessel-specific total catch limits.

For its Amendment 18 review process, NMFS Northwest Region is preparing a practicability analysis to address the Magnuson-Stevens Act National Standard 9 guidelines. The practicability analysis is intended to provide background on the use of the term “practicable” in assessing bycatch minimization measures and a broad view of the practicability of some of the bycatch minimization measures envisioned in Amendment 18. NMFS plans to provide a draft of this practicability analysis as a supplemental document for this agenda item.

Council Action:

1. **Adopt Final FMP Text.**
2. **Review Work Plan and Identify Work Plan Elements to be Implemented Through the 2007-2008 Groundfish Harvest Specifications and Management Measures Process.**
3. **Review and Comment on Practicability Analysis.**

Reference Materials:

1. Agenda Item H.6.a, Attachment 1: Public Review Draft Amendment 18 (Bycatch Mitigation Program) and Amendment 19 (Essential Fish Habitat) to the Pacific Coast Groundfish Fishery Management Plan.
2. Agenda Item H.6.a, Attachment 2: Draft Work Plan Excerpt.

Agenda Order:

a. Agenda Item Overview — Kit Dahl
b. Reports and Comments of Advisory Bodies
c. Public Comment
d. Council Action: Adopt Final FMP Text and Review Work Plan Practicability Analysis.

PFMC
10/12/05

[Preamble]

For the reasons set out in the preamble, 50 CFR part 660 is proposed to be amended as follows:

PART 660--FISHERIES OFF WEST COAST STATES AND IN THE WESTERN PACIFIC

1. The authority citation for part 660 continues to read as follows:

Authority: 16 U.S.C. 1801 et seq.

2. In § 660.301, the purpose and scope, subpart (a) is modified as follows:

(a) This subpart implements the Pacific Coast Groundfish Fishery Management Plan (PCGFMP) developed by the Pacific Fishery Management Council. This subpart governs fishing vessels of the U.S. in the EEZ off the coasts of Washington, Oregon, and California. All weights are in round weight or round-weight equivalents, unless specified otherwise.

3. In § 660.302, a definition for “essential fish habitat or EFH” is added, and the definition for “fishing gear” is revised to read as follows:

§ 660.302 Definitions.

* * * * *

Essential Fish Habitat (EFH). (See §600.10).

* * * * *

Fishing Gear includes the following types of gear and equipment:

(1) Bottom Contact Gear. Fishing gear designed or modified to make contact with the bottom. This includes, but is not limited to, beam trawl, bottom trawl, dredge, fixed gear, set net, demersal seine, dinglebar gear, and other gear (including experimental gear) designed or modified to make contact with the bottom. Gear used to harvest bottom dwelling organisms (e.g. by hand, rakes, and knives) are also considered bottom contact gear for purposes of subpart.

(2) Demersal seine. A net designed to encircle fish on the seabed. The Demersal seine is characterized by having its net bounded by lead-weighted ropes that are not encircled with bobbins or rollers. Demersal seine gear is fished without the use of steel cables or otter boards (trawl doors). Scottish and Danish Seines are demersal seines. Purse seines, as defined at § 600.10, are not demersal seines. Demersal seine gear is included in the definition of bottom trawl gear in (9)(i) of this subsection.

(3) Dredge Gear. Dredge gear, with respect to the U.S. West Coast EEZ, refers to a gear consisting of a metal frame attached to a holding bag constructed of metal rings or mesh. As the metal frame is dragged upon or above the seabed, fish are pushed up and over the frame, then into the mouth of the holding bag.

(4) Fixed gear (anchored nontrawl gear) includes the following gear types: longline, trap or pot, set net, and stationary hook-and-line (including commercial vertical hook-and-line) gears.

(5) Entangling nets include the following types of net gear:

(i) Gillnet. (See §600.10).

(ii) Set net. A stationary, buoyed, and anchored gillnet or trammel net.

(iii) Trammel net. A gillnet made with two or more walls joined to a common float line.

(6) Hook-and-line. One or more hooks attached to one or more lines. It may be stationary (commercial vertical hook-and-line) or mobile (troll).

(i) Commercial vertical hook-and-line. Commercial fishing with hook-and-line gear that involves a single line anchored at the bottom and buoyed at the surface so as to fish vertically.

(ii) Dinglebar Gear. One or more lines retrieved and set with a troll gurdy or hand troll gurdy, with a terminally attached weight from which one or more leaders with one or more lures or baited hooks are pulled through the water while a vessel is making way.

(iii) Bottom Longline. A stationary, buoyed, and anchored groundline with hooks attached, so as to fish along the seabed. It does not include pelagic hook-and-line or troll gear.

(iv) Troll Gear. A lure or jig towed behind a vessel via a fishing line. Troll gear is used in commercial and recreational fisheries.

(7) Mesh size. The opening between opposing knots. Minimum mesh size means the smallest distance allowed between the inside of one knot to the inside of the opposing knot, regardless of twine size.

(8) Nontrawl gear. All legal commercial groundfish gear other than trawl gear.

(9) Trawl gear. (See §600.10)

(i) Bottom trawl. A trawl in which the otter boards or the footrope of the net are in contact with the seabed. It includes demersal seine gear, and pair trawls fished on the bottom. Any trawl not meeting the requirements for a midwater trawl in §660.381 is a bottom trawl.

(A) Beam Trawl Gear. A type of trawl gear in which a beam is used to hold the trawl open during fishing. Otter boards or doors are not used.

(B) Large footrope trawl gear. Large footrope gear is bottom trawl gear with a footrope diameter larger than 8 inches (20 cm,) and no larger than 19 inches (48cm) including any rollers, bobbins, or other material encircling or tied along the length of the footrope.

(C) Small footrope trawl gear. Small footrope trawl gear is bottom trawl gear with a footrope diameter of 8 inches (20 cm) or smaller, including any rollers, bobbins, or other material encircling or tied along the length of the footrope. Selective flatfish trawl gear that meets the gear component requirements in § 660.381 is a type of small footrope trawl gear.

(ii) Midwater (pelagic or off-bottom) trawl. A trawl in which the otter boards and footrope of the net remain above the seabed. It includes pair trawls if fished in midwater. A midwater trawl has no rollers or bobbins on any part of the net or its component wires, ropes, and chains

(iii) Trawl gear components.

(A) Breastline. A rope or cable that connects the end of the headrope and the end of the trawl fishing line along the edge of the trawl web closest to the towing point.

(B) Chafing gear. Webbing or other material attached to the codend of a trawl net to protect the codend from wear.

(C) Codend. (See §600.10).

(D) Double-bar mesh. Webbing comprised of two lengths of twine tied into a single knot.

(E) Double-walled codend. A codend constructed of two walls of webbing.

(F) Footrope. A chain, rope, or wire attached to the bottom front end of the trawl webbing forming the leading edge of the bottom panel of the trawl net, and attached to the fishing line.

(G) Headrope. A chain, rope, or wire attached to the trawl webbing forming the leading edge of the top panel of the trawl net.

(H) Rollers or bobbins are devices made of wood, steel, rubber, plastic, or other hard material that encircle the trawl footrope. These devices are commonly used to either bounce or pivot over seabed obstructions, in order to prevent the trawl footrope and net from snagging on the seabed.

(I) Single-walled codend. A codend constructed of a single wall of webbing knitted with single or double-bar mesh.

(J) Trawl fishing line. A length of chain or wire rope in the bottom front end of a trawl net to which the webbing or lead ropes are attached.

(K) Trawl riblines. Heavy rope or line that runs down the sides, top, or underside of a trawl net from the mouth of the net to the terminal end of the codend to strengthen the net during fishing.

(11) Spear. A sharp, pointed, or barbed instrument on a shaft.

(12) Trap or Pot. These terms are used as interchangeable synonyms. See § 600.10 definition of "trap."

4. In § 660.306, paragraphs (a)(13) and (a)(14), and (h)(4) through (h)(9) are added to read as follows:

§ 660.306 Prohibitions.

In addition to the general prohibitions specified in § 660.306 of this chapter, it is unlawful for any person to:

(a) * * *

(13) Fish with dredge gear (defined in § 660.302) anywhere within the EEZ.

(14) Fish with beam trawl gear (defined in § 660.302) anywhere within the EEZ.

* * * * *

(h) * * *

(4) Fish with bottom trawl gear (defined in § 660.302) anywhere within the EEZ seaward of a line approximating the 700 fathom (1280 m) depth contour, as defined in § 660.395.

(5) Fish with bottom trawl gear (defined in § 660.302) with a footrope diameter greater than 19 inches (48 cm) (including rollers, bobbins or other material encircling or tied along the length of the footrope) anywhere within the EEZ.

(6) Fish with bottom trawl gear (defined in § 660.302) with a footrope diameter greater than 8 inches (20 cm) (including rollers, bobbins or other material encircling or tied along the length of the footrope) anywhere within the EEZ shoreward of a line approximating the 100 fathom (183 m) depth contour (defined in § 660.393).

(7) Fish with bottom trawl gear (as defined in § 660.302), within the EEZ in the following areas (defined in §§ 660.395

through 660.397): Olympic 2, Biogenic 1, Biogenic 2, Grays Canyon, Biogenic 3, Nahelem Bank / Shale Pile, Astoria Canyon, Siletz Deepwater, Daisy Bank / Nelson Island, Newport Rockpile / Stonewall Bank, Heceta Bank, Deepwater off Coos Bay, Bandon High Spot, Rogue Canyon.

(8) Fish with bottom trawl gear (as defined in § 660.302), other than Danish or demersal seine, within the EEZ in the following areas (defined in §§ 660.395 through 660.397): Eel River Canyon, Blunts Reef, Mendocino Ridge, Delgada Canyon, Tolo Bank, Point Arena Offshore, Outer Cordell Bank, Biogenic Area 12, Farallon Islands / Fanny Shoal, Half Moon Bay, Monterey Bay / Canyon, Point Sur Deep, TNC/ED Area 2, TNC/ED Area 1, TNC/ED Area 3 [NOTE - these areas will probably be re-named for the proposed rule], Potato Bank (within Cowcod Conservation Area West), Cherry Bank (within Cowcod Conservation Area West) Hidden Reef / Kidney Bank (within Cowcod Conservation Area West), Catalina Island and Cowcod Conservation Area East.

(9) Fish with bottom contact gear (as defined in § 660.302) within the EEZ in the following areas (defined in § 660.396): Thompson Seamount, President Jackson Seamount, Inner Cordell Bank (within 50 fm (91 m) isobath).

(10) Fish with bottom contact gear (as defined in § 660.302), or any other gear that is deployed deeper than 500 fathoms, within the Davidson Seamount area (defined in §

660.396).

(11) Fish within the EEZ in the following areas (defined in §§ 660.396 through 660.397): Anacapa Island SMR, Carrington Point, Footprint, Gull Island, Harris Point, Judith Rock, Painted Cave, Richardson Rock, Santa Barbara, Scorpion, Skunk Point, and South Point.

(12) Fish within the EEZ in in the Anacapa Island SMCA (as defined in 50 CFR §§ 660.396), except for recreational fishing for lobster by hand or hoop net, and recreational fishing for other species by spear or hook and line gear. Hook and line gear used in this area may not be augmented with more than 6 oz. Of weight.

5. In § 660.385, the introductory text is revised to read as follows:

<u>§ 660.385 Washington coastal tribal fisheries management measures</u>. 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, and concluded that, 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 fishing areas (described at 50 CFR 660.324). Measures implemented to minimize adverse impacts to groundfish EFH, as described in §§ 660.306 do not apply to tribal fisheries

in their usual and accustomed fishing areas (described in 660.324) because treaty fisheries can not operate outside ususal and accustomed fishing areas. Tribal fishery allocations for sablefish and whiting, are provided in paragraphs (a) and (e) of this section, respectively, and the tribal harvest guideline for black rockfish is provided in paragraph (b)(1) of this section. Trip limits for certain species were recommended by the tribes and the Council for 2005-2006 and are specified here with the tribal allocations.

6. § 660.395 is added to read as follows:

§ 660.395 <u>Groundfish Essential Fish Habitat (EFH) Conservation Areas.</u> In § 660.302, essential fish habitat (EFH) is defined as “those waters and substrate necessary to fish for spawning, breeding, feeding or growth to maturity.” The areas in this subsection are designated to “minimize adverse impacts to EFH to the extent practicable.” Straight lines connecting a series of Latitude/longitude coordinates demarcate the boundaries for areas designated as Groundfish EFH Conservation Areas. Coordinates outlining the boundaries of Groundfish EFH Conservation Areas are provided in §§ 660.395 through 660.397. Fishing activity that is prohibited or permitted within the EEZ in a particular area designated as a groundfish EFH Conservation Area is detailed at § 660.306 and § 660.385.

(a) <u>Seaward of the 700 fathom contour</u>. This area includes all waters within the West Coast EEZ west of a line approximating the 700 fathom (1280 m) depth contour and is defined by straight lines connecting all of the following points in the order stated:

(1) 48°06.97' N. lat., 126°02.96' W. long.;

(2) 48°00.44' N. lat., 125°54.96' W. long.;

(3) 47°55.96' N. lat., 125°46.51' W. long.;

(4) 47°47.21' N. lat., 125°43.73' W. long.;

(5) 47°42.89' N. lat., 125°49.58' W. long.;

(6) 47°38.18' N. lat., 125°37.26' W. long.;

(7) 47°32.36' N. lat., 125°32.87' W. long.;

(8) 47°29.77' N. lat., 125°26.27' W. long.;

(9) 47°28.54' N. lat., 125°18.82' W. long.;

(10) 47°19.25' N. lat., 125°17.18' W. long.;

(11) 47°08.82' N. lat., 125°10.01' W. long.;

(12) 47°04.69' N. lat., 125°03.77' W. long.;

(13) 46°48.38' N. lat., 125°18.43' W. long.;

(14) 46°41.92' N. lat., 125°17.29' W. long.;

(15) 46°27.49' N. lat., 124°54.36' W. long.;

(16) 46°14.13' N. lat., 125°02.72' W. long.;

(17) 46°09.53' N. lat., 125°04.75' W. long.;

(18) 45°46.64' N. lat., 124°54.44' W. long.;

(19) 45°40.86' N. lat., 124°55.62' W. long.;

(20) 45°36.50' N. lat., 124°51.91' W. long.;

(21) 44°55.69' N. lat., 125°08.35' W. long.;

(22) 44˚49.93' N. lat., 125˚01.51' W. long.;

(23) 44˚46.93' N. lat., 125˚02.83' W. long.;

(24) 44˚41.96' N. lat., 125˚10.64' W. long.;

(25) 44˚28.31' N. lat., 125˚11.42' W. long.;

(26) 43˚58.37' N. lat., 125˚02.93' W. long.;

(27) 43˚52.74' N. lat., 125˚05.58' W. long.;

(28) 43˚44.18' N. lat., 124˚57.17' W. long.;

(29) 43˚37.58' N. lat., 125˚07.70' W. long.;

(30) 43˚15.95' N. lat., 125˚07.84' W. long.;

(31) 42˚47.50' N. lat., 124˚59.96' W. long.;

(32) 42˚39.02' N. lat., 125˚01.07' W. long.;

(33) 42˚34.80' N. lat., 125˚02.89' W. long.;

(34) 42˚34.11' N. lat., 124˚55.62' W. long.;

(35) 42˚23.81' N. lat., 124˚52.85' W. long.;

(36) 42˚16.80' N. lat., 125˚00.20' W. long.;

(37) 42˚06.60' N. lat., 124˚59.14' W. long.;

(38) 41˚59.28' N. lat., 125˚06.23' W. long.;

(39) 41˚31.10' N. lat., 125˚01.30' W. long.;

(40) 41˚14.52' N. lat., 124˚52.67' W. long.;

(41) 40˚40.65' N. lat., 124˚45.69' W. long.;

(42) 40˚35.05' N. lat., 124˚45.65' W. long.;

(43) 40˚23.81' N. lat., 124˚41.16' W. long.;

(44) 40˚20.54' N. lat., 124˚36.36' W. long.;

(45) 40˚20.84' N. lat., 124˚57.23' W. long.;

(46) 40°18.54' N. lat., 125°09.47' W. long.;

(47) 40°14.54' N. lat., 125°09.83' W. long.;

(48) 40°11.79' N. lat., 125°07.39' W. long.;

(49) 40°06.72' N. lat., 125°04.28' W. long.;

(50) 39°50.77' N. lat., 124°37.54' W. long.;

(51) 39°56.67' N. lat., 124°26.58' W. long.;

(52) 39°44.25' N. lat., 124°12.60' W. long.;

(53) 39°35.82' N. lat., 124°12.02' W. long.;

(54) 39°24.54' N. lat., 124°16.01' W. long.;

(55) 39°01.97' N. lat., 124°11.20' W. long.;

(56) 38°33.48' N. lat., 123°48.21' W. long.;

(57) 38°14.49' N. lat., 123°38.89' W. long.;

(58) 37°56.97' N. lat., 123°31.65' W. long.;

(59) 37°49.09' N. lat., 123°27.98' W. long.;

(60) 37°40.29' N. lat., 123°12.83' W. long.;

(61) 37°22.54' N. lat., 123°14.65' W. long.;

(62) 37°05.98' N. lat., 123°05.31' W. long.;

(63) 36°59.02' N. lat., 122°50.92' W. long.;

(64) 36°50.32' N. lat., 122°17.44' W. long.;

(65) 36°44.54' N. lat., 122°19.42' W. long.;

(66) 36°40.76' N. lat., 122°17.28' W. long.;

(67) 36°39.88' N. lat., 122°09.69' W. long.;

(68) 36°44.52' N. lat., 122°07.13' W. long.;

(69) 36°42.26' N. lat., 122°03.54' W. long.;

(70) 36˚30.02' N. lat., 122˚09.85' W. long.;

(71) 36˚22.33' N. lat., 122˚22.99' W. long.;

(72) 36˚14.36' N. lat., 122˚21.19' W. long.;

(73) 36˚09.50' N. lat., 122˚14.25' W. long.;

(74) 35˚51.50' N. lat., 121˚55.92' W. long.;

(75) 35˚49.53' N. lat., 122˚13.00' W. long.;

(76) 34˚58.30' N. lat., 121˚36.76' W. long.;

(77) 34˚53.13' N. lat., 121˚37.49' W. long.;

(78) 34˚46.54' N. lat., 121˚46.25' W. long.;

(79) 34˚37.81' N. lat., 121˚35.72' W. long.;

(80) 34˚37.72' N. lat., 121˚27.35' W. long.;

(81) 34˚26.77' N. lat., 121˚07.58' W. long.;

(82) 34˚18.54' N. lat., 121˚05.01' W. long.;

(83) 34˚02.68' N. lat., 120˚54.30' W. long.;

(84) 33˚48.11' N. lat., 120˚25.46' W. long.;

(85) 33˚42.54' N. lat., 120˚38.24' W. long.;

(86) 33˚46.26' N. lat., 120˚43.64' W. long.;

(87) 33˚40.71' N. lat., 120˚51.29' W. long.;

(88) 33˚33.14' N. lat., 120˚40.25' W. long.;

(89) 32˚51.57' N. lat., 120˚23.35' W. long.;

(90) 32˚38.54' N. lat., 120˚09.54' W. long.;

(91) 32˚35.76' N. lat., 119˚53.43' W. long.;

(92) 32˚29.54' N. lat., 119˚46.00' W. long.;

(93) 32˚25.99' N. lat., 119˚41.16' W. long.;

(94) 32°30.46' N. lat., 119°33.15' W. long.;

(95) 32°23.47' N. lat., 119°25.71' W. long.;

(96) 32°19.19' N. lat., 119°13.96' W. long.;

(97) 32°13.18' N. lat., 119°04.44' W. long.;

(98) 32°13.40' N. lat., 118°51.87' W. long.;

(99) 32°19.62' N. lat., 118°47.80' W. long.;

(100) 32°27.26' N. lat., 118°50.29' W. long.;

(101) 32°28.42' N. lat., 118°53.15' W. long.;

(102) 32°31.30' N. lat., 118°55.09' W. long.;

(103) 32°33.04' N. lat., 118°53.57' W. long.;

(104) 32°19.07' N. lat., 118°27.54' W. long.;

(105) 32°18.57' N. lat., 118°18.97' W. long.;

(106) 32°09.01' N. lat., 118°13.96' W. long.;

(107) 32°06.57' N. lat., 118°18.78' W. long.;

(108) 32°01.32' N. lat., 118°18.21' W. long.; and

(109) 31°57.82' N. lat., 118°10.34' W. long.;

(b) Astoria Canyon. Astoria Canyon is defined by straight lines connecting all of the following points in the order stated:

46°06.48' N. lat., 125°05.46' W. long.;

46°03.00' N. lat., 124°57.36' W. long.;

46°02.28' N. lat., 124°57.66' W. long.;

46°01.92' N. lat., 125°02.46' W. long.;

45°48.72' N. lat., 124°56.58' W. long.;

45°47.70' N. lat., 124°52.20' W. long.;

45˚40.86' N. lat., 124˚55.62' W. long.;

45˚29.82' N. lat., 124˚54.30' W. long.;

45˚25.98' N. lat., 124˚56.82' W. long.;

45˚26.04' N. lat., 125˚10.50' W. long.;

45˚33.12' N. lat., 125˚16.26' W. long.;

45˚40.32' N. lat., 125˚17.16' W. long.;

46˚03.00' N. lat., 125˚14.94' W. long.;

and connecting back to 46˚06.48' N. lat., 125˚05.46' W. long.

(c) Daisy Bank / Nelson Island. Daisy Bank / Nelson Island is defined by straight lines connecting all of the following points in the order stated:

44˚39.73' N. lat., 124˚41.43' W. long.;

44˚39.60' N. lat., 124˚41.29' W. long.;

44˚37.17' N. lat., 124˚38.60' W. long.;

44˚35.55' N. lat., 124˚39.27' W. long.;

44˚37.57' N. lat., 124˚41.70' W. long.;

44˚36.90' N. lat., 124˚42.91' W. long.;

44˚38.25' N. lat., 124˚46.28' W. long.;

44˚38.52' N. lat., 124˚49.11' W. long.;

44˚40.27' N. lat., 124˚49.11' W. long.;

44˚41.35' N. lat., 124˚48.03' W. long.;

and connecting back to 44˚39.73' N. lat., 124˚41.43' W. long.

(d) <u>Newport Rockpile / Stonewall Bank</u>. Newport Rockpile / Stonewall Bank is defined by straight lines connecting all of the following points in the order stated:

44˚27.61' N. lat., 124˚26.93' W. long.;

44˚34.64' N. lat., 124˚26.82' W. long.;

44˚38.15' N. lat., 124˚25.15' W. long.;

44˚37.78' N. lat., 124˚23.05' W. long.;

44˚28.82' N. lat., 124˚18.80' W. long.;

44˚25.16' N. lat., 124˚20.69' W. long.;

and connecting back to 44˚27.61' N. lat., 124˚26.93' W. long.

(e) <u>Cherry Bank</u>. Cherry Bank is within the Cowcod Conservation Area West, an area south of Point Conception, and is defined by straight lines connecting all of the following points in the order stated:

32˚59.00' N. lat., 119˚32.05' W. long.;

32˚59.00' N. lat., 119˚17.05' W. long.;

32˚46.00' N. lat., 119˚17.05' W. long.;

32˚46.00' N. lat., 119˚32.05' W. long.;

and connecting back to 32˚59.00' N. lat., 119˚32.05' W. long.

(f) <u>Potato Bank</u>. Potato Bank is within the Cowcod Conservation Area West, an area south of Point Conception, and is defined by straight lines connecting all of the following points in the order stated:

33˚30.00' N. lat., 120˚00.06' W. long.;

33˚30.00' N. lat., 119˚50.06' W. long.;

33˚20.00' N. lat., 119˚50.06' W. long.;

33˚20.00' N. lat., 120˚00.06' W. long.;

and connecting back to 33˚30.00' N. lat., 120˚00.06' W. long.

(g) Olympic 2. Olympic 2 is defined by straight lines connecting all of the following points in the order stated:

48˚21.46' N. lat., 124˚51.61' W. long.;

48˚17.00' N. lat., 124˚57.18' W. long.;

48˚06.13' N. lat., 125˚00.68' W. long.;

48˚06.66' N. lat., 125˚06.55' W. long.;

48˚08.44' N. lat., 125˚14.61' W. long.;

48˚22.57' N. lat., 125˚09.82' W. long.;

48˚21.42' N. lat., 125˚03.55' W. long.;

48˚22.99' N. lat., 124˚59.29' W. long.;

48˚23.89' N. lat., 124˚54.37' W. long.;

and connecting back to 48˚21.46' N. lat., 124˚51.61' W. long.

(h) Biogenic 1. Biogenic 1 is defined by straight lines connecting all of the following points in the order stated:

47˚29.97' N. lat., 125˚20.14' W. long.;

47˚30.01' N. lat., 125˚30.06' W. long.;

47˚40.09' N. lat., 125˚50.18' W. long.;

47˚47.27' N. lat., 125˚50.06' W. long.;

47˚47.00' N. lat., 125˚24.28' W. long.;

47˚39.53' N. lat., 125˚10.49' W. long.;

47˚30.31' N. lat., 125˚08.81' W. long.;

and connecting back to 47˚29.97' N. lat., 125˚20.14' W. long.

(i) Biogenic 2. Biogenic 2 is defined by straight lines connecting all of the following points in the order stated:

47˚08.77' N. lat., 125˚00.91' W. long.;

47˚08.82' N. lat., 125˚10.01' W. long.;

47˚20.01' N. lat., 125˚10.00' W. long.;

47˚20.00' N. lat., 125˚01.25' W. long.;

and connecting back to 47˚08.77' N. lat., 125˚00.91' W. long.

(j) Biogenic 3. Biogenic 3 is defined by straight lines connecting all of the following points in the order stated:

46˚48.16' N. lat., 125˚10.75' W. long.;

46˚40.00' N. lat., 125˚10.00' W. long.;

46˚40.00' N. lat., 125˚20.01' W. long.;

46˚50.00' N. lat., 125˚20.00' W. long.;

and connecting back to 46˚48.16' N. lat., 125˚10.75' W. long.

(k) Grays Canyon. Grays Canyon is defined by straight lines connecting all of the following points in the order stated:

46˚51.55' N. lat., 125˚00.00' W. long.;

46˚56.79' N. lat., 125˚00.00' W. long.;

46˚58.01' N. lat., 124˚55.09' W. long.;

46˚55.07' N. lat., 124˚54.14' W. long.;

46˚59.60' N. lat., 124˚49.79' W. long.;

46˚58.72' N. lat., 124˚48.78' W. long.;

46˚54.45' N. lat., 124˚48.36' W. long.;

46˚53.99' N. lat., 124˚49.95' W. long.;

46˚54.38' N. lat., 124˚52.73' W. long.;

46˚52.38' N. lat., 124˚52.02' W. long.;

46˚48.93' N. lat., 124˚49.17' W. long.;

and connecting back to 46˚51.55' N. lat., 125˚00.00' W. long.

(l) Tolo Bank. Tolo Bank is defined by straight lines connecting all of the following points in the order stated:

39˚58.75' N. lat., 124˚04.58' W. long.;

39˚56.05' N. lat., 124˚01.45' W. long.;

39˚53.99' N. lat., 124˚00.17' W. long.;

39˚52.28' N. lat., 124˚03.12' W. long.;

39˚57.90' N. lat., 124˚07.07' W. long.;

and connecting back to 39˚58.75' N. lat., 124˚04.58' W. long.

(m) Point Sur Deep. The Point Sur Deep is defined by straight lines connecting all of the following points in the order stated:

36˚25.25' N. lat., 122˚11.61' W. long.;

36˚16.05' N. lat., 122˚14.37' W. long.;

36˚16.14' N. lat., 122˚15.94' W. long.;

36˚17.98' N. lat., 122˚15.93' W. long.;

36˚17.83' N. lat., 122˚22.56' W. long.;

36˚22.33' N. lat., 122˚22.99' W. long.;

36˚26.00' N. lat., 122˚20.81' W. long.;

and connecting back to 36˚25.25' N. lat., 122˚11.61' W. long.

(n) Point Arena Offshore. Point Arena Offshore is defined by straight lines connecting all of the following points in the order stated:

39˚03.32' N. lat., 123˚51.15' W. long.;

38˚56.54' N. lat., 123˚49.79' W. long.;

38˚54.12' N. lat., 123˚52.69' W. long.;

38˚59.64' N. lat., 123˚55.02' W. long.;

39˚02.83' N. lat., 123˚55.21' W. long.;

and connecting back to 39˚03.32' N. lat., 123˚51.15' W. long.

(o) Blunts Reef. Blunts Reef is defined by straight lines connecting all of the following points in the order stated:

40˚27.53' N. lat., 124˚26.84' W. long.;

40˚24.66' N. lat., 124˚29.49' W. long.;

40˚28.50' N. lat., 124˚32.42' W. long.;

40˚30.46' N. lat., 124˚32.23' W. long.;

40˚30.21' N. lat., 124˚26.85' W. long.;

and connecting back to 40˚27.53' N. lat., 124˚26.84' W. long.

(p) Biogenic Area 12. Biogenic Area 12 is defined by straight lines connecting all of the following points in the order stated:

38˚35.49' N. lat., 123˚34.79' W. long.;

38˚32.86' N. lat., 123˚41.09' W. long.;

38˚34.92' N. lat., 123˚42.53' W. long.;

38˚35.74' N. lat., 123˚43.82' W. long.;

38˚47.28' N. lat., 123˚51.19' W. long.;

38˚49.50' N. lat., 123˚45.83' W. long.;

38˚41.22' N. lat., 123˚41.76' W. long.;

and connecting back to 38˚35.49' N. lat., 123˚34.79' W. long.

(q) Half Moon Bay. Half Moon Bay is defined by straight lines connecting all of the following points in the order stated:

37˚18.14' N. lat., 122˚31.15' W. long.;

37˚19.80' N. lat., 122˚34.70' W. long.;

37˚19.28' N. lat., 122˚38.76' W. long.;

37˚23.54' N. lat., 122˚40.75' W. long.;

37˚25.41' N. lat., 122˚33.20' W. long.;

37˚23.28' N. lat., 122˚30.71' W. long.;

and connecting back to 37˚18.14' N. lat., 122˚31.15' W. long.

(r) TNC/ED Area 2. TNC/ED Area 2 is defined by straight lines connecting all of the following points in the order stated:

36˚17.83' N. lat., 122˚22.56' W. long.;

36˚17.98' N. lat., 122˚15.93' W. long.;

36˚16.14' N. lat., 122˚15.94' W. long.;

36˚10.82' N. lat., 122˚15.97' W. long.;

36˚15.84' N. lat., 121˚56.35' W. long.;

36˚14.27' N. lat., 121˚53.89' W. long.;

36˚10.93' N. lat., 121˚48.66' W. long.;

36˚07.40' N. lat., 121˚43.14' W. long.;

36˚04.89' N. lat., 121˚51.34' W. long.;

35˚55.70' N. lat., 121˚50.02' W. long.;

35˚53.05' N. lat., 121˚56.69' W. long.;

35˚38.99' N. lat., 121˚49.73' W. long.;

35˚20.06' N. lat., 121˚27.00' W. long.;

35˚20.54' N. lat., 121˚35.84' W. long.;

35˚02.49' N. lat., 121˚35.35' W. long.;

35˚02.79' N. lat., 121˚26.30' W. long.;

34˚58.71' N. lat., 121˚24.21' W. long.;

34˚47.24' N. lat., 121˚22.40' W. long.;

34˚35.70' N. lat., 121˚45.99' W. long.;

35˚47.36' N. lat., 122˚30.25' W. long.;

35˚27.26' N. lat., 122˚45.15' W. long.;

35˚34.39' N. lat., 123˚00.25' W. long.;

36˚01.64' N. lat., 122˚40.76' W. long.;

36˚17.41' N. lat., 122˚41.22' W. long.;

and connecting back to 36˚17.83' N. lat., 122˚22.56' W. long.

(s) TNC/ED Area 1. TNC/ED Area 1 is defined by straight lines connecting all of the following points in the order stated:

34˚45.09' N. lat., 121˚05.73' W. long.;

34˚39.90' N. lat., 121˚10.30' W. long.;

34˚43.39' N. lat., 121˚14.73' W. long.;

34˚52.83' N. lat., 121˚14.85' W. long.;

34˚52.82' N. lat., 121˚05.90' W. long.;

and connecting back to 34˚45.09' N. lat., 121˚05.73' W. long.

(t) TNC/ED Area 3. TNC/ED Area 3 is defined by straight lines connecting all of the following points in the order stated:

34˚29.24' N. lat., 120˚36.05' W. long.;

34˚28.57' N. lat., 120˚34.44' W. long.;

34˚26.81' N. lat., 120˚33.21' W. long.;

34˚24.54' N. lat., 120˚32.23' W. long.;

34˚23.41' N. lat., 120˚30.61' W. long.;

33˚53.05' N. lat., 121˚05.19' W. long.;

34˚13.64' N. lat., 121˚20.91' W. long.;

34˚40.04' N. lat., 120˚54.01' W. long.;

34˚36.41' N. lat., 120˚43.48' W. long.;

34˚33.50' N. lat., 120˚43.72' W. long.;

34˚31.22' N. lat., 120˚42.06' W. long.;

34˚30.04' N. lat., 120˚40.27' W. long.;

34˚30.02' N. lat., 120˚40.23' W. long.;

34˚29.26' N. lat., 120˚37.89' W. long.;

and connecting back to 34˚29.24' N. lat., 120˚36.05' W. long.

(u) Nehalem Bank / Shale Pile. Nehalem Bank / Shale Pile is defined by straight lines connecting all of the following points in the order stated:

46˚00.60' N. lat., 124˚33.94' W. long.;

45˚52.77' N. lat., 124˚28.75' W. long.;

45˚47.95' N. lat., 124˚31.70' W. long.;

45˚52.75' N. lat., 124˚39.20' W. long.;

45˚58.02' N. lat., 124˚38.99' W. long.;

46˚00.83' N. lat., 124˚36.78' W. long.;

and connecting back to 46˚00.60' N. lat., 124˚33.94' W. long.

(v) Bandon High Spot. Bandon High Spot is defined by straight lines connecting all of the following points in the

order stated:

43˚08.83' N. lat., 124˚50.93' W. long.;

43˚08.77' N. lat., 124˚49.82' W. long.;

43˚05.16' N. lat., 124˚49.05' W. long.;

43˚02.94' N. lat., 124˚46.87' W. long.;

42˚57.18' N. lat., 124˚46.01' W. long.;

42˚56.10' N. lat., 124˚47.48' W. long.;

42˚56.66' N. lat., 124˚48.79' W. long.;

42˚52.89' N. lat., 124˚52.59' W. long.;

42˚53.82' N. lat., 124˚55.76' W. long.;

42˚57.56' N. lat., 124˚54.10' W. long.;

42˚58.00' N. lat., 124˚52.99' W. long.;

43˚00.39' N. lat., 124˚51.77' W. long.;

43˚02.64' N. lat., 124˚52.01' W. long.;

43˚04.60' N. lat., 124˚53.01' W. long.;

43˚05.89' N. lat., 124˚51.60' W. long.;

and connecting back to 43˚08.83' N. lat., 124˚50.93' W. long.

(w) Heceta Bank. Heceta Bank is defined by straight lines connecting all of the following points in the order stated:

43˚57.68' N. lat., 124˚55.48' W. long.;

44˚00.14' N. lat., 124˚55.25' W. long.;

44˚02.88' N. lat., 124˚53.96' W. long.;

44˚13.47' N. lat., 124˚54.08' W. long.;

44˚20.30' N. lat., 124˚38.72' W. long.;

44˚13.52' N. lat., 124˚40.45' W. long.;

44˚09.00' N. lat., 124˚45.30' W. long.;

44˚03.46' N. lat., 124˚45.71' W. long.;

44˚03.26' N. lat., 124˚49.42' W. long.;

43˚58.61' N. lat., 124˚49.87' W. long.;

and connecting back to 43˚57.68' N. lat., 124˚55.48' W. long.

(x) Rogue Canyon. Rogue Canyon is defined by straight lines connecting all of the following points in the order stated:

42˚41.33' N. lat., 125˚16.61' W. long.;

42˚41.55' N. lat., 125˚03.05' W. long.;

42˚35.29' N. lat., 125˚02.21' W. long.;

42˚34.11' N. lat., 124˚55.62' W. long.;

42˚30.61' N. lat., 124˚54.97' W. long.;

42˚23.81' N. lat., 124˚52.85' W. long.;

42˚17.94' N. lat., 125˚10.17' W. long.;

and connecting back to 42˚41.33' N. lat., 125˚16.61' W. long.

(y) Deepwater off Coos Bay. Deepwater off Coos Bay is defined by straight lines connecting all of the following points in the order stated:

43˚29.32' N. lat., 125˚20.11' W. long.;

43˚38.96' N. lat., 125˚18.75' W. long.;

43˚37.88' N. lat., 125˚08.26' W. long.;

43˚36.58' N. lat., 125˚06.56' W. long.;

43˚33.04' N. lat., 125˚08.41' W. long.;

43˚27.74' N. lat., 125˚07.25' W. long.;

43˚15.95' N. lat., 125˚07.84' W. long.;

43˚15.38' N. lat., 125˚10.47' W. long.;

43˚25.73' N. lat., 125˚19.36' W. long.;

and connecting back to 43˚29.32' N. lat., 125˚20.11' W. long.

(z) Siletz Deepwater. Siletz Deepwater is defined by straight lines connecting all of the following points in the order stated:

44˚42.72' N. lat., 125˚18.49' W. long.;

44˚56.26' N. lat., 125˚12.61' W. long.;

44˚56.34' N. lat., 125˚09.13' W. long.;

44˚49.93' N. lat., 125˚01.51' W. long.;

44˚46.93' N. lat., 125˚02.83' W. long.;

44˚41.96' N. lat., 125˚10.64' W. long.;

44˚33.36' N. lat., 125˚08.82' W. long.;

44˚33.38' N. lat., 125˚17.08' W. long.;

and connecting back to 44˚42.72' N. lat., 125˚18.49' W. long.

7. Section 660.396 is added to read as follows:

§ 660.396 Groundfish Essential Fish Habitat (EFH)

<u>Conservation Areas. (continued)</u>. In § 660.302, essential fish habitat (EFH) is defined as "those waters and substrate necessary to fish for spawning, breeding, feeding or growth to maturity." The areas in this subsection are designated to "minimize adverse impacts to EFH to the extent practicable." Straight lines connecting a series of Latitude/longitude coordinates demarcate the boundaries for areas designated as Groundfish EFH Conservation Areas. Coordinates outlining the boundaries of Groundfish EFH Conservation Areas are provided in §§ 660.395 through 660.397. Fishing activity that is prohibited or permitted within the EEZ in a particular area designated as a groundfish EFH Conservation Area is detailed at § 660.306 and § 660.385.

(a) <u>Hidden Reef / Kidney Bank</u>. Hidden Reef / Kidney Bank is defined by straight lines connecting all of the following points in the order stated:

33˚48.00' N. lat., 119˚15.06' W. long.;

33˚48.00' N. lat., 118˚57.06' W. long.;

33˚33.00' N. lat., 118˚57.06' W. long.;

33˚33.00' N. lat., 119˚15.06' W. long.;

and connecting back to 33˚48.00' N. lat., 119˚15.06' W. long.

(b) <u>Eel River Canyon</u>. Eel River Canyon is defined by straight lines connecting all of the following points in the

order stated:

40˚38.27' N. lat., 124˚27.16' W. long.;

40˚35.60' N. lat., 124˚28.75' W. long.;

40˚37.52' N. lat., 124˚33.41' W. long.;

40˚37.47' N. lat., 124˚40.46' W. long.;

40˚35.47' N. lat., 124˚42.97' W. long.;

40˚32.78' N. lat., 124˚44.79' W. long.;

40˚24.32' N. lat., 124˚39.97' W. long.;

40˚23.26' N. lat., 124˚42.45' W. long.;

40˚27.34' N. lat., 124˚51.21' W. long.;

40˚32.68' N. lat., 125˚05.63' W. long.;

40˚49.12' N. lat., 124˚47.41' W. long.;

40˚44.32' N. lat., 124˚46.48' W. long.;

40˚40.75' N. lat., 124˚47.51' W. long.;

40˚40.65' N. lat., 124˚46.02' W. long.;

40˚39.69' N. lat., 124˚33.36' W. long.;

and connecting back to 40˚38.27' N. lat., 124˚27.16' W. long.

(c) <u>Davidson Seamount</u>. Davidson Seamount is defined by straight lines connecting the following points in the order stated:

35˚54.00' N. lat., 123˚00.00' W. long.;

35˚54.00' N. lat., 122˚30.00' W. long.;

35˚30.00' N. lat., 122˚30.00' W. long.;

35˚30.00' N. lat., 123˚00.00' W. long.;

and connecting back to 35˚54.00' N. lat., 123˚00.00' W. long.

(d) Outer Cordell Bank. Cordell Bank is located offshore of California's Marin County defined by straight lines connecting all of the following points in the order stated:

38˚04.05' N. lat., 123˚07.28' W. long.;

38˚02.84' N. lat., 123˚07.36' W. long.;

38˚01.09' N. lat., 123˚07.06' W. long.;

38˚01.02' N. lat., 123˚22.08' W. long.;

37˚54.75' N. lat., 123˚23.64' W. long.;

37˚46.01' N. lat., 123˚25.62' W. long.;

37˚46.68' N. lat., 123˚27.05' W. long.;

37˚47.66' N. lat., 123˚28.18' W. long.;

37˚50.26' N. lat., 123˚30.94' W. long.;

37˚54.41' N. lat., 123˚32.69' W. long.;

37˚56.94' N. lat., 123˚32.87' W. long.;

37˚57.12' N. lat., 123˚25.04' W. long.;

37˚59.43' N. lat., 123˚27.29' W. long.;

38˚00.82' N. lat., 123˚29.61' W. long.;

38˚02.31' N. lat., 123˚30.88' W. long.;

38˚03.99' N. lat., 123˚30.75' W. long.;

38˚04.85' N. lat., 123˚30.36' W. long.;

38˚04.88' N. lat., 123˚27.85' W. long.;

38˚04.44' N. lat., 123˚24.44' W. long.;

38˚03.05' N. lat., 123˚21.33' W. long.;

38˚05.77' N. lat., 123˚06.83' W. long.;

and connecting back to 38˚04.05' N. lat., 123˚07.28' W. long.

(e) Inner Cordell Bank (within 50 fm isobath). Cordell Bank (within 50 fm isobath) is located offshore of California's Marin County defined by straight lines connecting all of the following points in the order stated:

37˚57.62' N. lat., 123˚24.22' W. long.;

37˚57.70' N. lat., 123˚25.25' W. long.;

37˚59.47' N. lat., 123˚26.63' W. long.;

38˚00.24' N. lat., 123˚27.87' W. long.;

38˚00.98' N. lat., 123˚27.65' W. long.;

38˚02.81' N. lat., 123˚28.75' W. long.;

38˚04.26' N. lat., 123˚29.25' W. long.;

38˚04.55' N. lat., 123˚28.32' W. long.;

38˚03.87' N. lat., 123˚27.69' W. long.;

38˚04.27' N. lat., 123˚26.68' W. long.;

38˚02.67' N. lat., 123˚24.17' W. long.;

38˚00.87' N. lat., 123˚23.15' W. long.;

37˚59.32' N. lat., 123˚22.52' W. long.;

37˚58.24' N. lat., 123˚23.16' W. long.;

and connecting back to 37˚57.62' N. lat., 123˚24.22' W.

long.

(f) Cowcod Conservation Area East. Cowcod Conservation Area East is an area west of San Diego defined by straight lines connecting all of the following points in the order stated:

32˚41.15' N. lat., 118˚02.00' W. long.;

32˚42.00' N. lat., 118˚02.00' W. long.;

32˚42.00' N. lat., 117˚50.00' W. long.;

32˚36.70' N. lat., 117˚50.00' W. long.;

32˚30.00' N. lat., 117˚53.50' W. long.;

32˚30.00' N. lat., 118˚02.00' W. long.;

32˚40.49' N. lat., 118˚02.00' W. long.;

and connecting back to 32˚41.15' N. lat., 118˚02.00' W. long.

(g) Thompson Seamount. Thompson Seamount is defined by straight lines connecting all of the following points in the order stated:

46˚06.93' N. lat., 128˚39.77' W. long.;

46˚06.76' N. lat., 128˚39.60' W. long.;

46˚07.80' N. lat., 128˚39.43' W. long.;

46˚08.50' N. lat., 128˚34.39' W. long.;

46˚06.76' N. lat., 128˚29.36' W. long.;

46˚03.64' N. lat., 128˚28.67' W. long.;

45˚59.64' N. lat., 128˚31.62' W. long.;

45˚56.87' N. lat., 128˚33.18' W. long.;

45˚53.92' N. lat., 128˚39.25' W. long.;

45˚54.26' N. lat., 128˚43.42' W. long.;

45˚56.87' N. lat., 128˚45.85' W. long.;

46˚00.86' N. lat., 128˚46.02' W. long.;

46˚03.29' N. lat., 128˚44.81' W. long.;

46˚06.24' N. lat., 128˚42.90' W. long.;

and connecting back to 46˚06.93' N. lat., 128˚39.77' W. long.

(h) President Jackson Seamount. President Jackson Seamount is defined by straight lines connecting all of the following points in the order stated:

42˚21.41' N. lat., 127˚42.91' W. long.;

42˚21.96' N. lat., 127˚43.73' W. long.;

42˚23.78' N. lat., 127˚46.09' W. long.;

42˚26.05' N. lat., 127˚48.64' W. long.;

42˚28.60' N. lat., 127˚52.10' W. long.;

42˚31.06' N. lat., 127˚55.02' W. long.;

42˚34.61' N. lat., 127˚58.84' W. long.;

42˚37.34' N. lat., 128˚01.48' W. long.;

42˚39.62' N. lat., 128˚05.12' W. long.;

42˚41.81' N. lat., 128˚08.13' W. long.;

42˚43.44' N. lat., 128˚10.04' W. long.;

42˚44.99' N. lat., 128˚12.04' W. long.;

42˚48.27' N. lat., 128˚15.05' W. long.;

42˚51.28' N. lat., 128˚15.05' W. long.;

42˚53.64' N. lat., 128˚12.23' W. long.;

42˚52.64' N. lat., 128˚08.49' W. long.;

42˚51.64' N. lat., 128˚06.94' W. long.;

42˚50.27' N. lat., 128˚05.76' W. long.;

42˚48.18' N. lat., 128˚03.76' W. long.;

42˚45.45' N. lat., 128˚01.94' W. long.;

42˚42.17' N. lat., 127˚57.57' W. long.;

42˚41.17' N. lat., 127˚53.92' W. long.;

42˚38.80' N. lat., 127˚49.92' W. long.;

42˚36.43' N. lat., 127˚44.82' W. long.;

42˚33.52' N. lat., 127˚41.36' W. long.;

42˚31.24' N. lat., 127˚39.63' W. long.;

42˚28.33' N. lat., 127˚36.53' W. long.;

42˚23.96' N. lat., 127˚35.89' W. long.;

42˚21.96' N. lat., 127˚37.72' W. long.;

42˚21.05' N. lat., 127˚40.81' W. long.;

and connecting back to 42˚21.41' N. lat., 127˚42.91' W. long.

(i) <u>Catalina Island</u>. Catalina Island is defined by straight lines connecting all of the following points in the order stated:

33˚34.71' N. lat., 118˚11.40' W. long.;

33˚25.88' N. lat., 118˚03.76' W. long.;

33˚11.69' N. lat., 118˚09.21' W. long.;

33˚19.73' N. lat., 118˚35.41' W. long.;

33˚23.90' N. lat., 118˚35.11' W. long.;

33˚25.68' N. lat., 118˚41.66' W. long.;

33˚30.25' N. lat., 118˚42.25' W. long.;

33˚32.73' N. lat., 118˚38.38' W. long.;

33˚27.07' N. lat., 118˚20.33' W. long.;

and connecting back to 33˚34.71' N. lat., 118˚11.40' W. long.

(j) Monterey Bay / Canyon. Monterey Bay / Canyon is defined by straight lines connecting all of the following points in the order stated:

36˚38.21' N. lat., 121˚55.96' W. long.;

36˚25.31' N. lat., 121˚54.86' W. long.;

36˚25.25' N. lat., 121˚58.34' W. long.;

36˚30.86' N. lat., 122˚00.45' W. long.;

36˚30.02' N. lat., 122˚09.85' W. long.;

36˚30.23' N. lat., 122˚36.82' W. long.;

36˚55.08' N. lat., 122˚36.46' W. long.;

36˚51.41' N. lat., 122˚14.14' W. long.;

36˚49.37' N. lat., 122˚15.20' W. long.;

36˚48.31' N. lat., 122˚18.59' W. long.;

36˚45.55' N. lat., 122˚18.91' W. long.;

36˚40.76' N. lat., 122˚17.28' W. long.;

36˚39.88' N. lat., 122˚09.69' W. long.;

36˚44.94' N. lat., 122˚08.46' W. long.;

36˚47.37' N. lat., 122˚03.16' W. long.;

36˚49.60' N. lat., 122˚00.85' W. long.;

36˚51.53' N. lat., 121˚58.25' W. long.;

36˚50.78' N. lat., 121˚56.89' W. long.;

36˚47.39' N. lat., 121˚58.16' W. long.;

36˚48.34' N. lat., 121˚50.95' W. long.;

36˚47.23' N. lat., 121˚52.25' W. long.;

36˚45.60' N. lat., 121˚54.17' W. long.;

36˚44.76' N. lat., 121˚56.04' W. long.;

36˚41.68' N. lat., 121˚56.33' W. long.;

and connecting back to 36˚38.21' N. lat., 121˚55.96' W. long.

(k) Farallon Islands / Fanny Shoal. Farallon Islands, Fanny Shoal is defined by straight lines connecting all of the following points in the order stated:

37˚51.58' N. lat., 123˚14.07' W. long.;

37˚44.51' N. lat., 123˚01.50' W. long.;

37˚41.71' N. lat., 122˚58.38' W. long.;

37˚40.80' N. lat., 122˚58.54' W. long.;

37˚39.87' N. lat., 122˚59.64' W. long.;

37˚42.05' N. lat., 123˚03.72' W. long.;

37˚43.73' N. lat., 123˚04.45' W. long.;

37˚49.23' N. lat., 123˚16.81' W. long.;

and connecting back to 37˚51.58' N. lat., 123˚14.07' W. long.

(l) Delgada Canyon. Delgada Canyon is defined by straight lines connecting all of the following points in the order stated:

40˚07.13' N. lat., 124˚09.09' W. long.;

40˚06.58' N. lat., 124˚07.39' W. long.;

40˚01.18' N. lat., 124˚08.84' W. long.;

40˚02.48' N. lat., 124˚12.93' W. long.;

40˚05.71' N. lat., 124˚09.42' W. long.;

40˚07.18' N. lat., 124˚09.61' W. long.;

and connecting back to 40˚07.13' N. lat., 124˚09.09' W. long.

(m) Mendocino Ridge. Mendocino Ridge is defined by straight lines connecting all of the following points in the order stated:

40˚25.23' N. lat., 124˚24.06' W. long.;

40˚12.50' N. lat., 124˚22.59' W. long.;

40˚14.40' N. lat., 124˚35.82' W. long.;

40˚16.16' N. lat., 124˚39.01' W. long.;

40˚17.47' N. lat., 124˚40.77' W. long.;

40˚19.26' N. lat., 124˚47.97' W. long.;

40˚19.98' N. lat., 124˚52.73' W. long.;

40˚20.06' N. lat., 125˚02.18' W. long.;

40˚11.79' N. lat., 125˚07.39' W. long.;

40˚12.55' N. lat., 125˚11.56' W. long.;

40˚12.81' N. lat., 125˚12.98' W. long.;

40˚20.72' N. lat., 125˚57.31' W. long.;

40˚23.96' N. lat., 125˚56.83' W. long.;

40˚24.04' N. lat., 125˚56.82' W. long.;

40˚25.68' N. lat., 125˚09.77' W. long.;

40˚21.03' N. lat., 124˚33.96' W. long.;

40˚25.72' N. lat., 124˚24.15' W. long.;

and connecting back to 40˚25.23' N. lat., 124˚24.06' W. long.

(n) Anacapa Island SMCA. Anacapa Island SMCA is bounded by mean high water and straight lines connecting all of the following points in the order stated:

34˚00.80' N. lat., 119˚26.70' W. long.;

34˚05.00' N. lat., 119˚26.70' W. long.;

34˚05.00' N. lat., 119˚24.60' W. long.;

34˚00.40' N. lat., 119˚24.60' W. long.

(o) Anacapa Island SMR. Anacapa Island SMR is bounded by mean high water and straight lines connecting all of the following points in the order stated:

34˚00.40' N. lat., 119˚24.60' W. long.;

34˚05.00' N. lat., 119˚24.60' W. long.;

34˚05.00' N. lat., 119˚21.40' W. long.;

34˚01.00' N. lat., 119˚21.40' W. long.

(p) Carrington Point. Carrington Point is bounded by mean high water and straight lines connecting all of the following points:

34˚01.30' N. lat., 120˚05.20' W. long.;

34˚04.00' N. lat., 120˚05.20' W. long.;

34˚04.00' N. lat., 120˚01.00' W. long.;

34˚00.50' N. lat., 120˚01.00' W. long.;

34˚00.50' N. lat., 120˚02.80' W. long.;

(q) Footprint. Footprint is defined by straight lines connecting all of the following points in the order stated:

33˚59.00' N. lat., 119˚26.00' W. long.;

33˚59.00' N. lat., 119˚31.00' W. long.;

33˚54.11' N. lat., 119˚31.00' W. long.;

33˚54.11' N. lat., 119˚26.00' W. long.;

and connecting back to 33˚59.00' N. lat., 119˚26.00' W. long.

(r) Gull Island. Gull Island is bounded by mean high water and straight lines connecting all of the following points in the order stated:

33˚58.02' N. lat., 119˚51.00' W. long.;

33˚58.02' N. lat., 119˚53.00' W. long.;

33˚51.63' N. lat., 119˚53.00' W. long.;

33˚51.62' N. lat., 119˚48.00' W. long.;

33˚57.70' N. lat., 119˚48.00' W. long.

(s) Harris Point. Harris Point is bounded by mean high water and straight lines connecting all of the following points in the order stated:

34˚03.10' N. lat., 120˚23.30' W. long.;

34˚12.50' N. lat., 120˚23.30' W. long.;

34˚12.50' N. lat., 120˚18.40' W. long.;

34˚01.80' N. lat., 120˚18.40' W. long.;

34˚02.90' N. lat., 120˚20.20' W. long.;

34˚03.50' N. lat., 120˚21.30' W. long.;

(t) Harris Point Exception. An exemption to the Harris Point reserve, where commercial and recreational take of living marine resources is allowed, exists between mean high water in Cuyler Harbor and a straight line connecting all of the following points:

34˚02.90' N. lat., 120˚20.20' W. long.;

34˚03.50' N. lat., 120˚21.30' W. long.;

(u) Judith Rock. Judith Rock is bounded by mean high water and a straight line connecting all of the following points in the order stated:

34˚01.80' N. lat., 120˚26.60' W. long.;

33˚58.50' N. lat., 120˚26.60' W. long.;

33˚58.50' N. lat., 120˚25.30' W. long.;

34˚01.50' N. lat., 120˚25.30' W. long.

(v) Painted Cave. Painted Cave is bounded by mean high water and a straight line connecting all of the following points in the

order stated:

34˚04.50' N. lat., 119˚53.00' W. long.;

34˚05.20' N. lat., 119˚53.00' W. long.;

34˚05.00' N. lat., 119˚51.00' W. long.;

34˚04.00' N. lat., 119˚51.00' W. long.

(w) Richardson Rock. Richardson Rock is defined by straight lines connecting all of the following points in the order stated:

34˚10.40' N. lat., 120˚28.20' W. long.;

34˚10.40' N. lat., 120˚36.29' W. long.;

34˚02.21' N. lat., 120˚36.29' W. long.;

34˚02.21' N. lat., 120˚28.20' W. long.;

and connecting back to 34˚10.40' N. lat., 120˚28.20' W. long.

(x) Santa Barbara. Santa Barbara is bounded by mean high water and straight lines connecting all of the following points in the order stated:

33˚28.50' N. lat., 119˚01.70' W. long.;

33˚28.50' N. lat., 118˚54.54' W. long.;

33˚21.78' N. lat., 118˚54.54' W. long.;

33˚21.78' N. lat., 119˚02.20' W. long.;

33˚27.90' N. lat., 119˚02.20' W. long.

(y) Scorpion. Scorpion is bounded by mean high water and a straight line connecting all of the following points in the order stated:

34˚02.94' N. lat., 119˚35.50' W. long.;

34˚09.35' N. lat., 119˚35.50' W. long.;

34˚09.35' N. lat., 119˚32.80' W. long.;

34˚02.80' N. lat., 119˚32.80' W. long.

(z) Skunk Point. Skunk Point is bounded by mean high water and straight lines connecting all of the following points in the order stated:

33˚59.00' N. lat., 119˚58.80' W. long.;

33˚59.00' N. lat., 119˚58.02' W. long.;

33˚57.10' N. lat., 119˚58.00' W. long.;

33˚57.10' N. lat., 119˚58.20' W. long.;

8. Section 660.397 is added to read as follows:

§ 660.397 Groundfish Essential Fish Habitat (EFH)(continued). In § 660.302, essential fish habitat (EFH) is defined as "those waters and substrate necessary to fish for spawning, breeding, feeding or growth to maturity." The areas in this subsection are designated to "minimize adverse impacts to EFH to the extent practicable." Straight lines connecting a series of Latitude/longitude coordinates demarcate the boundaries for areas designated as Groundfish EFH Conservation Areas. Coordinates outlining the boundaries of Groundfish EFH Conservation Areas are provided in §§ 660.395 through 660.397. Fishing activity that is prohibited or permitted within the EEZ in a particular area designated as a groundfish EFH Conservation

Area is detailed at § 660.306 and § 660.385.

(a) South Point. South Point is bounded by mean high water and straight lines connecting all of the following points in the order stated:

33˚55.00' N. lat., 120˚10.00' W. long.;

33˚50.40' N. lat., 120˚10.00' W. long.;

33˚50.40' N. lat., 120˚06.50' W. long.;

33˚53.80' N. lat., 120˚06.50' W. long.;

GROUNDFISH ADVISORY SUBPANEL REPORT ON AMENDMENT 19 (ESSENTIAL FISH HABITAT)

The Groundfish Advisory Subpanel (GAP) reviewed Amendment 19 draft language and the associated implementing regulations for essential fish habitat (EFH). Mr. Steve Copps, National Marine Fisheries Service (NMFS), was available to answer questions regarding the proposed regulations and encouraged the GAP to provide technical comments as appropriate.

Specific comments on draft language include:

1. Page 6, Item J, should read: Trawl Fishing Line. A length of chain, *rope*, or wire rope….
2. Include a definition of "stowed" as it relates to recreational fishing gear

Specific comments on boundaries to closed areas include:

1. The closed areas for Potato Bank, Cherry Bank, and Hidden Reef/Kidney Bank are much larger then the actual banks – these areas should be downsized to reflect agreements between stakeholders.
2. Adjacent to Soquel Canyon the EFH line should follow the 60 fathom curve as was agreed to by stakeholders. The current proposal cuts into the center of the halibut trawl grounds.

The GAP also notes that there is inconsistency between the EFH draft regulations provided by NMFS and the proposed regulations provided by the Sanctuary and that these inconsistencies should be analyzed and corrected.

On a separate but related issue, the GAP recognizes that the EFH closed area in Monterey Bay will eliminate most of the area as available for fishing. Monterey Bay Aquarium Research Institute (MBARI) has proposed a cable observatory in the only open area left after the EFH closed area is applied. The GAP would recommend to the Council that a letter be sent to the National Science Foundation (which is funding MBARI), MBARI, and the Monterey Sanctuary regarding this issue which could impact the fishery in that area unfairly.

PFMC
11/02/05

Agenda Item H.7.b
Supplemental GMT Report
November 2005

GROUNDFISH MANAGEMENT TEAM REPORT ON AMENDMENT 19 (ESSENTIAL FISH HABITAT)

The Groundfish Management Team (GMT) reviewed the draft regulations for essential fish habitat (EFH) in conjunction with the Enforcement Consultants at our meeting in early October, and provided suggested changes to Mr. Steve Copps, National Marine Fisheries Service. The GMT reviewed the subsequent draft (Agenda Item H.7.a., Supplemental Attachment 3), dated October 25, 2005, and notes that most of our suggested changes were incorporated. The GMT would like to provide the following comments and recommendations relative to the revised draft:

As part of the Council's action in June, the Council decided to prohibit fishing with dredge gear and beam trawl gear from the shore seaward to 200 miles (i.e., within state waters from 0-3 miles, but not in the bays and estuaries, and within the entire exclusive economic zone [EEZ]). The draft EFH regulations prohibit dredge gear and beam trawl gear only within the EEZ. The GMT believes there are advantages to including those prohibitions in the federal regulations to apply from the shore to 3 miles. Having the federal rules in place will help facilitate the states taking conforming action. Also, having the rules in federal regulations promotes consistency and will help ensure that the prohibitions will remain in place until the Council takes action to change or remove them.

GMT Recommendations

1. Revise the regulations to prohibit fishing with dredge gear and beam trawl gear from the shore seaward to 200 miles.

PFMC
11/02/05

HABITAT COMMITTEE REPORT ON AMENDMENT 19 (ESSENTIAL FISH HABITAT)

The Habitat Committee (HC) reaffirms the comments we provided in June 2005 (attached). We also recommend the Council clarify the first paragraph of the draft regulations describing the process for adding, modifying, or eliminating designations for habitat areas of particular concern.

With respect to protection of habitat and ecosystems, it is unclear to the HC whether there is a difference in habitat/ecosystem protection under the Magnuson-Stevens Fishery Conservation and Management Act or National Marine Sanctuaries Act jurisdiction. In some cases, overlapping jurisdictions may be necessary to fully protect ocean ecosystems.

PFMC
10/27/05

HABITAT COMMITTEE REPORT ON THE GROUNDFISH ESSENTIAL FISH HABITAT ENVIRONMENTAL IMPACT STATEMENT

The Habitat Committee (HC) developed this statement on the Groundfish Essential Fish Habitat Draft Environmental Impact Statement (DEIS) through email communication. We reiterate some of the HC's earlier statements, particularly on description of Essential Fish Habitat (EFH), designation of habitat areas of particular concern (HAPC), and research and monitoring, but also have refined our thinking on measures to minimize adverse impacts to EFH due to fishing, after review of the DEIS (February 11, 2005).

Summary of Recommendations of Habitat Committee

A. Designation of EFH: Adopt Alternative A2
B. Designation of HAPC: Adopt B2, B3, B4, B6, B7 and B.9.
C. Measures to Minimize Impacts of Fishing:
Adopt <u>elements of</u> C4.2, C7.2, C9.5, C9.6, C.10, and C.12, 13 and 14.
D. Research and Monitoring: Adopt a combination of D.2. and D.4.

The HC believes that the designation, description and protection of EFH, as mandated by the 1996 Sustainable Fisheries Act, is a helpful tool for the Pacific Fishery Management Council. It helps moves fishery management into a broader ecological context and is a step forward in the incorporation of the principles of ecosystem-based management as called for by the U.S. Commission on Ocean Policy (2004), the Pew Ocean Commission (2003) and the U.S. Department of Commerce report to Congress on Ecosystem-based Management (1999).

The preparation of the DEIS to support the Council's upcoming decisions on EFH has focused a great deal of effort and has brought information together that would not otherwise have been available to managers in a usable format. While there are significant gaps and uncertainties in our understanding of marine habitat and the specifics of how changes in habitat condition lead to changes in fishery resource productivity, the process of compiling the available information has been integral in bringing these gaps and uncertainties to light. This, in turn, suggests priority areas for future monitoring and research efforts. The authors of the DEIS have done a remarkable job assembling and depicting alternatives and supporting information with very limited time and resources; they cannot be faulted for the data gaps and uncertainties that remain. Consequently, the DEIS represents a comprehensive compilation of the best information currently available, and is an adequate basis for decision-making by the Council.

The HC understands that industry and environmental groups are likely to come forward with new alternative formulations as refinements to those already presented in the draft DEIS for fishing impact minimization. While we are unable to comment on these hypothetical and unseen alternatives, we offer recommendations on the four decision areas based on the existing published alternatives. We provide a rationale for these recommendations and have prepared a matrix (attached) showing how the existing alternatives help to meet some of these principles.

We hope this is a useful tool that the Council can use to review new alternatives against. In arriving at our recommendations, we considered how each alternative would help achieve the following six principles or objectives:

General Principles

1. **Understand impacts of fishing**

All habitats, whether marine or terrestrial, experience natural disturbances. Fishing can also represent a disturbance to habitat, and management and conservation attention should be most concerned with disturbances that are quantitatively and/or qualitatively unlike the natural disturbances that marine habitats and constituent organisms experience and are presumably better able to withstand.

We must act with precaution as we seek improved understanding of fishing impacts to habitat of various types and under differing energy regimes. Study of impacts and recovery require areas where specific fishing disturbances can be studied experimentally as well as two types of control areas that are not impacted by any fishing and areas that are open to fishing impacts of all kinds.

As noted in the DEIS, most studies of fishing gear impacts on habitat have been conducted outside of the West Coast region. The HC supports the concept that ecological principles can be applied to data collected during studies of fishing gear impacts on marine habitats in other areas. However, specific studies conducted in this region will strengthen our understanding, particularly in the context of the unique and complex assemblage of species managed under the Council's groundfish FMP.

Areas chosen for study should be broadly representative of all habitat types in which PFMC managed groundfish occur. In particular, they should represent this diversity based on depth, substrate type, latitude and ecoregion (e.g. both above and below Pt. Conception). Many areas in the West Coast Exclusive Economic Zone (EEZ) are not currently fished. We recommend that unfished study areas be selected in collaboration with fishermen from all gear sectors in order to take advantage of these unfished areas and to minimize additional areas closed by regulation (see #6, below).

2. Focus on Priority Habitats

The HC feels that priority habitats that are vulnerable to disturbance by fishing gear, and that warrant protective measures include canopy kelp, seagrasses, seapens, and biogenic structure forming organisms such as corals and sponges that are associated with high relief rocky habitats, canyons, and seamounts.

As noted in the Scientific and Statistical Committee report to the Council in March 2005, the distribution and abundance of priority habitats is poorly understood and warrants further investigation.

3. Protect undisturbed areas

There may be other areas that hold unique habitats that are as yet undiscovered or poorly understood and potentially fragile. These areas should be candidates for future protection. As a precautionary step, the HC recommends that areas that are presently undisturbed should remain that way until better mapping information is available. A number of recent discoveries along the West Coast of unique and poorly studied habitats with associated species support this principle, including: a common, conspicuous, and previously undescribed species of black coral living in the Southern California Bight; multispecies aggregations of a deep-dwelling sculpin and a deep-sea octopod brooding eggs in a fluid seep area on the Gorda Escarpment off California; and methane seeps with associated carbonate rock structures and chemosynthetic communities along the shelf break off Oregon. These recent observations suggest that there are undiscovered unique areas scattered along the West Coast that warrant protection by limiting the expansion of existing fisheries.

4. Protect the forage base

The HC understands that prohibiting a directed krill fishery will take place through another management approach by the Council. The HC is very supportive of this action and encourages the Council to expand protection to all of the currently non-managed forage species as well. Preservation of a healthy forage base that is relied upon by managed groundfish species is an important element in the broader context of habitat protection and ecosystem-based management.

5. Timely implementation of protection measures

While there is substantial learning to be done on this topic, the HC feels that action on EFH protection proceed with a plan for effectiveness monitoring. This would be a precautionary approach with adjustments expected during each 5-year review period.

6. Utilize existing restricted areas to also achieve habitat objectives.

In working to select areas for habitat protection, we encourage the consideration of areas that have already received some protection for other purposes (e.g., bycatch reduction and stock rebuilding) so as to both realize the benefits that are already accruing to habitat from these measures, and to minimize the imposition of new regulatory restrictions on the fishing industry.

The HC understands that the Council has the flexibility to adopt any alternative, or blend of alternatives, provided that it is within the scope of the analyses contained in the draft DEIS. We note how helpful the GIS tool has been in dealing with the habitat-based management options in the DEIS and encourage the Council to use this tool during deliberations considering the various new and existing options. Our recommendations are explained below and accompanied by an attached table.

HC Recommendations on the Alternatives

A. Designation of EFH: Adopt Alternative A.2

The HC recommends adopting EFH Alternative A.2 (identified as 100% of the area where habitat suitability probability (HSP) is greater than zero for all species and any additional area in depths less than or equal to 3,500 m or 1914 fathoms) as its final Preferred Alternative. This recommendation reflects our belief that the maximum probabilistic approach to determining EFH, as is represented in this alternative, is reasonable given data uncertainties, and that the added precaution of including some areas beyond depths where data become particularly uncertain is also wise. It is our understanding that the proposed EFH designation includes not only substrate, but also the water column above that substrate, including surface waters.

B. Designation of HAPC: Adopt B.2, B.3, B.4, B.6, B.7. and B.9

The purpose of HAPC is to identify areas that 1) possess important ecological functions for groundfish, 2) are sensitive to human-induced environmental degradation, 3) are at risk of stress due to development actions, and/or 4) are rare habitat types for groundfish. We are aware that designating HAPC serves to concentrate attention on potential threats to these habitats, but provides no explicit protection.

The HC recommends that the Council adopt as its final alternative an amalgamation of Alternatives B.2, B.3, B.4, and B.6 (estuaries, canopy kelp, seagrass beds, and rocky reef areas). We also note that areas identified under Alternative B.7.(areas of interest) that are not already encompassed in the previous four draft alternatives have unique geological and ecological features of special value to fisheries and accordingly, many of these are also currently being used as research areas. As such, the HC believes that these areas merit the special attention afforded HAPC designation and deserve incorporation into the Council's final alternative. In addition, the HC recommends that the Council include Alternative 9 in its final alternatives as a mechanism to streamline future HAPC designations based on new information.

C. Measures to Minimize Impacts of Fishing to EFH: Adopt <u>elements of</u> C4.2, C7.2, C9.5, C.10, and C.12, 13 and 14.

The HC notes that while the importance of habitat to marine fishery resources is increasingly recognized, detailed understanding of the relationship of habitat condition to fishery resource productivity on the one hand, and to the individual and cumulative impacts of fishing activities on the other, is still being developed.

In light of the principles and considerations outlined above, the HC recommends adopting <u>some</u> elements of:

Alternative C.4.2 limits expansion of fisheries for all bottom tending gear

Alternative C.7.2 protects areas of interest as identified by HAPC alternative B.7 from all bottom tending gear. We note that this alternative specifically takes advantage of the cowcod closure area and we recommend identification of a subset of the RCAs also to be identified for closure to encompass all habitat types, depths, and latitudes.

Alternative C.9.5 prohibits the use of dredge gear. Dredge gear is little used, has been or is being phased out, and is known to be destructive to habitat.

Alternative C.10 (Central California buyout and closure) has merit and is very progressive in its approach, but is limited in geographic scope. However, if the private parties involved (fishermen and the Nature Conservancy) jointly agree that this is a productive proposal, we believe that there are habitat benefits that deserve support.

Alternative C.12 is the Oceana alternative relating only to bottom trawl gear, while Alternatives C.13 contains the same areas but closes them to all bottom contacting gear and C.14 closes these areas to all fishing. (The HC thinks that all three approaches should be used in various combinations to meet its principles of allowing protection and research).

Discussion

It is clear that the Council, the scientific community, and the public are developing an increasing awareness that complex habitats of relief, including biogenic habitats such as seagrasses, kelp, corals, sponges and sea-pens are important to the growth and survival of managed species. Consequently, we recommend that the Council's Final Alternative include measures that will afford protection to these priority habitat types. The most direct method to protect these habitat types would be to identify measures that would prohibit fishing with mobile bottom tending gear in these areas. Because many of these features are associated with rocky substrate, the Council may prefer to focus its primary attention on this substrate type.

A comprehensive alternative that addresses specific habitat protection goals and criteria would be useful. One of the Council's most difficult decisions will be whether and how to apply habitat protection measures to only trawl gear or to other bottom-contacting fisheries as well. Our base of information on the spatial distribution and intensity of fixed gear commercial and recreational fisheries, as well as of the habitat impacts of these fisheries, is much less robust than it is for mobile, bottom-tending gear.

The HC recognizes that the Council has been placed in an extraordinarily difficult position of balancing the benefits of habitat protection against the costs of displaced fisheries, in the face of this uncertainty. Fixed gear and recreational fisheries target different species occupying different habitats than many trawl fisheries. However, we understand that fixed gear can impact habitat features through contact of gear, and shearing of lines as gear is retrieved. The HC recommends that the Council take initial measures in a precautionary fashion to protect priority habitat types. The Council should also assure that there is some full and on-going protection of areas that represent a full suite of habitat types, depth and latitude ranges to reflect uncertainty. However, all-encompassing depth-based measures that may have negative consequences to fisheries may be overly broad.

While we think Alternative C.8 to zone fishing activities is an interesting idea, it requires NOAA to do extensive research to demonstrate that any unavoidable adverse impacts would be minimal and temporary. Lack of available funds makes this option impractical. Further, it is silent on criteria to be employed to determine whether an area should be open or closed and much of its protective force would be deferred to the future.

The HC believes that habitat protection through new gear restrictions (Alternative C.9) can be appropriate, particularly if they are readily enforceable and accepted by the fishing industry. The HC recognizes that the Council's action to reduce catch of overfished species, using restrictions on large footrope trawl gear, has also seemed to have had the added benefit of protecting habitat by moving trawl effort off of high relief habitat.

In general, the HC cannot speak to the habitat benefits of the several options under this alternative. Much depends on where the gear is fished, and how it is fished. For example, in high relief areas with abundant emergent invertebrates (e.g. sponges or corals), or low energy environments with little disturbance, infrequent bottom contact by any gear may have a significant habitat impact.

We note that fishing gear is constantly evolving; development of habitat friendly fishing gear should be encouraged. While gear restrictions may act to protect habitat under present conditions and configurations, there are no assurances that the habitat protections envisioned will be maintained through time as gear configurations change. Much will depend on how legal and prohibited gear is defined in future regulations.

D. Research and Monitoring : Adopt a combination of D.2. and D.4.

The HC recommends that the Council adopt a combination of Alternative D.2, option 1 (mandatory logbooks for all groundfish operations) and Alternative D.4 (a system of research closures to provide areas for experimentation and observation of habitat condition in open and closed areas) as its final alternative for research and monitoring.

The HC believes that it is essential that the mandatory five year review of the Council's measures to identify and protect EFH be conducted with a much better understanding of the spatial distribution of habitat types and functions, the spatial distribution fishing activities, and the relationship of habitat condition to fishing activities and the productivity of fishery resources.

Collection of accurate spatial information on non-trawl fisheries is a significant need for the next EFH update. This information needs to provide a comprehensive picture of activity showing seasonal and interannual variability, effort and catch across a wide representation of the fleet. We believe a logbook program provides the best vehicle to collect the needed comprehensive information linking effort, harvest and location, Additionally we suggest the Council retain the option of requiring vessel monitoring systems (VMS) for circumstances where automated collection of precise locational information addresses management or enforcement questions. As the technology becomes available and affordable, adoption of an electronic logbook format should be encouraged to facilitate more broad and rapid use of logbook data.

Evaluation of the Council's measures to protect habitat from adverse effects of fishing, and of fishing impacts to habitat are essential to understanding whether any restrictions to fishing activities are warranted and justified. Developing these evaluations through carefully structured comparisons of open, closed and experimental areas that are matched for habitat type (substrate, depth and latitude) is necessary in order to clearly differentiate changes that are the result of Council management and conservation actions, as opposed to changes that may result from broader changes in oceanographic conditions and recruitment events. Clearly, implementation of research or conservation closures requires that goals and objectives be identified, as well as mechanisms for siting and monitoring. This is a topic the Council has endorsed in its MPA policy white paper. The HC encourages the Council to actively support funding to the participating agencies and universities for the necessary research to meet this goal.

Additionally, a specific plan for monitoring the effectiveness of the adopted EFH measures should be identified and funded so we can evaluate their effectiveness during the mandatory 5 year EFH review.

Habitat Committee Analysis of
Groundfish EFH DEIS Fishing Impact Minimization Alternatives

(alternatives shown in bold outline are Council preliminary preferred Alternatives)

Principles → **Fishing Impact Minimization Alternatives↓**	Provides on-going protection of sensitive or special habitats from gear with bottom contact		Areas with little disturbance remain undisturbed		Utilizes existing closed or unfished areas		Considers prey base (other food chain interactions?)	Implementation to begin near-term
	all bottom contacting gear	all bottom trawl gear	all bottom contacting gear	all bottom trawl gear	all bottom contacting gear	all bottom trawl gear		
C.1 No action								X
Depth Based								X
C.2. 1. No large footrope trawl shoreward of 200 fm and no fixed gear shoreward of 100 fm								X
C.2.2. no large footrope trawl throughout the EEZ and no fixed gear shoreward of 100 fm								X
C.2.3. no large footrope trawl gear shoreward of 200 fm and no fixed gear shoreward of 60 fm								X
Close Sensitive Habitat								X
C.3.1. sensitive areas with low existing trawling efforts (higher threshold) closed to all fishing (all gear types)	X	X	X	X				X
C.3.2. sensitive areas (lower threshold) with low existing trawl effort closed to all fishing (all gear types)	X	X	X	X				X
C.3.3.same as .1 except no adjustment made for trawl effort	X	X	X	X				X
C.3.4. same as .2 except no adjustment made for trawl effort	X	X	X	X				X

Principles → **Fishing Impact Minimization Alternatives↓**	Provides on-going protection of sensitive or special habitats from gear with bottom contact		Areas with little disturbance remain undisturbed		Utilizes existing closed or unfished areas		Considers prey base (other food chain interactions?)	Implementation to begin near-term
	all bottom contacting gear	all bottom trawl gear	all bottom contacting gear	all bottom trawl gear	all bottom contacting gear	all bottom trawl gear		
Prohibit Geographic Expansion of Fishing								
C.4.1. Trawl fisheries would be prohibited from fishing in areas that were untrawled during 2000-2002		X		X		X		X
C.4.2. All bottom tending gear types prohibited from fishing west from the 1094 fm contour	X	X	X	X	X	X		X
Prohibit a Krill Fishery								
C.5.Designate krill as a component of EFH and prohibit fisheries that target it.							X	X
Close Hotspots								
C.6. Prohibit bottom trawling in areas that have high habitat suitability (great then 20%) for more than 50 species or life stages (results in most waters shallower than 200 m being closed to bottom trawling)		X						X
Close Areas of Interest								
C.7.1 close certain HAPC areas (Alt. B.7 areas) to bottom trawling		X				X (cowcod closure area)		X
C.7.2. close certain HAPC areas (Alt. B.7) to all bottom contacting fisheries	X	X			X (cowcod closure)	X (cowcod closure)		X

Principles → **Fishing Impact Minimization Alternatives↓**	Provides on-going protection of sensitive or special habitats from gear with bottom contact		Areas with little disturbance remain undisturbed (limits expansion of fisheries)		Utilizes existing closed or unfished areas		Considers prey base (other food chain interactions?)	Implementation to begin near-term
	all bottom contacting gear	all bottom trawl gear	all bottom contacting gear	all bottom trawl gear	all bottom contacting gear	all bottom trawl gear		
Zoning Fishing Activities								
C.8.1. Fishing zones established for bottom tending mobile gear within 5 years where research shows unavoidable impacts would be minimal and temporary; no fishing outside 2000 m contour immediately		?		X (outside of 2000 m only)		?		outside of 2000 m only
C.8.2 Fishing zones established for all bottom contacting gears within 5 years where research shows unavoidable impacts would be minimal and temporary; no fishing outside 2000 m for all bottom contacting gear immediately	?	?	X (outside of 2000 m only)	X (outside of 2000 m only)	?	?		outside of 2000 m only
Gear Restrictions in areas identified as EFH for groundfish								
C.9.1. prohibit roller gear larger than 15 inches								X
C.9.2. prohibit the use of flat trawl doors								X
C.9.3. Limit the length of a single longline groundline to 3 nm								X
C.9.4. employ habitat friendly anchoring								X
C.9.5. prohibit dredge gear	dredge gear only							X
C.9.6. prohibit beam trawl gear	beam trawl gear only							X
C.9.7. prohibit set gillnets beyond 60 fm	set net gear only							X
C.9.8. prohibit dingle bar gear	dingle bar							X

(troll groundfish gear)	gear only							
Principles → **Fishing Impact Minimization Alternatives↓**	Provides on-going protection of sensitive or special habitats from gear with bottom contact		Areas with little disturbance remain undisturbed (limits expansion of fisheries)		Utilizes existing closed or unfished areas		Considers prey base	Implementation to begin near-term
	All bottom contacting gear	all bottom trawl gear	all bottom contacting gear	all bottom trawl gear	all bottom contacting gear	all bottom trawl gear		
Central California No Trawl Zones								
C.10. buyout of 50% of groundfish trawl permits with corresponding bottom trawling closure		X		X		X		?
Relax Gear Endorsement Requirements								
C.11. allows permit holders to switch gear types; may benefit habitat if trawl gear fishermen switch to pot or trap gear								X
Close Ecologically Important Areas to Bottom Trawl Gear								
C.12. Alternative restricts bottom trawling to existing open areas, closes sensitive habitat areas and areas closed to trawling 2000-2003 (existing management closures), limits roller gear size, requires ongoing research and monitoring (Oceana alternative)		X		X		X		X
C.13. Same as C.12 but areas closed to all bottom-contacting gear	X	X	X	X	X	X		X
C.14 Same as C.12 but areas closed to all fishing	X	X	X	X	X	X		X

Agenda Item H.7.c
Public Comment
November 2005

Mendonoma Marine Life Conservancy

**P.O. Box 217
Manchester, CA 95459
(707) 882-2186**

September 30, 2005

Pacific Fisheries Management Council
7700 NE Ambassador Place, Suite 200
Portland, OR 97220-1384

Agenda Item H.7.c--Amendment 19
November 2, 2005

Ladies & Gentlemen,

The Mendonoma Marine Life Conservancy requests that the Council remove Section 7.3.1.6 and all other references to oil production platforms as a Habitat Areas of Particular Concern from Amendment 19 to the Pacific Coast Groundfish Fishery Management Plan.

The basis for our request is threefold:

• The data sets cited by CARE and other proponents in support of HAPC designation can be interpreted entirely differently with the same scientific level of confidence.

• The total "reef" area represented by California's production platforms is so small in relation to regional availability of hard bottom substrates that any regional impacts are likely to be small and possibly not even detectable empirically.

• PFMC designation of oil platforms as a HAPC interferes with, undermines, and weakens California's effort to enforce the decommissioning provisions of its contractual agreements with platform owners.

Interpretation of data:

Some of the research referenced by California Artificial Reef Enhancement consists of personal communications and proposals unavailable to us. Others (eg: OCS Studies MMS 2001-028 and 2003-032) are not available on the Minerals Management Service website, and MMS has not responded to our written request for these studies to date. However, to the best of our determination, these studies suffer from the same shortcoming as OSC Study MMS 2003-053, *Consequences of Alternative Decommissioning Options to Reef Fish Assemblages and Implications for Decommissioning Policy*. This study compares fish populations at six oil platforms and five natural reefs in Southern California from 1995 through 1997.

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The data sets in this study contrast fish populations at platforms and natural reefs in great detail; but the ambiguity of the data is burried inside two paragraphs in the middle of the 105-page study (pages 58 - 59):

Fishing effort is strong on the natural reefs we studied and the influence of this mortality on the age/size structure and density of targeted populations...may be pronounced as well. In contrast, very little, if any, recreational and live-fish fishing has been allowed for many years on the platforms we studied.

Thus, some of the differences we detected in population size structure, density and assemblage structure may simply reflect the effects of both recreational and commercial live-fish fishery, rather than differences between habitat types.

Indeed, if one adds a "fished" vs "unfished" element to the data sets presented in OSC Study MMS 2003-053, the resulting data catagorizations would be identical to the "reef" vs "platform" categorizations published in the study. Thus, the data used to demonstrate population differences between natural reefs and oil platforms can be interpreted with the same scientific level of confidence to show the results of fishing restrictions.

<u>Statistical Insignificance:</u>

In *Ecological Issues Related to Decommissioning of California's Offshore Production Platforms* (November 8, 2000), the University of California's Select Scientific Advisory Committee on Decommissioning noted (pages 35-36), *The total "reef" area represented by California's 27 platforms is extremely small in relation to regional availability of hard bottom substrates, suggesting that for the majority of species any regional impacts (whether positive or negative) of a decommissioning option are likely to be small and possibly not even detectable empirically.*

The Committee concludes its report (page 36), *Thus, in light of the lack of strong evidence of benefit and the relatively small contribution of platforms to reef habitat in the region, evaluation of decommissioning alternatives in our opinion should not be based on the assumption that platforms currently enhance marine resources.*

<u>Interference With California's Oil Contracts:</u>

Owners of the oil production platforms in California's waters are contractually obligated to completely remove each platform when it is decommissioned. This legal obligation was reconfirmed by the California Coastal Commission in 1999.

Subsequently there have been two attempts to pass legislation allowing platform owners to leave a portion of each decommissioned platform in place. In 2000 SB241 was defeated in the Legislature, and in 2001 SB1 was vetoed by Governor Davis.

MMLC

We have received oral verification from the CA Fish & Game Commission's Executive Director, Bob Treanor, and the CA Department of Fish & Game's legislative analyst, Julie Oltman, that there has been no change in State policy regarding production platform decommissioning since 2001. So, in granting HAPC status to oil platforms, PFMC is potentially upsetting the balance of negotiations between the State of California and platform owners, and is in fact acting in opposition to California's last stated position on platform decommissioning.

In summary, MMLC finds:

• the science upon which Alternative B.8 is based is subject to completely different interpretation,

• the relative area of platforms as a proportion of hard bottom habitat is too small to be of practical significance, and

• the designation of production platforms as a HAPC is in conflict with California's platform decommissioning policy.

We urge you to reconsider HAPC Alternative B.8 and to refrain from including it in any fishery management plan or environmental impact statement.

Thank you for the opportunity to comment.

Rob Cozens, Staff Conservator

STATE OF CALIFORNIA—THE RESOURCES AGENCY

ARNOLD SCHWARZENEGGER, GOVERNOR

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PFMC

October 6, 2005

Mr. Donald K. Hansen, Chairman
Pacific Fishery Management Council
7700 NE Ambassador Place, Suite 200
Portland, Oregon 97220-1384

Re: **Pacific Coast Groundfish Fishery Management Plan, Amendment 19: Designating Offshore Oil Platforms as Habitat Areas of Particular Concern.**

Dear Chairman Hansen and Council Members:

We appreciate the opportunity to comment on proposed Draft Amendment 19 to the Pacific Coast Groundfish Fishery Management Plan, scheduled for consideration at your November meeting. Due to staffing constraints, we are unable to comment on the proposed Fishery Management Plan as a whole, however we are particularly concerned about the proposed designation of thirteen oil platforms offshore California as "Habitat Areas of Particular Concern".

The California Coastal Commission has worked closely for many years with local, State and federal agencies and industry representatives on the potential conversion of platforms to artificial reefs ("rigs to reefs"). The Commission's involvement stems from its regulatory authority under the California Coastal Act and federal Coastal Zone Management Act over the installation and decommissioning and removal of platforms and associated structures located in State and federal waters.

We are familiar with the scientific community's research involving whether these structures constitute "habitat" with diverse and robust habitat values, whether they function to actually increase the regional abundance of fish populations, or whether they are primarily fish attractors. A study conducted in 2000 by an independent committee of University of California scientists[1] finds:

> Surveys of platforms in California waters reveal that they harbor rich assemblages of marine organisms, including many fishes and invertebrates that typically occur on natural rocky reef substrates… Despite the fact that platforms can harbor abundant marine life, it is the platform's contribution to regional stocks of species that is the crucial metric for

[1] Holbrook, Sally, et. al. *Ecological Issues Related to Decommissioning of California's Offshore Production Platforms.* Report to the University of California Marine Council by the Select Scientific Advisory Committee on Decommissioning. University of California. November 8, 2000.

> evaluating its ecological impact... At present there is not any sound scientific evidence (that the Committee is aware of) to support the idea that platforms enhance (or reduce) regional stocks of marine species. (p. 4)

Furthermore,

> ...[T]he 27 platforms represent a tiny fraction of the available hard substrate in the Southern California Bight, so their contribution to stocks of most reef organisms is likely to be small relative to the contribution from natural reefs. (p. 3)

In the absence of sound scientific evidence that platforms enhance regional stocks of marine species, Commission staff is strongly opposed to designating offshore oil platforms generally as "habitat." This designation should be reserved for natural reefs only, and for those artificial reefs whose contribution to enhancing marine species has been conclusively demonstrated.

We disagree with the Draft Environmental Impact Statement's assertion that the designation of oil platforms as Habitat Areas of Particular Concern will not convey higher regulatory standards.[2] Designating these platforms as Habitat Areas of Particular Concern will lead the oil industry, and potentially other resource agencies, to place a high priority on "protecting" all platforms, and provide support to the idea that those platforms should be abandoned in place. We oppose the view that it is good environmental policy to abandon in the ocean industrial refuse after the primary purpose of the structures has been served. Certainly, over time, these platforms have served some habitat purposes. However, to suggest, in the absence of convincing scientific evidence, that such purposes are somehow unique or particularly valuable is not warranted.

We respectfully request that the Council delete the section of Amendment 19 to the Fishery Management Plan that proposes to designate the thirteen offshore platforms as Habitat Areas of Particular Concern.

If you have any questions, please do not hesitate to contact me, or Alison Dettmer, manager of the Commission's Energy and Ocean Resources Unit at (415) 904-5200.

Sincerely,

PETER M. DOUGLAS
Executive Director

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[2] National Marine Fisheries Service. *Pacific Coast Groundfish Fishery Management Plan Essential Fish Habitat Designation and Minimization of Adverse Impacts, Draft Environmental Impact Statement*. National Marine Fisheries Service, Northwest Region. Seattle, WA. February 2005. pp. xi-xii.

Agenda Item H.7.c
Supplemental EC Report
November 2005

ENFORCEMENT CONSULTANTS REPORT ON AMENDMENT 19 (ESSENTIAL FISH HABITAT)

The Enforcement Consultants (EC) have reviewed and discussed Amendment 19 and draft essential fish habitat (EFH) regulations.

The EC has worked with National Marine Fisheries Service on the draft regulations and concentrated heavily on proposed definitions and how they relate to current definitions. Most of our suggestions have been incorporated into the latest draft.

We note the following slight difference still exist in Agenda Item H.7.a, Supplemental Attachment 3-Revised Draft EFH Regulations.

(6)(iii) <u>Bottom</u> Longline: The definition in this section is unchanged. Simply inserting "<u>bottom</u>" to the term being defined may have consequences. We are not sure the reason for the change.

(9)(ii) Midwater trawl. This definition has new language added: "…<u>on any part of the net or its component wires, ropes, and chains.</u>" The additional language appears to be redundant and we are not sure it is necessary.

660.306 Prohibitions: Replace section (12) with the following:

> Section (12) Fish within the EEZ in the Anacapa Island SMCA (as defined in 50 CFR 660.396), except for the following recreational fishing:
>
> Species: Lobster
> Gear: only by hand, or hoop net
>
> Species: Pelagic fin fish
> Gear: Hook and line with terminal gear not more than 6 ounces of weight

The last issue we have is found in the draft fishery management plan (FMP) on page 62 and continued to 63.

We see a very good description and discussion about EFH area identification. On page 63, a map shows these areas. The EC would hope that this would be sufficient in the plan and a series of thousands of coordinates describing these areas would not be necessary in regulation. We would expect any sub-areas with EFH restrictions would be described as done in the past where coordinates were used.

PFMC
11/02/05

Agenda Item H.7.c
Supplemental Public Comment 2
November 2005

CARE
California Artificial Reef Enhancement PROGRAM

October 25, 2005

Mr. Donald K. Hansen
Chairman
Pacific Fishery Management Council
7700 NE Ambassador Place, Suite 200
Portland, OR 97220-1384

Mr. D. Robert Lohn, Regional Administrator
c/o Maryann Nickerson
National Oceanic and Atmospheric Administration
7600 Sand Point Way, NE, Building 1
Seattle WA 98115-0700

Re: Comments on Draft Amendment 19 to the Pacific Coast Groundfish Fishery Management Plan and Supplemental Information Pertaining to the Environmental Impact Statement for Pacific Coast Groundfish Essential Fish Habitat

Dear Sirs:

This letter contains the comments of the California Artificial Reef Enhancement Program (CARE) on Draft Amendment 19 to the Pacific Coast Groundfish Fishery Management Plan (FMP). We are also sending these comments to NOAA Fisheries to provide supplemental information which we believe would be useful in preparation of the Final Environmental Impact Statement (FEIS) for Essential Fish Habitat for the FMP. This letter is intended to provide both agencies with updated information and a correction to the comments submitted in our letters of May 11 and 25, 2005 and our document of October 5, 2004.

Please contact me at (805) 320-8456 if you have any questions or would like any further information that CARE may be able to provide.

Sincerely,

George Steinbach

George Steinbach
Executive Director

Encs.

October 25, 2005

Comments and Supplemental Information Provided by CARE Pertaining to Fishery Management Plan Amendment 19 and the Environmental Impact Statement for Pacific Coast Groundfish EFH

Comment 1: CARE supports designation of oil platforms as HAPC

For the reasons explained in our previous submittals of October 5, 2004 and May 11 and 25, 2005, incorporated by reference herein, CARE concurs with the designation of thirteen oil platforms off the California coast as Habitat Areas of Particular Concern (HAPC) for fish managed under the Pacific Coast Groundfish Fishery Management Plan (FMP). We also concur with the procedure for designating new HAPCs as set forth in draft FMP Amendment 19.

Comment 2: California Coastal Commission comment on Amendment 19

The October 6, 2005 letter of the California Coastal Commission (CCC), commenting on Amendment 19, claims that there is no "sound" or "convincing" scientific evidence to support the designation of oil platforms as HAPC, and asserts that in the absence of such evidence, policy considerations dictate the removal of platforms once their primary purpose has been served. However, as discussed at length in CARE's comments on the DEIR dated May 11, 2005, and again in our comments on the selection of the preferred alternative dated May 25, 2005, extensive scientific evidence in support of the habitat value of the platforms has been accumulated through recent studies. The CCC appears to be unaware of this research. Instead, the CCC's letter relies solely on the outdated report of Holbrook et al. (2000), titled *Ecological Issues Related to Decommissioning of California's Offshore Production Platforms*. Our May 11 and 25 letters explain in detail how more recent research, expressly designed to fill in the data gaps identified by Holbrook et al., has subsequently addressed those concerns. Consistent with the requirement that EFH decisions must be based on "the best available scientific information" (50 CFR § 600.815(a)(1)(ii)), we believe that the CCC's concerns should be discounted for the following reasons:

- The CCC letter quotes Holbrook et al. as stating that there is no sound scientific evidence that the platforms enhance (or reduce) regional stocks of marine species. On the contrary, recent research demonstrates that, because platform reefs have more adults in higher densities than natural reefs, they produce a disproportionate share of larvae in the region; moreover, higher densities of young-of-the-year rockfishes are found at platform reefs (Love et al., 2003; Love 2005). Platform reefs also recruit larval fish that would otherwise have perished in the absence of the platform reef (Love 2005). Love et al. (2003) concluded that platform reefs are functionally more important than natural reefs as groundfish nurseries. As vividly illustrated by Appendix 4 in Love et al. (2003), the highest densities of a number of overfished rockfish species are observed at platforms rather than natural outcrops. (We previously submitted Love et al. (2003) but are attaching a copy of Appendix 4 for your convenience.) Some species and life stages (including young-of-the-year lingcod, painted greenling and copper rockfish) are observed exclusively at platforms. At Platform Gail in particular, which had the highest densities of mature bocaccio and cowcod of any natural or man-made habitat surveyed, Love (2005) estimated that for bocaccio one hectare of sea floor at that platform reef was equivalent to 68 hectares at an average natural reef, and for cowcod one platform reef hectare was equivalent to 26 hectares at an average natural reef.

- The CCC letter also quotes Holbrook et al. as stating that, because oil platforms represent a tiny fraction of available hard substrate in the Southern California Bight, their contribution to stocks is likely to be small relative to that of natural reefs. On the contrary, the higher densities of adult rockfishes found at platform reefs are so pronounced that, in some locations, platform reefs provide much or all of the adult fishes of some heavily fished species and thus contribute disproportionately to those species' larval production. (Love et al., 2003.) Love (2005) found that the number of juvenile bocaccio found around six platforms in the Santa Barbara Channel constituted 20 percent of the average number of juvenile bocaccio that survive in a year for the species' entire range. He determined that, when adults, these bocaccio will contribute about one percent of the additional amount of fish needed to rebuild the Pacific Coast population. Thus, the platforms clearly are contributing to fish stocks disproportionately relative to the fraction of hard substrate that they represent.

- At least one author of the Holbrook et al. study has acknowledged that subsequent research is addressing the data gaps reported by that study. In an article in the Los Angeles Daily News dated June 22, 2005 (attached), Professor Mark Carr of University of California – Santa Cruz stated: "It looks like that for those species that were studied, that rigs-to-reefs is a reasonable direction to go in. What's inspiring is that we [i.e., the Holbrook et al. authors] said, 'Here's what we know and what we need to know,' and now we're starting to get that information." In sum, it is inappropriate for CCC and other stakeholders to continue to rely on this outdated report, without even acknowledging the subsequent findings.

Comment 3: Mendonoma Marine Life Conservancy comment on Amendment 19

The September 30, 2005 letter of Mendonoma Marine Life Conservancy (MMLC), commenting on Amendment 19, also relies on the Holbrook et al. (2000) study to claim that eliminating the small area represented by platforms off California would have a negligible impact. As described above, the Holbrook et al. study is out of date on this and other points. Subsequent research has demonstrated that platform reefs to harbor dense groundfish populations that disproportionately contribute to fish stocks relative to their area. These results are statistically significant, as documented in the studies cited above (Love et al., 2003; Love 2005).

The MMLC also asserts that the scientific evidence supporting HAPC designation of platform reefs is "subject to completely different interpretation." However, the interpretation MMLC suggests is that the ecological value of platforms is a reflection of the protection of their fish populations from fishing pressure – which is not a different interpretation. As stated in CARE's May 11, 2005 comments, platform reefs off California are not currently heavily fished and, in fact, act as de facto marine refuges. This finding is acknowledged in the EFH DEIS and corroborated by Love et al. (2003) and by the 2003 U.S. Minerals Management Service study which MMLC cites. It is not clear why MMLC considers this a reason for not designating such de facto reserves as HAPC, now that high densities of overfished species have developed there. In fact, HAPC designation would likely help continue the protection of these populations against future exposure to fishing pressure.

Finally, MMLC asserts that oil platforms should not be designated as HAPC because platform owners may have contractual obligations requiring their removal, and the State of California does not have legislation or policy in place authorizing the conversion of decommissioned platforms to artificial reefs. However, under the EFH regulations, these are not appropriate considerations for the identification of HAPC. The only relevant issue is whether a suggested course of action conserves and enhances EFH and assists in the recovery of fish populations. HAPC designations must be based on four criteria set forth in 50 CFR § 600.815(a)(8): importance of the ecological function provided by the habitat; extent to which the habitat is sensitive to human-induced environmental degradation; whether, and to what extent, development activities are, or will be, stressing the habitat type; and rarity of the habitat type. In addition, EFH decisions must be based on "the best scientific information available" (50 CFR § 600.815(a)(1)(ii)(B). As described in our May 11, 2005 comments, platform reefs meet all of the HAPC criteria and their designation is supported by the best scientific information available.

Comment 4: EPA comment on the EFH DEIS

The United States Environmental Protection Agency (EPA) provided comments on the DEIS in a letter to NOAA Fisheries dated May 11, 2005. With regard to HAPC Alternative B.8, designating oil platforms as HAPC, EPA acknowledges that high concentrations of groundfish, including overfished species, have been observed in association with many oil platforms and recommends that the platforms remain in place at least until more information is available. This approach is consistent with the requirement to interpret information in EFH decisions "in a risk-averse fashion" (50 CFR § 600.815(a)(1)(iv)).

EPA goes on to express four concerns regarding the designation of platforms as HAPC. EPA cites no scientific evidence in support of any of its concerns. As discussed at length in CARE's comments on the DEIR dated May 11, 2005, each of these issues has been addressed by recent studies of which EPA appears to be unaware. Consistent with the requirement that EFH decisions must be based on "the best available scientific information" (50 CFR § 600.815(a)(1)(ii)), we believe that EPA's concerns should be discounted for the following reasons:

- EPA asserts that the platforms "may be attracting fish populations away from natural reefs." On the contrary, significant scientific evidence has accumulated regarding the important ecological function of the platform reefs. Specifically, evidence demonstrates that platform reefs are important habitat for rockfish and function just as natural reefs do, in that they both produce and attract fish depending on species, site, season and ocean conditions (Love et al., 2003).

- EPA asserts that that the platforms may be "exposing fish to mercury contamination." The U.S. Department of the Interior, Minerals Management Service (MMS), has extensively studied the issue of mercury contamination from drilling muds in the Gulf of Mexico. As the MMS states on its website: "While the issue of mercury in seafood in the Gulf of Mexico is the subject of an increasing amount of research particularly because of global and regional inputs, the results of research to date generally supports the conclusion that oil and gas platforms do not play a significant role in elevating levels of mercury in fish and other seafood." (See: http://www.gomr.mms.gov/homepg/regulate/environ/mercury.html).

- EPA asserts that the platforms may be "attracting predators resulting in a net loss to the fish populations…." On the contrary, available scientific evidence that suggests the predation of young fishes on platform reefs is probably lower than that on natural outcrops (Love et al., 2003). Other natural predators, such as pinnipeds, do not appear to be attracted to platform reefs (Love 2005, personal communication).

- EPA asserts that the platforms may be "increasing fishing effort in the area." As the DEIS acknowledges, and as corroborated by Love et al. (2003) and EPA (2000), platform reefs are not currently heavily fished and, in fact, act as de facto marine refuges.

Comment 5: Correction regarding characterization of mercury species

In CARE's May 11, 2005 letter, we discussed the findings of two scientific reports that addressed whether increased levels of methyl mercury ("MeHg"), which is the bioavailable form of mercury, were associated with oil and gas drilling platforms. We wish to clarify and correct the discussion of those results in our letter.

- First, we cited Trefry, et al. (2002) as concluding that elevated levels of MeHg around oil and gas platforms are not widespread in the Gulf of Mexico. Rather, Trefry, et al. (2002) concluded that, while total mercury levels (all forms, including inorganic mercury species which are not bioavailable) were elevated near platforms, MeHg levels were not elevated. Thus, the bioavailable form of mercury is not merely not widespread – it is simply not present at elevated levels.

- Second, we cited Creselius et al. (2002) as concluding that, while high levels of total mercury around oil and gas drilling sites are correlated with the drilling mud weighting agent barite, the increase in MeHg at or adjacent to oil and gas drilling sites is not directly attributable to mercury introduced with barite. Again, the increase in mercury reported at or adjacent to drilling sites represents levels of total mercury, including inorganic species. The results of Creselius et al. (2002) demonstrate that, while increased levels of total mercury has been seen adjacent to oil and gas drilling sites, there is no evidence suggesting that MeHg levels near platforms are elevated or that the conditions near platforms are suitable for converting inorganic mercury to MeHg.

Comment 6: Pending publication of recent studies.

Two scientific studies by Dr. Milton Love's team, that were cited in our May 11, 2005 letter, have been accepted in the following publication: *Comparing Potential Larval Production of Bocaccio* (Sebastes paucispinis) *and Cowcod* (Sebastes levis) *around Oil Platforms and Natural Outcrops off California*, in the Bulletin of Marine Science; and *Do Oil and Gas Platforms off California Affect the Fate of Recruiting Bocaccio* (Sebastes paucispinis)? *An Analysis Based on High Frequency Derived Surface Trajectories*, in the Fishery Bulletin. In our May 11 letter, we discussed the preliminary conclusions of these two studies, which were contained in Love (2005), a document we attached to our May 11 letter. Copies of the published studies will be provided when they are available, probably in November.

References:

Becher, B. 2005. The future of offshore rigs? Debate rages on the structures, which double as fish sanctuaries. Los Angeles Daily News, June 22, 2005. (Attached.)

Creselius, E., L. Marshall Jr., W. Schroeder, D. Stephenson-Hawk. 2002. Mercury in the Gulf of Mexico: The Role of Outer Continental Shelf Oil and Gas Activities. Department of Interior, Minerals Management Service, Outer Continental Shelf Scientific Committee, Subcommittee on Mercury in the Gulf of Mexico. (Attached as Exhibit 12 to CARE's May 11, 2005 comments.)

Holbrook, S.J., et al. 2000. Ecological Issues Related to Decommissioning of California's Offshore Production Platforms. Report to the University of California Marine Council by the Select Scientific Advisory Committee on Decommissioning.

Love, M.S. 2005. The ecological role of natural reefs and oil and gas production platforms on rocky reef fishes in southern California. Summary of research and project proposal. Santa Barbara, California. (Attached as Exhibit 5 to CARE's May 11, 2005 comments.)

Love, M.S. 2005. Comparing Potential Larval Production of Bocaccio (*Sebastes paucispinis*) and Cowcod (*Sebastes levis*) around Oil Platforms and Natural Outcrops off California. Bulletin of Marine Science. In press.

Love, M.S. 2005. Do Oil and Gas Platforms off California Affect the Fate of Recruiting Bocaccio (*Sebastes paucispinis*)? An Analysis Based on High Frequency Derived Surface Trajectories. Fishery Bulletin. In press.

Love, M. S., D. Schroeder and M. Nishimoto. 2003. The ecological role of oil and gas platforms and natural outcrops on fishes in southern and central California: a synthesis of information. U. S. Department of the Interior, U. S. Geological Survey, Biological Resources Division, Seattle, Washington. OCS Study MMS 2003-032. (Attached as Exhibit 4 to CARE's May 11, 2005 comments.)

Trefry, J. H., R. Trocine, M. McElvaine, R. Rember. 2002. Concentrations of total mercury and methyl mercury in sediment adjacent to offshore drilling sites in the Gulf of Mexico. Final Report to the Synthetic Based Muds (SBM) Research Group. Florida Institute of Technology. (Attached as Exhibit 11 to CARE's May 11, 2005 comments.)

U.S. Environmental Protection Agency. 2000. Essential fish habitat assessment for NPDES Permit No. CA 2800000. (Prepared by Science Applications International Corporation). (Attached as Exhibit 9 to CARE's May 11, 2005 comments.)

Los Angeles Daily News

The future of offshore rigs? Debate rages on the structures, which double as fish sanctuaries

By Bill Becher
Special to the Daily News

Wednesday, June 22, 2005 - LONG BEACH - The ugly, rust-streaked steel structure rises out of the sea like a shipwreck. Platform Gail -- 10 miles off the Southern California coast -- was built to pump oil from beneath the seabed, not as a fish refuge.

Don't tell Tom Raftican that. When Raftican slides beneath the Pacific swell in his scuba gear, he sees a viable ecosystem where the rig's underwater supports are. Marine animals have covered the supports so completely, it's difficult to tell it's not a natural reef, even from up close. Mussels, sea urchins, barnacles, tubeworms and other invertebrates cling to the steel legs of the oil rig as garibaldi and rockfish hover nearby. According to UC Santa Barbara marine biologist Milton Love, Platform Gail has a higher density of cowcod and bocaccio rockfish than anywhere else in Southern California. The near extinction of these critically depleted species has prompted recent restrictions on fishing for rockfish.

Raftican, president of United Anglers of Southern California, a sportfishing advocacy group, likes what he sees at Platform Gail and doesn't want to see it disturbed anytime soon. Raftican's wish might be only that, a wish. As offshore oil rigs in Southern California reach the end of their useful lives, there is an intense debate raging over whether to remove the rigs entirely, as is required under current law, or to dismantle the upper structure and leave the underwater supports as fish sanctuaries.

That idea was approved by California's legislature in 2001 in a "Rigs-to-Reefs" bill but was vetoed by governor Gray Davis after strong lobbying from environmental groups. In the Gulf Coast, offshore oil rigs have been converted to artificial reefs, and the program has been considered a success by fish and game officials in Florida and Texas. Oil companies would clearly benefit by saving the cost of completely removing the rigs and have offered to give one-half of the savings to marine research and conservation. That could amount to a $500 million donation, according to one study.

Linda Krop of the Environmental Defense Center in Santa Barbara, which helped defeat the California legislation, says that leaving the rigs off California's coast would create pollution and navigational hazards. She also claims there is no scientific evidence to support the claims that the rigs would help restore ocean fisheries. Krop also said that the Gulf Coast differs in that most of the rigs in that area are moved to appropriate places and are located in shallower water than in California, where rigs were erected in the best places for oil, not fish. Krop cites a 2000 report by a blue-ribbon panel of oceanic researchers that recommended against the Rigs-to-Reefs program until more research can be done.

Mark Carr, a professor at UC Santa Cruz -- and member of the panel that conducted the study -- said new findings suggest that oil rigs are good habitats for some species of rockfish. "It looks like that for those species that were studied, that rigs-to-reefs is a reasonable direction to go in," Carr said. "What's inspiring is that we said, 'Here's what we know and what we need to know,' and now we're starting to get that information."

Carr said artificial reefs would be most beneficial in southern areas of the Southern California Bight, which lack the natural reefs of the Channel Islands.

California Artificial Reef Enhancement is asking the federal government to support California's Rigs-to-Reefs program. The organization, supported by Chevron, Texaco and United Anglers, has helped fund research on the topic.

Surveys of several oil rigs from central California to Long Beach in 1995-2001 found that rigs that were converted to reefs provided habitat for rockfish that was equal to or better than natural reefs and acted as nursery grounds for some fish that would otherwise not survive, including bocaccio.

Valerie Chambers, an official with NOAA Fisheries, said her agency would like to evaluate the effects of oil platforms on depleted rockfish populations as well as the impacts of removing oil rigs.

"Removing the platforms will stir up toxic sediment and eliminate a lot of fish and invertebrates," said Chambers. "But we shouldn't just allow people to leave all their junk on the sea bottom."

Time is running out on many rigs' offshore oil leases, so a decision on whether to leave the structures as fish habitats or remove them completely will be coming in the next few years.

Bill Becher covers the outdoors for the Daily News. He can be reached at billbecher@yahoo.com

APPENDIX 4

Densities, at the top 20 sites, of some of the most abundant species in our deepwater surveys. Platforms are listed in blue, natural outcrops in red.

Species	Site	Year	Habitat Type	Density(Fish per 100 m^2)
Lingcod (adult)	Hidalgo	1996	Bottom	3.2
	Irene	1997	Bottom	1.7
	Irene	1997	Shell Mound	1.5
	Hermosa	1996	Bottom	1.0
	Footprint	2001	Natural	1.0
	Hermosa	1997	Bottom	0.9
	Reef "A"	1997	Natural	0.8
	Reef "A"	1998	Natural	0.7
	Hermosa	1999	Bottom	0.7
	Gail	2001	Bottom	0.7
	Santa Monica Bay	2001	Natural	0.7
	Santa Cruz I.	2000	Natural	0.6
	Santa Monica Bay	2001	Natural	0.5
	Hermosa	2000	Bottom	0.5
	Gail	1996	Bottom	0.5
	Gail	1997	Bottom	0.5
	Gail	1999	Bottom	0.5
	GAIL	2000	Bottom	0.5
	Irene	1998	Bottom	0.5
	Irene	2000	Bottom	0.5
	Irene	2001	Bottom	0.5
Lingcod (juvenile)	Irene	1996	Bottom	18.8
	Holly	1999	Bottom	6.1
	Grace	2000	Shell Mound	5.4
	Grace	2001	Platform pipe	4.6
	14 Mile Bank	2001	Natural	4.5
	Grace	2000	Bottom	3.8
	Hidalgo	1999	Shell mound	3.6
	Platform "C"	2000	Shell mound	3.4
	Grace	2001	Shell mound	3.2
	Irene	2001	Bottom	2.7
	Hidalgo	1997	Bottom	2.7
	Grace	1999	Shell Mound	2.3
	Harvest	2000	Bottom	2.2
	Grace	2001	Bottom	2.2
	Irene	1999	Bottom	2.2
	Hidalgo	2000	Bottom	2.1
	Harvest	1999	Bottom	1.9
	More Mesa	1995	Natural	1.9
	Irene	1997	Shell Mound	1.9
	12 Mile Reef	2000	Natural	1.8
Lingcod YOY	Irene	1998	Shell Mound	31.5
	Irene	2001	Shell Mound	29.2
	Irene	2001	Bottom	24.1
	Irene	1998	Bottom	19.6
	Irene	1996	Bottom	17.9
	Irene	2000	Shell Mound	12.0
	Irene	1997	Shell Mound	10.9
	Irene	2000	Bottom	10.6

Species	Site	Year	Habitat Type	Density(Fish per 100 m^2)
Lingcod YOY (cont.)	Irene	1999	Shell Mound	9.7
	Irene	1999	Bottom	7.5
	Hidalgo	1999	Shell Mound	4.6
	Hidalgo	2000	Shell Mound	4.3
	Hidalgo	2000	Bottom	3.0
	Irene	1997	Bottom	2.9
	Hidalgo	2001	Shell Mound	2.6
	Hidalgo	1998	Shell Mound	1.9
	Hidalgo	1997	Shell Mound	1.8
	Grace	1999	Shell Mound	1.2
	Hidalgo	1998	Bottom	1.1
	Hidalgo	1999	Bottom	1.1
Painted greenling	Holly	1998	Midwater	18.0
	Harvest	1999	Midwater	9.9
	Harvest	1997	Midwater	9.9
	Holly	2001	Midwater	8.2
	Hermosa	1997	Midwater	8.1
	Irene	1997	Bottom	8.0
	Hermosa	1998	Midwater	6.9
	Hermosa	1999	Midwater	5.5
	Houchin	2000	Midwater	5.3
	Irene	1997	Shell Mound	5.3
	Irene	2000	Shell Mound	5.1
	Irene	1996	Bottom	4.8
	Harvest	1999	Midwater	4.7
	Holly	1998	Shell Mound	4.6
	Irene	2000	Bottom	4.6
	Irene	2000	Midwater	4.5
	Platform "C"	2000	Shell Mound	4.4
	Hermosa	2000	Midwater	4.4
	Irene	2001	Bottom	4.4
	Hidalgo	2000	Midwater	4.2
Greenspotted rockfish	Hermosa	1996	Bottom	30.3
	Hidalgo	2000	Bottom	21.8
	Gail	1996	Bottom	21.3
	Hidalgo	1996	Bottom	20.6
	Hidalgo	1999	Bottom	19.9
	Hidalgo	1998	Bottom	19.1
	Hidalgo	1997	Bottom	17.6
	Hidalgo	2001	Bottom	12.1
	Gail	1997	Bottom	10.8
	Hermosa	1997	Bottom	10.6
	North Reef	1997	Natural	9.8
	Gail	2000	Bottom	9.3
	Hermosa	1998	Bottom	9.1
	Hermosa	2000	Bottom	5.8
	Reef "A"	1997	Natural	5.0
	North Reef	1998	Natural	5.0
	Reef "C"	1999	Natural	4.9

Species	Site	Year	Habitat Type	Density(Fish per 100 m^2)
Greenspotted rockfish (cont.)	Reef "A"	2000	Natural	4.8
	Hermosa	1999	Bottom	4.3
	Grace	1996	Bottom	4.0
Copper rockfish	Irene	2000	Bottom	88.5
	Irene	1996	Bottom	71.6
	Irene	1997	Bottom	53.6
	Irene	2001	Bottom	40.8
	Irene	2000	Shell Mound	27.1
	Holly	1997	Bottom	21.8
	Holly	1999	Bottom	21.5
	Irene	1999	Bottom	21.5
	Holly	1998	Shell Mound	12.0
	Holly	1996	Bottom	11.4
	Irene	2001	Shell Mound	10.4
	Irene	1998	Bottom	10.4
	Holly	1997	Shell Mound	9.3
	Holly	2001	Bottom	8.4
	Platform "C"	2000	Shell Mound	7.3
	Irene	1997	Shell Mound	5.2
	Irene	1999	Shell Mound	4.5
	Holly	1998	Bottom	4.4
	Irene	2001	Midwater	3.9
	Irene	2000	Midwater	3.7
Swordspine rockfish	14 Mile Bank	1996	Natural	94.4
	14 Mile Bank	1996	Natural	47.4
	14 Mile Bank	2001	Natural	45.8
	Footprint	2000	Natural	41.0
	Footprint	2000	Natural	39.6
	Footprint	1999	Natural	29.7
	Osborn Bank	2000	Natural	27.5
	Footprint	2001	Natural	24.9
	Catalina I.	1996	Natural	22.4
	Santa Monica Bay	2001	Natural	21.9
	Tanner Bank	1997	Natural	20.1
	Footprint	2000	Natural	20.1
	Santa Barbara I.	2000	Natural	18.3
	Footprint	2001	Natural	15.3
	Footprint	2000	Natural	14.2
	Cortes Bank	1997	Natural	12.8
	Santa Monica Bay	1998	Natural	10.6
	Footprint	2001	Natural	9.9
	Footprint	2000	Natural	8.3
	Footprint	1999	Natural	8.2
Greenstriped rockfish	Harvest	2000	Bottom	14.7
	Harvest	1999	Bottom	9.2
	Gail	2000	Bottom	7.5
	Harvest	1997	Shell Mound	7.1
	Harvest	1997	Shell Mound	6.1
	Harvest	2000	Shell Mound	5.9

Species	Site	Year	Habitat Type	Density(Fish per 100 m^2)
Greenstriped rockfish (cont.)	Harvest	1998	Bottom	5.2
	Harvest	1999	Shell Mound	4.3
	Harvest	1997	Bottom	3.6
	Harvest	1998	Shell Mound	3.5
	Hidalgo	1998	Bottom	3.4
	Hidalgo	2000	Bottom	3.4
	Reef "A"	2000	Natural	3.3
	Gail	1997	Shell Mound	2.6
	Reef "A"	1997	Natural	2.5
	Gail	1999	Shell Mound	2.4
	Hidalgo	2001	Bottom	2.3
	Gail	2000	Shell Mound	2.2
	Santa Rosa Passage	1995	Natural	2.2
	Hidalgo	1998	Shell Mound	2.1
Widow rockfish (YOY)	Irene	1998	Midwater	344.0
	Irene	1996	Midwater	253.3
	Holly	1999	Bottom	252.9
	Harvest	1999	Midwater	188.9
	Grace	2000	Midwater	175.7
	Irene	1997	Midwater	173.6
	San Nicholas I.	1996	Natural	173.5
	Catalina I.	1996	Natural	116.8
	Irene	1998	Bottom	79.1
	Grace	2001	Midwater	73.8
	San Nicolas I.	1996	Natural	68.1
	Grace	1997	Bottom	66.3
	Cortes Bank	1997	Natural	66.0
	Santa Cruz I.	2000	Natural	65.4
	North Reef	1999	Natural	63.6
	Hidalgo	1998	Midwater	52.9
	Footprint	1995	Natural	45.9
	Hermosa	2000	Midwater	44.4
	Footprint	2001	Natural	40.3
	Grace	1999	Midwater	39.6
Squarespot rockfish	Santa Cruz I.	2000	Natural	282.5
	Santa Barbara I.	2000	Natural	263.0
	Santa Monica Bay	1998	Natural	196.4
	Harvest	1999	Midwater	180.0
	Cortes Bank	1997	Natural	149.6
	Grace	2001	Midwater	130.6
	San Miguel I.	1995	Natural	122.1
	Footprint	1998	Natural	94.6
	San Nicolas I.	1996	Natural	93.9
	Anacapa Passage	1999	Natural	88.8
	Santa Monica Bay	1998	Natural	85.0
	Hidden Reef	1999	Natural	72.6
	San Nicolas I.	1996	Natural	69.7
	Guano Bank	1995	Natural	69.6
	Footprint	2000	Natural	61.8

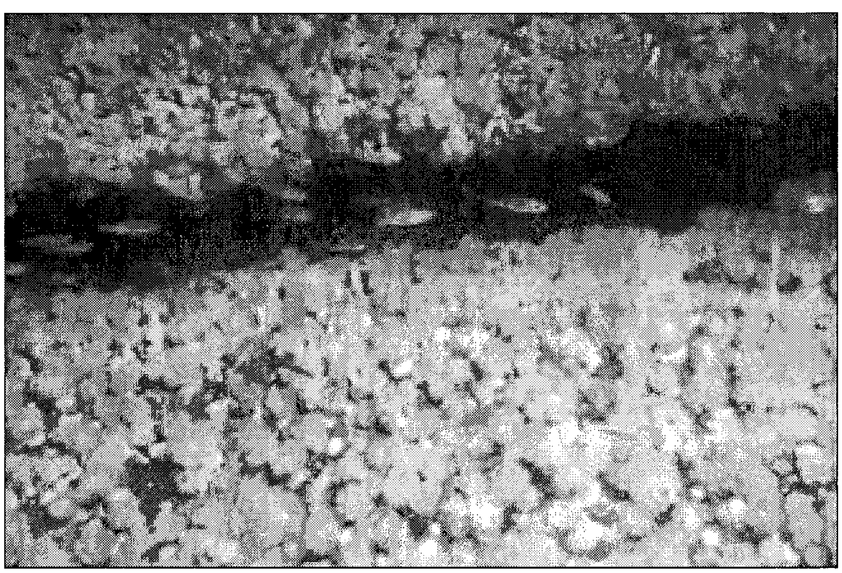
Species	Site	Year	Habitat Type	Density(Fish per 100 m^2)
Squarespot rockfish (cont.)	Osborn Bank	2000	Natural	54.9
	Osborn Bank	2000	Natural	51.9
	Anacapa Passage	1995	Natural	50.5
	Santa Monica Bay	2001	Natural	44.3
	Santa Rosa I.	1995	Natural	43.4
Vermilion rockfish	Platform "C"	2000	Shell Mound	74.5
	Holly	2001	Bottom	58.1
	Irene	2000	Bottom	55.2
	Irene	1996	Bottom	47.8
	Irene	1997	Bottom	32.8
	Grace	2001	Platform pipe	30.8
	Irene	1999	Bottom	30.4
	Anacapa Passage	1995	Natural	30.1
	Grace	2001	Bottom	29.9
	Holly	1999	Bottom	23.8
	Holly	1996	Bottom	22.0
	Irene	2001	Bottom	14.0
	Irene	1998	Bottom	12.5
	Holly	2001	Shell Mound	11.9
	Irene	2000	Shell Mound	10.6
	Grace	2001	Bottom	8.8
	Holly	1998	Shell Mound	8.3
	Irene	2001	Shell Mound	6.1
	Santa Cruz I.	2000	Natural	5.2
	Holly	1997	Bottom	4.5
Bocaccio (adult)	Gail	1997	Bottom	18.2
	Gail	1999	Bottom	11.0
	Gail	1996	Bottom	10.8
	Gail	2000	Bottom	6.2
	Gail	2001	Bottom	3.5
	Hidalgo	2001	Bottom	3.0
	Hidalgo	1996	Bottom	2.7
	Reef "A"	1997	Natural	1.9
	Reef "D"	1999	Natural	1.6
	Hidalgo	1997	Bottom	1.3
	Santa Rosa Passage	1995	Natural	1.2
	Footprint	1995	Natural	1.1
	Hidalgo	1998	Bottom	0.9
	Footprint	2001	Natural	0.9
	Footprint	2001	Natural	0.9
	Footprint	2000	Natural	0.8
	Footprint	2000	Natural	0.7
	Catalina I.	1996	Natural	0.6
	Footprint	1999	Natural	0.6
	San Nicolas I.	1996	Natural	0.6
Bocaccio (juvenile)	Grace	2000	Bottom	39.6
	Grace	2000	Midwater	13.0
	Santa Cruz I.	2000	Natural	5.6
	14 Mile Bank	2001	Natural	5.1

Species	Site	Year	Habitat Type	Density(Fish per 100 m^2)
Bocaccio (juvenile)	Santa Barbara I.	2000	Natural	2.5
(cont.)	Santa Monica Bay	2001	Natural	2.4
	Gail	2001	Bottom	2.3
	Osborn Bank	2000	Natural	2.3
	12 Mile Reef	2000	Natural	2.0
	Gail	2000	Bottom	1.8
	Footprint	2000	Natural	1.2
	Grace	2001	Platform pipe	0.9
	Reef"A"	1997	Natural	0.9
	Footprint	2000	Natural	0.8
	Hidalgo	2000	Bottom	0.8
	Gail	1997	Bottom	0.7
	Footprint	2000	Natural	0.6
	Grace	2000	Shell Mound	0.6
	Hidalgo	1996	Bottom	0.6
	Hidalgo	2001	Bottom	0.6
Bocaccio (YOY)	Irene	1999	Midwater	166.4
	Irene	1996	Midwater	91.8
	Grace	1999	Bottom	44.9
	Grace	1999	Midwater	24.1
	Irene	1997	Midwater	17.2
	Grace	1999	Shell Mound	15.9
	Hidalgo	1996	Midwater	5.6
	Harvest	1999	Midwater	4.0
	Grace	2001	Midwater	3.0
	Hidden Reef	1999	Natural	2.3
	Irene	1999	Bottom	2.2
	Grace	2001	Midwater	1.5
	Harvest	1999	Midwater	1.3
	Santa Barbara I.	1996	Natural	1.3
	Irene	1997	Bottom	1.2
	Harvest	1997	Midwater	1.1
	Grace	2000	Midwater	1.0
	Hidalgo	1997	Midwater	0.9
	Santa Monica Bay	2001	Natural	0.9
	Hidalgo	2000	Bottom	0.8
Canary rockfish	Irene	2001	Bottom	5.5
	Holly	2001	Bottom	3.4
	Hidalgo	1999	Bottom	1.9
	Holly	2001	Shell Mound	1.7
	Hidalgo	1998	Bottom	1.7
	North Reef	1999	Natural	1.7
	Reef "D"	1999	Natural	1.6
	Hidalgo	1996	Bottom	1.3
	Reef "A"	1999	Natural	1.2
	Irene	1997	Bottom	1.2
	Reef "B"	1997	Natural	1.1
	Hidalgo	1997	Bottom	0.9
	Hidalgo	2001	Bottom	0.9

Species	Site	Year	Habitat Type	Density(Fish per 100 m^2)
	Grace	2000	Bottom	0.9
	Holly	1996	Bottom	0.8
	North Reef	2000	Natural	0.7
	Reef "C"	1998	Natural	0.7
	Irene	2001	Shell Mound	0.7
	Reef "A"	1998	Natural	0.5
	Grace	1998	Shell Mound	0.5
Greenblotched rockfish	Gail	1997	Bottom	17.7
	Gail	1999	Bottom	13.7
	Gail	2001	Bottom	11.3
	Hidalgo	2001	Bottom	10.6
	Gail	1996	Bottom	9.7
	Gail	2000	Bottom	9.2
	Gail	1997	Shell Mound	5.9
	Harvest	1999	Bottom	4.6
	Harvest	1998	Bottom	3.8
	Gail	1999	Shell Mound	3.3
	Harvest	1997	Bottom	1.6
	San Miguel I.	1995	Natural	1.4
	Hidalgo	1999	Bottom	1.3
	North Reef	1997	Natural	1.0
	Footprint	2001	Natural	1.0
	Reef "A"	1999	Natural	0.9
	Reef "B"	1997	Natural	0.8
	Hidalgo	2000	Bottom	0.8
	North Reef	2001	Natural	0.7
	Gail	2001	Shell Mound	0.7
Flag rockfish	Hidalgo	1997	Bottom	15.5
	Hidalgo	1996	Bottom	11.0
	Hidalgo	1999	Bottom	7.2
	Grace	1996	Bottom	6.6
	Grace	2001	Bottom	5.7
	Hidalgo	1998	Bottom	5.5
	Hidalgo	2000	Bottom	5.1
	Grace	2000	Bottom	4.4
	Hidalgo	2001	Bottom	3.8
	Holly	2001	Bottom	3.1
	Grace	2001	Bottom	3.1
	Santa Barbara Point	1995	Natural	3.0
	Hermosa	1996	Bottom	2.7
	Grace	1999	Midwater	2.6
	Gail	1999	Midwater	2.5
	Hermosa	2000	Bottom	2.2
	Grace	2001	Shell Mound	2.2
	Santa Rosa Passage	1995	Natural	2.0
	Holly	1998	Shell Mound	1.8
	Holly	2001	Shell Mound	1.7

Species	Site	Year	Habitat Type	Density(Fish per 100 m^2)
Halfbanded rockfish	Hidalgo	2000	Bottom	907.1
	Grace	1997	Bottom	800.5
	Anacapa I.	1999	Natural	703.1
	Irene	1999	Bottom	621.2
	Irene	1998	Bottom	595.9
	Hidalgo	2000	Shell Mound	461.0
	Grace	1999	Shell Mound	415.1
	Hermosa	2000	Shell Mound	406.9
	Grace	2000	Bottom	405.2
	Hermosa	2000	Bottom	398.1
	Grace	1996	Bottom	395.1
	Hermosa	1997	Bottom	381.4
	Grace	1999	Bottom	344.2
	Hidalgo	2001	Bottom	318.4
	Hermosa	1999	Bottom	313.2
	E. End Anacapa I.	1995	Natural	284.9
	Hidalgo	1999	Bottom	275.8
	Grace	2001	Bottom	266.4
	Grace	2001	Shell Mound	259.1
	Grace	2001	Bottom	237.7
Pygmy rockfish	Hidden Reef	1999	Natural	263.7
	San Nicolas I.	1996	Natural	236.9
	Footprint	2001	Natural	125.7
	Cortes Bank	1997	Natural	119.7
	North Reef	2000	Natural	93.8
	Santa Monica Bay	1998	Natural	93.7
	San Miguel I.	1995	Natural	87.3
	Santa Monica Bay	2001	Natural	84.1
	Cortes Bank	1997	Natural	76.7
	Footprint	2000	Natural	72.2
	Santa Cruz I.	2000	Natural	71.9
	Osborn Bank	2000	Natural	71.2
	San Nicolas I.	1996	Natural	64.6
	14 Mile Bank	2001	Natural	64.5
	San Nicolas I.	1996	Natural	64.2
	Santa Rosa I.	1995	Natural	60.6
	Footprint	2000	Natural	54.6
	Reef "D"	1999	Natural	47.0
	Footprint	1999	Natural	42.3
	Santa Monica Bay	2001	Natural	38.3
Pink seaperch	Santa Monica Bay	1998	Natural	304.5
	Grace	1998	Shell Mound	39.2
	Holly	1998	Shell Mound	11.1
	Holly	1999	Bottom	9.1
	Catalina I.	1996	Natural	4.0
	Grace	1997	Shell Mound	2.9
	Grace	1997	Bottom	2.7
	Holly	1996	Bottom	1.8

Species	Site	Year	Habitat Type	Density(Fish per 100 m^2)
Pink seaperch (cont.	Reef "D"	1999	Natural	1.7
	Santa Monica Bay	1997	Natural	1.3
	Holly	1997	Bottom	1.3
	Catalina I.	1996	Natural	1.2
	Holly	1997	Shell Mound	1.2
	Santa Monica Bay	1997	Natural	1.2
	Santa Rosa I.	1995	Natural	1.2
	Grace	2000	Bottom	1.1
	Grace	2001	Platform pipe	1.0
	Reef"A"	1997	Natural	0.9
	Santa Cruz I.	1996	Natural	0.8
	North Reef	1998	Natural	0.8
Yellowtail rockfish (adult)	Reef "B"	1995	Natural	3.9
	San Miguel I.	1995	Natural	3.5
	North Reef	1996	Natural	2.8
	North Reef	1995	Natural	2.1
	Santa Rosa I.	1995	Natural	2.1
	San Miguel I.	1995	Natural	1.9
	San Miguel I.	1995	Natural	1.7
	Reef "D"	1999	Natural	1.6
	North Reef	2000	Natural	1.5
	Reef "A"	2000	Natural	1.0
	San Miguel I.	1995	Natural	0.7
	Reef "A"	1998	Natural	0.7
	Reef "B"	1997	Natural	0.5
	North Reef	1999	Natural	0.5
	Santa Rosa I.	1995	Natural	0.4
	Reef "A"	1997	Natural	0.3
	North Reef	1997	Natural	0.3
	Santa Rosa I.	1995	Natural	0.2
	North Reef	1998	Natural	0.2


LOVELAB UC, SANTA BARBARA

Young-of-the-year rockfish in the platform midwater.

I attended one of the first industry workshops dealing with EFH areas being considered on the Oregon coast. I was told early on that the shrimp fleet didn't need to worry about the EFH areas being developed for several reasons. One was that the areas were only going to be closed to bottom trawl drag gear, and two the areas were going to be placed where the shrimp fleet doesn't fish.

The process was well under way before the shrimp fleet found out that shrimp trawl gear was included in the gear banned for use in an EFH area. Fortunately, 99% of the EFH area proposed is area where shrimp trawling does not occur. If the shrimp fleet had been involved from the very beginning, it would have been easy to make the entire EFH area completely off of the shrimp grounds.

It is truly a shame that we could be faced with a man made line in an area that has been productive shrimp ground for 30 years. And if a shrimp fisherman happens to cross over that line on one tow for one minute, he has committed a crime. Even more ironic than that is the language written into the rule that would allow a Native American to tow a drag net all day long through an EFH on their historical fishing grounds.

I compare towing a shrimp net through mud to a farmer tilling the ground. The shrimp doors and foot rope stir up nutrients from the mud that enables the entire marine environment to thrive and be reproductive. The result has been 30 years of towing the same mud bottom and seeing healthy shrimp and fish stocks thrive in these areas year after year.

In conclusion I urge the council to make sure that these EFH areas are drawn on the bottom that needs to be protected – the hard bottom areas with deep water coral necessary for sustaining certain juvenile fish species . These hard bottom areas are already inaccessible by shrimp gear, and would eliminate the need for enforcement. Do not create an environment that makes criminals out of hard working shrimp fishermen that are struggling to survive under the current pressure of a fading industry.

Respectfully,

Brian Petersen
Shrimp Producers Marketing Association

DRAFT

October 7, 2005

Mr. Robert Lohn, Regional Administrator
National Marine Fisheries Service, Northwest Region
7600 Sand Point Way NE, Bin C15700
Seattle, WA 98115

Dear Mr. Lohn:

Enclosed is a joint Oregon Department of Fish and Wildlife, Washington Department of Fish and Wildlife, and California Department of Fish Game application for an exempted fishing permit (EFP) for your review and approval. The EFP is requested to allow legal retention, delivery and temporary possession of incidentally caught Pacific salmon and Pacific halibut in the shoreside Pacific hake fishery, and to allow for overages of other groundfish species caught while target fishing for hake. Accurate enumeration of the target and incidental catch in this fishery continues to be needed. In each year, 100% of the landed catch is weighed at processing plants. In addition, the minimum observation rate of 10% of all trips was easily achieved with such observations being conducted shoreside, with the added assurance of video monitoring for compliance with maximum retention requirements while at-sea. We also included collection of biological data for bycatch of key groundfish species. Participating processors allowed us to achieve a 100% observation rate for salmon and halibut bycatch by setting aside all salmon and halibut encountered during offloads, regardless of whether the landing was observed or not. An EFP for the shoreside sector of the Pacific hake fishery continues to be the only means available to allow full retention and to estimate the bycatch of prohibited species and groundfish while permanent regulatory language is developed.

Under EFP program, permitted vessels would be required not to sort their catch at-sea so that the entire catch can be sampled at landing. Shoreside observers enumerate prohibited species and groundfish bycatch for 10% to 15% (ranges from 10%-100% by processor) of all shoreside deliveries, and also collect biological information on hake and bycatch species. An allowance for overages of groundfish catch continues to be needed for calculating the groundfish bycatch rate and to facilitate collection of valuable biological data (age, sex, weight, and length) for bycatch groundfish species (e.g. sablefish, yellowtail rockfish, and widow rockfish). These biological samples will be used to support stock assessment work. The shoreside hake industry, in cooperation with state fishery managers, has dramatically reduced the bycatch rates for rockfishes. This is in addition to new methods for predicting and reducing salmon and sablefish bycatch in this fishery. Any prohibited species and proceeds from groundfish overages will be forfeited to the state of landing.

DRAFT

We have not yet determined how many vessels will participate in the fishery next year, but we expect approximately 30 vessels.

As you are aware, the regulatory framework for the EFP program has undergone significant change in 2004 and 2005 with the addition of electronic monitoring for compliance with full retention, and the process of violations checks on participating vessel owner and operators to comply with the council process for issuing EFPs. In 2006 there may be additional requirements added to minimize bycatch and discard in the fishery, and to enhance observation rates and confidence in groundfish and salmon bycatch estimates for the fishery.

Sincerely,

Patricia M. Burke
Marine Resources Program Manager

Attachment

SHORESIDE WHITING FISHERY EXEMPTED FISHING PERMIT APPLICATION

1. Date of Application

October 7, 2005

2. Applicant Name(s)

Washington Department of Fish and Wildlife
48A Devonshire Road
Montesano, WA 98563-9618
Attention: Brian Culver (360)249-1205

Oregon Department of Fish and Wildlife
2040 SE Marine Science Drive
Newport, OR 97365-5294
Attention: Steve Parker (541) 867-4741

California Department of Fish and Game
411 Burgess Drive
Menlo Park, CA 94025-3488
Attention: Mike Fukushima (415) 581-7358

3. Purposes and Goals of the Proposed Experiment

The goal of the exempted fishery is to implement an observation program at the request of the Pacific Fishery Management Council to enumerate the bycatch in hake harvests delivered to shoreside processing plants for 10 – 15 percent of all EFP deliveries. The program also seeks to minimize the amount of bycatch in the fishery, including the amount of excess catch experienced due to exceeding the capacity of the vessel.

Hake must be handled quickly to ensure quality, and as a result many vessels dump tows directly into the hold and are unable to sort their catch in the short time available to cool the fish. The technical purpose of the EFP is to allow delayed sorting from mid-water trawl catches of Pacific hake until the catch is unloaded at a shoreside processing plant. In addition, in order to sample unsorted total catch shoreside, the EFP must include provisions to allow for potential overages in groundfish trip limits as well as the retention of prohibited species (e.g. salmon and halibut) until offloading. The amounts of groundfish exceeding current vessel trip and period limits will be forfeited to the state in which the delivery is made and payment made at the current port price. Current groundfish regulations at 50 CFR 663.7(b) stipulate that prohibited species must be returned to the sea as soon as practicable with a minimum of injury when caught and brought aboard.

The EFP is also necessary to authorize retention of prohibited species until shoreside delivery by vessels participating in the observation program. The EFP would be valid only for landings by permitted vessels at processing plants that have been designated by the States of Washington, Oregon or California as participants in the observation program. Designated processing plants will have signed agreements with their state and agree to set aside prohibited species for biological sampling and disposition, and allow sampling of hake landings and groundfish bycatch. Participating vessels will also undergo a state and federal violations check to exclude vessels with significant fisheries violations from participating in an exempted fishery. Details of this violations check will be developed prior to April 1, 2006.

There are two options for disposal of incidentally caught prohibited species brought ashore: (1) donate to a local food share or other appropriate charitable organization, or (2) reduction in the fish meal plant. Option 1 is preferred, but salmon caught by trawls are often in poor condition, and they are also very perishable. In addition to enumerating each prohibited species, other data to be collected include length, sex, and weight. Salmon snouts will be collected for coded wire tags from appropriately marked fish.

Another goal is to document the bycatch of other groundfish species encountered while target fishing for Pacific hake. Biological data (age, weight, length, otoliths, and sex) will be collected for Pacific hake, sablefish, yellowtail rockfish, widow rockfish, Pacific mackerel, and jack mackerel and other species as needed and available.

4. Justification

The EFP is requested so that an accurate count of incidentally caught salmon can be generated, and estimates of groundfish bycatch rates can be obtained from shoreside deliveries of Pacific hake. An EFP provides legal protection for trawlers and processors that have possession of incidentally caught prohibited species, and also provides legal protection from overages of groundfish resulting from targeted fishing trips for hake.

5. Statement of Project Significance

Enumeration of incidentally caught species is the primary purpose for this EFP. Monitoring the bycatch of salmon in the hake fishery also is a requirement of an ESA Section 7 consultation. Estimation of groundfish bycatch and collection of biological information to support stock assessment work is an additional purpose. Results from this project will be needed to project bycatch if regulation changes should occur (e.g. modification of prohibited species harvests) to allow this fishery to operate without the need for an EFP each year.

6. Vessels to be covered by the EFP

List to be provided at a later date.

7. Species and Amounts to be Harvested

The target species to be harvested is Pacific hake (*Merluccius productus*). The preliminary U.S. Pacific hake harvest guideline in 2005 will be determined at the March 2006 council meeting based on the February assessment. In 2005, the whiting fishery was allocated an OY of 265,069 mt. The corresponding shore-based allocation was 97,469 mt for 2005. According to current council management specifications for 2006 and 2007, the entire Pacific hake fishery will be conducted under a cap of 4.7 mt of canary rockfish, and 243 mt of widow rockfish in 2006. Based on bycatch information from our EFP program during 2004, the following catches of salmon, sablefish, and other species that would be expected in the shoreside sector in 2006 if the bycatch rates were the same as in 2004 and the hake quota is the same as in 2005, are as follows:

Species/Species Group	Bycatch Rate (no/mt.)	Expected Bycatch (number)
Chinook salmon	0.0469	4,597
Halibut	0.0006	57

Species/Species Group	Expected Bycatch (kilograms)
Sablefish	123,765
Widow Rockfish	31,221
Yellowtail Rockfish	125,195
Canary Rockfish	905
Yelloweye Rockfish	11
Darkblotched Rockfish	803
Bocaccio Rockfish	25
Lingcod	4,040
POP	818
*Misc. Rockfish	26,902
Mackerel	117,018
Walleye Pollock	8,073
American shad	50,828
Pacific herring	67,775
Spiny dogfish	32,488
**Other Misc. Fish	4,869

*Misc rockfish includes market categories of nearshore, shelf, and slope rockfish, and shortbelly rockfish, and chilipepper rockfish.

**Other misc. fish include: Pacific cod, shark, squid, octopus, flatfish (other than halibut), and skates.

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8. Conduct of Fishing Experiment

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Fishing will occur in the EEZ in the INPFC Eureka, Columbia and Vancouver areas. Ports of interest are Ilwaco and Westport, WA; Astoria, Newport and Charleston, OR; and Crescent City and Eureka, CA. An additional processor may operate in Moss Landing, CA. Trawls, which conform to current legal requirements for midwater trawls, will be used to capture the target species. The season will open June 15, 2006 (April 1 off northern California, April 15 off central California (note: the April 15 opening date for central California is under discussion by the PFMC), and will likely run through August 2006 depending on optimum yield. The EFP should be valid through the end of December 2006, to allow for any delay in shore-based allocation attainment.

As in 2004 and 2005, the fishery plans to use electronic monitoring (on board video) to ensure compliance with maximum retention stipulations of the permit and to allow shoreside sampling to provide accurate estimates of the total catch for each fishing trip. Electronic monitoring will also allow estimation of the amount of hake discard and provides an evaluation tool for vessel operators to use to minimize their excess catch.

The program will continue to rely on industry funding to pay for observers, part of the salary for a coordinator and data analyst assistant, supplies, and travel to processing plants and meetings. This is funded by processors that pay into a PSMFC fund based on their projected relative landings of hake in the 2005 fishery. At this time, funding for electronic monitoring is uncertain. A mechanism for funding this contract by either processors or vessels will be developed during the winter of 2005-2006.

Lastly, the total number of salmon caught in the entire whiting fishery exceeded the 11,000 Chinook cap requiring a reinitiation of the Biological Opinion prior to the fishery in 2006. This consultation will occur during the winter months of 2005-2006. Operating rules for the EFP will depend to some degree on the outcome of this consultation.

CALIFORNIA SHORESIDE WHITING
EXPERIMENTAL FISHING PERMIT APPLICATION

1. Date of Application

   August 30, 2005

2. Applicant

   Del Mar Seafoods, Inc.
   331 Ford Street
   Watsonville, Ca. 95076

3. Purposes and Goals of the Proposed Experiment

   The goal of this experimental fishing permit is to more closely align the start of the Pacific whiting season, south of the 40°30' N latitude line, with the presence of the Pacific whiting during their yearly migratory pattern.

   The purpose is to be permitted to catch the Pacific whiting at the time they are available in our area while maintaining due diligence to minimize the amount of bycatch and interaction with species of concern.

4. Justification

   The justification for this EFP is many-fold:

   a) To have a fishery that matches effort and availability.
   b) To have the fishery more closely match the migratory patterns of the Pacific whiting.
   c) To be able to reduce the duration and frequency of tows because of the abundance of the target (whiting) species – More efficient.
   d) Will reduce bycatch by reducing the duration and frequency of tows. – Less time in the water.
   e) Allows the fishermen to fish for another species (Pacific whiting) which will reduce the effort on other species more traditionally fished in this area.
   f) Will facilitate the fishermen to fish for a migratory species (Pacific whiting) which will reduce the effort on a more local, non migratory species.
   g) This early opening will be heavily observed and monitored to facilitate real time biological data for bycatch and any interaction with species of concern.

5. Statement of Project Significance

The main significance of this project is to match the season opening with the availability of the fish in the area south of the 40°30' N latitude line. It will allow the fishermen to prosecute the fishery in a more logical and viable manner.

There is renewed interest in this fishery for the last couple of years, south of the 40°30' N latitude line, which has been absent during the previous several years. This lack of interest in the previous years has made the opening date of the previous several years unimportant. This renewed interest has made the opening date for the Pacific whiting season, south of the 40°30' N latitude line now extremely significant.

This will be the start of a data base for Pacific whiting bycatch in the area south of the 40°30'N latitude line during a one month earlier starting date.

This experiment will also provide scientific data to better understand the Pacific whiting's migration pattern south of the 40°30' N latitude line.

6. Vessels to be covered under this EFP

Name(s) of vessel(s) to be provided at a later date. There will be no more then three vessels covered under this EFP

7. Species and Amounts to be Harvested

The target species to be harvested is the Pacific whiting (*Merluccius productus*). The amount to be caught will be no more than 1% of the 2006 U.S. West Coast shoreside Pacific whiting allocation.

For species other than the Pacific whiting: All rules, regulations, bycatch caps and other concerns set forth will apply. There will be 100% plant observer coverage (paid for by the plant). All bycatch data will be fully documented. Any scientific data requested to help with stock assessments, age, sex determination, etc. will be supplied. All data will be transmitted in a timely manner electronically. Any prohibited species will be documented and turned over to the State of California.

Species of concern and bycatch caps:

a) Chinook salmon…………………..50 fish cap (estimated max. 1,000 mt- applied the .05% standard)
b) Coho salmon……………………...10 fish cap.
c) Sablefish…………………………800 pound cap.
d) Widow Rockfish………………….800 pound cap.
e) Canary Rockfish………………….150 pound cap.
f) Yelloweye Rockfish……………..…50 pound cap.
g) Darkblotched Rockfish……………300 pound cap.
h) Bocaccio Rockfish………………..600 pound cap.
i) Lingcod ……………………………...1 mt cap.
j) Cowcod………………………………2 fish cap.

k) Pacific whiting…………………...cap of 1% of the 2006 coastwide shoreside Pacific whiting allocation.

These caps represent forty years of personal experience trawl fishing and other personal observations in this geographic area.

8. Conduct of Fishing Experiment

This will be a one month experimental fishing permit from March 15, 2006, to April 15, 2006. Fishing will occur in the EEZ south of the 40°30' N latitude line and more specifically in the Monterey area. The processing plant will maintain 100% observer coverage. Also, the fishing vessels covered under this EFP will have 100% at-sea observer coverage. We will require any and all vessels covered under this EFP to maintain full retention at all times. All assessments and research funds required will be paid by Del Mar Seafoods, Inc.

Application for Exempted Fishing Permit to Test Bycatch Reduction Devices in Experimental spot prawn trawl Fishery

Date of Application: May 23, 2005

Applicant: Southern California Trawler's Association
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Applicant Signature: Mike McCorkle

Application for Exempted Fishing Permit to Test Bycatch Reduction Devices in Experimental spot prawn trawl Fishery

Brief Description of Proposal (Purpose and Goals)

The purpose of this exempted fishing permit (EFP) proposal is to gather trawl target species and incidental catch (bycatch) data in order to indicate whether or not a trawl fishery for spot prawns may be conducted in an environmentally responsible and sustainable way in limited areas of soft-bottom habitat along the mainland coast of the Santa Barbara Channel.

The goals of the research are
1) to collect data on spot prawn trawl catch and bycatch along the Santa Barbara Channel coastline in soft-bottom habitats in depths at which spot prawns (*Pandalus platyceros*) have been traditionally fished in this area, using depth-stratified trawl sampling techniques.
2) to conduct comparative performance tests on several innovative bycatch reduction devices (BRDs) and/or combinations of BRDs in order to demonstrate the most effective BRD for the small trawl vessels to use in this region to minimize bycatch of groundfish species under stock rebuilding plans.
3) to test the most effective BRD or BRD combination on an array of vessel sizes likely to qualify for and/or conduct spot prawn trawling cost-effectively in the limited soft-bottom coastal habitat in the Santa Barbara Channel.

Specific objectives of these trawl tests include:
1) To find the best BRD or combination of BRDs for artisanal small-boat spot prawn trawlers (groundfish plan exempt trawl) that minimizes a) the bycatch of groundfish subject to stock rebuilding plans, b) bycatch of other groundfish plan species, c) bycatch of other finfish, d) biogenic organisms, e) other invertebrates, and/or f) any potential impacts to essential fish habitat (EFH) from the small-boat, artisanal trawl fishery that originally started the spot prawn market in Southern California.
2) To collect sufficient coastal, soft-bottom spot prawn trawl fishery bycatch information for management decision-making as to the sustainability of this artisanal spot prawn trawl fishery.
3) To re-open, if possible, a coastal soft-bottom trawl fishery for spot prawns in the Santa Barbara Channel, renewing the opportunity for these trawl vessels, which began the spot prawn market, to provide a highly-valued, fresh, local prawn product for local, community markets and seafood consumers in an ecologically sustainable manner, while meeting management goals for groundfish stock rebuilding and preservation of EFH.

Historic Background of Spot Prawn Trawl Fishery in the Santa Barbara Channel

The following description is, in part, paraphrased from the 2001 California Department of Fish and Game report to the Legislature entitled "California's Living Marine Resources: A Status Report."

Trawling for spot prawns in California began as a small-boat artisanal fishery in the Santa Barbara Channel in 1974. Small trawl vessels, principally from Santa Barbara and Ventura Harbors were the first to recognize and develop a local market for the prawn in the Southern California area. These boats trawled primarily in areas of soft bottom, where ridgeback prawns and spot prawns overlap. As in many fisheries, initial success prompted a rapid increase in participants, prompting fishermen and the Department to institute area, time, and gear restrictions to manage the fishery.

When ex-vessel prices rose to $8 to $10 per pound for live prawns, and the Pacific Fisheries Management Council (PFMC or Council) amended the Groundfish Management Plan (GMP) to severely restrict groundfish trawling throughout California, this area's prawn fishery attracted the attention of a number of larger trawl vessels from other areas of California and out-of-state. These larger, higher-horsepower vessels could tow larger nets, and began regular use of large "roller-gear," allowing fishing in hard-bottom habitat that the initial small-boat fleet did not generally have the horsepower to use. Concerns arose from non-government ocean-conservation organizations regarding impacts to such hard-bottom habitats from the use of this roller gear throughout California. These concerns were quickly brought to the attention of the Council and California Fish and Game Commission (Commission).

In 2003, the Council, in amendments to the Groundfish Management Plan, acted on concerns about take of declared-overfished groundfish species, including bocaccio, cowcod, canary and yelloweye rockfish, and lingcod, among others, in both the directed groundfish trawl fishery and so-called "exempt" trawl fisheries managed by the States. In 2003, the Council declared the spot prawn trawl fishery illegal throughout Washington, Oregon and California due to these concerns.

Likewise, in 2003, non-government conservation organizations petitioned the Commission on an emergency basis to close the spot prawn trawl fishery in California due to concerns about both habitat damage and bycatch of overfished groundfish stocks and other species. The Commission, upon receipt and review of a letter from NOAA Fisheries' Southwest Region and an observer report from the Department of Fish and Game, closed the spot prawn trawl fishery throughout California.

Neither the Commission nor the Council closely examined specific fleet components or the technology improvement potential of the spot prawn trawl fleet, nor the historic development of the spot prawn trawl fishery, during the decision process. The resulting decisions were across-the-board closure rather than a more surgical approach to regulating bycatch of overfished species incidental to this prawn fishery, particularly on a regional basis. It is possible, even likely, that at a certain scale and in certain places (specific coastal areas), spot prawn trawl fishing may occur without undue effects on either essential fish habitat or groundfish of concern. Zonal management of fisheries is practiced commonly at both the state and federal level.

<u>Justification for Exemption to Regulations</u>

As noted above, when the Council and Commission halted the spot prawn trawl fishery in California, consideration was not given to the possibility that there might be places, using improved BRD innovations, in which trawling for spot prawns in Southern California on soft-bottom habitats might be undertaken in such a way as to meet Council management goals for rebuilding overfished groundfish stocks and for preservation of EFH. Historic bycatch figures using traditional spot prawn trawl gear were significant enough for NOAA Fisheries to express concern to the Commission about both groundfish bycatch levels and levels of finfish bycatch in general. Since then, innovations in BRDs make it likely that this groundfish plan-exempt spot prawn trawl fishery may be conducted (particularly on the coastal soft-bottom habitat of the Santa Barbara Channel) in such a way as to avoid the concerns expressed by NOAA and the Commission.

The local, artisanal, small-boat trawl fishermen who began the spot prawn trawl fishery in the Santa Barbara Channel noted to the Commission during hearings that they do not catch appreciable quantities of bocaccio, cowcod, lingcod, canary, or yelloweye rockfish (all under rebuilding plans) when they trawl in soft-bottom habitat along the coastline of the Santa Barbara Channel. The DFG Spot Prawn observer report (Riley & Geibel, 2002) speaks to this (see Tables 1, 8, and 9 for Southern California observer data). For lingcod, the report footnotes (Table 8) that this species was not encountered in observed tows (although the same table reports 20 pounds landed). For bocaccio, the report estimates that the entire fleet in the Southern California area, at the highly uncertain extrapolated rate from observer data, would have caught 1,129 pounds of bocaccio in the 2000-2001 season.

When the GMP total allowable catch (TAC) for bocaccio was only 10,000 pounds for the West Coast, this ~ten percent figure may have been unacceptable for the exempted trawl fleet in California. Currently, however, the GMP TAC for bocaccio is 600,000 pounds for all fleets, and a 1,129 pound (estimated) incidental take of bocaccio should be scored quite differently on the overall scorecard.

For the other species of concern (especially those with stock rebuilding plans), only one pound of cowcod was taken in the Southern CA observer program. Cowcod have had significant measures (large Cowcod Conservation Area, Rockfish Conservation Area) taken to promote rebuilding, and the bycatch of that species is insignificant in the spot prawn trawl fishery as reported in the DFG observer data. No canary, and no yelloweye rockfish were reported taken in the DFG observer data for Southern CA. The other rockfish species taken incidental to spot prawn trawling in Southern CA are generally small, highly abundant, and not of significant concern under GMP or ecosystem perspectives. Biogenic organisms such as corals and/or sponges in deep water do not inhabit these soft-bottom habitats along the Santa Barbara Channel mainland coastline.

This proposal is intended to foster improved groundfish and EFH resource conservation and management, with a focus on bycatch reduction, as noted in Council Operating Procedure (COP) 19 guidelines. These experimental trawls may not be made in the Rockfish Conservation Area (RCA) currently, without an EFP. The innovative BRDs or combinations of BRDs would be the only trawl nets allowed to be used in this region to harvest spot prawns, and only under the EFP until further management review of the data has been done.

There are several species of flatfish in the groundfish complex that may be lawfully taken, within limits, during exempt prawn trawling, and this research proposal will encourage full retention and marketing of fishery mortalities of these flatfish stocks to the extent allowable under stock rebuilding plans, and under the guidelines of an EFP and COP 19, which allow for retention and sale of such marketable species, limited by specific day, trip or seasonal limits.

This soft-bottom spot prawn trawl fishery will also aid in data collection on groundfish stocks as the depth stratified sampling regime is conducted. Information that can supplement Southern California Groundfish Survey data will include where managed groundfish species are, and are not, in these depth-stratified trawl samples, for the Santa Barbara Channel coastline. A representative size- and capacity array of trawl boats that have historically fished for spot prawns in this area will be used to conduct these tests, providing useful management information.

By selecting coastal soft-bottom habitats where spot prawns are known to have occurred historically, and by avoiding hard-bottom habitats, this research will inform a more selective fishing strategy for this groundfish plan-exempt fishery that should improve avoidance of species of concern. Via the use of new and/or combinations of BRDs, this research will also encourage innovative gear modifications designed to minimize, to the maximum extent feasible, bycatch of any finfish whatsoever (groundfish species or otherwise) and minimize also any potential effects of such exempt prawn trawling on EFH.

Because the EFP and COP 19 guidelines allow for retention and sale of the spot prawns taken during these trawl tests, this will renew the development of market opportunities for trawl-caught live spot prawns in local markets throughout the Santa Barbara Channel region.

There is ample precedent in Council decisions to support approval of such an application. The Council last year passed motions recommending that NMFS approve three Exempted Fishing Permit (EFP) applications (Council Operating Procedure 19) that involve full observer coverage and many other restrictions and requirements, as follows:

1. Seven permits for trawl fishing north of 48° latitude to demonstrate the ability to target arrowtooth flounder with minimal incidental catch of canary rockfish;

2. Five permits in Northern California to demonstrate the selectivity of vertical hook and line gear in targeting yellowtail rockfish while avoiding canary rockfish;

3. Five permits for trawl fishing off California to demonstrate the ability to target chilipepper rockfish while avoiding bocaccio rockfish.

Potential Impacts of Exempted Activity

There are a number of potential impacts, both positive and negative, from conducting this experimental approach to reducing incidental take of rebuilding groundfish stocks while trawling for spot prawns. It is possible that some incidental take of overfished groundfish stocks will occur. It is possible that incidental take of biogenic organisms such as corals, sponges, or kelp might occur, although this is highly unlikely in the areas purposefully selected for this experiment and potential future fishery. And there exists the possibility that incidental take of other fishes and invertebrates may occur. However, the point of the research is to examine just how to bring take of these non-target, non-marketable species to the absolute minimum. The combined experience of the vessels and fishermen proposed for this research, along with their advisors and associates, bodes well for generating new BRD designs, or combinations of designs, to approach near-zero mortality of rebuilding groundfish stocks, in particular.

Also on the positive ledger, if this research is successful in indicating to the Council's Groundfish Management Team that insignificant levels of take of rebuilding groundfish stocks are taken, a local, artisanal fishery that originally initiated this spot prawn trawl fishery along the mainland coast may be re-instated with no appreciable impact on rebuilding groundfish stocks. This has positive impacts to the original spot prawn trawl vessels, to the ports and harbors infrastructure where these boats are home-ported, and to California seafood consumers who will once again have access to sustainably caught spot prawns from local waters.

Information From Research Useful to Management

The information collected during these experimental/research trawls will provide groundfish plan and EFH managers with useful and necessary information on the potential of small, artisanal trawl vessels to conduct plan-exempt spot prawn trawling in soft bottom habitat along the Santa Barbara Channel mainland coast without significantly affecting the management goals for rebuilding groundfish stocks or protecting EFH. The data may also allow managers to permit such a fishery, in the event that the research shows that the fishery may be conducted in such a way as to do no harm to rebuilding groundfish stocks or EFH. A representative size- and capacity array of trawl boats that have historically fished for spot prawns in this area are proposed to be used to conduct these tests, providing useful management information about likely performance at the scale intended for the fishery.

The data collected is also likely to assist in augmenting Southern California groundfish stock surveys already conducted, specifically to delineate where species of concern do and do not overlap with the spot prawn spatial distribution along the mainland coast of Southern California. It is feasible, and likely, that there are areas where spot prawn trawling may be conducted in this region on a sustainable basis.

Broader Significance of Work

Because the work focuses on bycatch reduction innovations, the information is likely to have broader application for groundfish plan management, particularly where certain kinds of BRDs may not prove practical for relatively small trawl vessels with smaller spool capacities.

The fostering of community-based regional or local fisheries that can be conducted in an environmentally sustainable fashion while avoiding impacts to rebuilding groundfish stocks and to EFH is one of the overall goals of the Magnuson Act, a goal which this proposal speaks to directly. Particularly given the potential for various alternatives currently under consideration for minimizing impacts to EFH by bottom-tending fishing gear, and in conjunction with various management measures that have already been taken to reduce fishing impacts on rebuilding groundfish stocks and EFH such as the buyback program, Rockfish Conservation Area, and Cowcod Conservation Area, along with various initiatives both at the State and Federal level to implement Marine Protected Areas/Marine Reserves/No-Take zones, there is a very real consideration as to how much fleet capacity will remain to foster the maintenance of necessary commercial fishing infrastructure in Southern California ports and harbors. An important component of many of these ports and harbors, as a draw to tourism, or to support continued access to federal dredging funds (as examples), is the rich traditional fishing heritage in the region over the last century. If it can be demonstrated that components of the trawl fishery can be conducted in an environmentally responsible way, one that does not significantly impact the Council's efforts to rebuild groundfish stocks as quickly as possible, then this component of such traditional fishing heritage can be retained as part of the diversity of commercial fishing practices historically conducted in the region. The coastal community social and economic fabric will thus be maintained to the maximum extent feasible while groundfish stocks have the opportunity to rebuild.

Expected Duration of EFP

For Phase 1, each paired set of net comparisons may take a total of 30 tows, for a grand total of 120 paired tows made good. Phase 2 will add a total of 60 additional tows. It is estimated that three tows per field day can be completed when sufficient time for sorting and identifying bycatch is allowed. Thus, approximately 60-80 days afield, for all three boats, total, is estimated to be necessary to accomplish the field work portion of this proposal, allowing for weather and technical contingencies. These field trial days will be conducted across the historic seasonal span of time in which the historic spot prawn trawl fishery was regulated by the California Department of Fish and Game, i.e., February 1, 2006 to September 30, 2006, a total of eight months in data collection.

Vessel Selection Criteria

The best possible way to test relative efficacy of various bycatch reduction devices (BRDs) against each other is with a double-rig vessel capable of towing two trawl nets side-by side simultaneously. This avoids the problem of different time/space coordinates when comparing one trawl with another. A small double-rig trawler can tow two nets separated by only dozens of feet, facilitating direct paired statistical testing of trawl catch/bycatch results. Once the completed series of paired trawl tests is completed (see Description of Research Protocol, below) and a "best" BRD configuration is determined, two other vessels will be selected and employed that typify the range of vessel sizes that are most likely to 1) qualify for and 2) conduct coastal spot prawn trawling in an economically and environmentally sustainable way.

Vessels covered under EFP

F/V SUSAN DIANE, Captain Jim Wylie

This vessel represents about the largest prawn trawl vessel to have been involved in this fishery historically. Captain Jim Wylie, owner of the double-rig trawler F/V SUSAN DIANE (68 feet OA) has been a commercial fisherman since the early 1950s. He has fished both coasts of North America for shrimp, prawns and finfish with a variety of fishing gear. Captain Wylie has been trawling the waters of the central and southern California coastline since 1970, and has been specifically fishing for prawns in the Channel since 1988. His experience running double-rig trawl gear will add greatly to the team's ability to test one net design modification directly against another with respect to efficacy of finfish bycatch reduction in prawn trawls.

F/V NEW HAZARD, Captain Jeff Hepp

This smaller trawl boat represents one of the historic highliners in the spot prawn trawl fleet operating out of Santa Barbara Harbor. A second-generation Santa Barbara Channel commercial fisherman, Capt. Hepp owns and operates the F/V New Hazard (46 feet OA). He has fished the Channel and California waters both nearshore and offshore for over 22 years. He has been trawling for halibut, sea cucumbers, ridgeback shrimp and spot prawns in the waters of the Santa Barbara Channel for over 18 years, and, prior to the closure of the spot prawn fishery, was a consistent producer of spot prawns for the local and regional live and fresh markets in the Santa Barbara area. The involvement of Capt. Hepp will add a small-to-mid-sized trawler to the test trawl mix and also ensure that effort will be undertaken in productive spot prawn grounds that are seasonally variable.

F/V PALM, Captain Randy Harmsen

The trawler Palm is about the smallest boat capable of fishing the depths in which spot prawns have been found traditionally along the mainland coast of the Santa Barbara Channel. Captain Harmsen, owner/operator of the small trawler F/V Palm (36 feet OA) has been commercially fishing the central and south coast of California for over 35 years. He has been trawling for sea cucumbers, halibut, shrimp and prawns in the Santa Barbara Channel for over 18 years. His detailed knowledge of the coastal trawl grounds for finfish, cucumbers and prawns will enhance the project's ability to target areas traditionally used by prawn trawlers, and his small boat trawl gear will demonstrate the efficacy of the best-net designs with a typical small-boat trawler used commonly in the Santa Barbara Channel.

Description of Research Protocol

To test the hypothesis that spot prawn trawling can be conducted in specific local areas of the coastline of the Santa Barbara Channel in an environmentally responsible way that minimizes take of groundfish for which there currently exist stock rebuilding plans, this project will focus on specific soft-bottom areas along the mainland coast of the Santa Barbara Channel, where the abundance of lingcod, bocaccio, cowcod, canary, and/or yelloweye rockfish is likely to minimize to the greatest extent feasible the incidental take of any of these species.

Three boats will be selected, as described above, to include the array of vessel sizes that have traditionally participated in this coastal spot prawn trawl fishery. In order to make direct, side-by-side comparisons of various net modifications intended to focus on the reduction of incidental take of finfish and invertebrates in spot prawn trawls along the coastline in selected areas of the Santa Barbara Channel, it is proposed to use one double-rig trawl boat, the F/V Susan Diane. In the first phase of data collection, a double-rigged paired trawl tow design is, from a statistical design point of view, the best possible method by which to directly compare one BRD design against another. By a series of one-on-one paired trawls using different BRD configurations, this project will demonstrate the relative efficiency of various innovative improvements to traditional spot prawn trawl net design, and arrive at a "best available technology" model that minimizes bycatch in this trawl fishery. After the paired net tests, the overall best BRD design that minimizes all bycatch of concern will be tested on two other trawl vessels of smaller total capacity, to illustrate the characteristics of the entire range of vessel sizes likely to participate in this fishery along the coast of the Channel, and to conduct the trawl tests throughout the depth range and seasonal time frame in which the former spot prawn trawl fishery was conducted.

Trawl Net/BRD Comparison Trial Protocols

Phase 1: Double-Rig Paired Trawls to Improve Finfish Bycatch Reduction

Net X (see descriptions, below) will be paired with Net Y for the first set of trials (See figure 1 for "pictorial" of paired trial series). The order of paired net trials can be determined randomly to test one BRD against another BRD. Once a random order of pairings is established, the two BRD nets (or one "standard" net without BRD) will be alternated between the port and starboard sides of the boat to minimize any systematic error possibly arising from port-starboard performance differences.

Each net pair trawl trial will consist of a one-hour tow. For the live prawn market that most of the vessels formerly serviced, this length of tow is optimal to keep the prawns in high-quality market condition. If, after 10 paired tows, one of the nets is clearly better than the other at bycatch exclusion (10 out of 10 trials one net wins, or 9 out of 10 trials one net wins), that trial will be determined over, and the better net will be paired with the next net in the randomly chosen BRD series, changing only one BRD feature at a time. If results are inconclusive (8 or fewer "wins" out of 10 trials), trials will continue with this first pair of nets to a total of 20 trials. If, after 20 paired trials, one net proves better than the other in 16 or more trials (80% of trials or more), the trial set will be determined to be over, and the better net will be paired with the next net in the design series. If, after 20 trials one net has not met these criteria, trials with this pair of nets will continue to a total of 30 trials, and the "better" net design at the end of trials will move on to the next set of paired trials. Figure 1 graphically illustrates one possible order of the paired-nets test design. In the unlikely event of "ties" in results between any pair of nets, the net retaining the least rockfish under stock rebuilding plans will be judged the better of the two. In the event that this measure is also tied (and/or zero for both nets), the next tiebreaker will be the net design that catches the least habitat-forming organisms such as corals and sponges (an EFH criterion). If that also results in a tie, the total non-marketable bycatch will be used to determine the best net of the pair.

The point of this novel 10-20-30 field test design is to optimize data returned in field efforts with overall experimental design and observer costs. If one net design for bycatch reduction proves clearly and consistently superior to another in any given paired test after 10 paired tows, it would not be reasonable or cost-effective to continue the testing further; additional significance would not be added to the results in a cost-effective manner. This 10-20-30 trials endpoint protocol will be continued for each set of paired trial nets, to arrive at the best possible net configuration and trawling techniques that clearly minimizes bycatch in these localized areas along the mainland coast of the Santa Barbara Channel.

Once the paired trawl trials have concluded with the best net design to minimize interactions with rebuilding stocks of groundfish, other finfish, and other invertebrates including habitat-forming species, Phase 2 of the field work will be conducted.

Phase 2: "Best Net" Trials Using Two Other, Smaller Spot Prawn Trawlers

Two other trawl vessels will be employed to utilize the net design that proved most efficient during the Phase 1 tests. Taken together with the double-rigged trawler, these two other, smaller vessels will illustrate the complete range of sizes of trawlers that are likely to qualify for a "coastal Santa Barbara Channel spot prawn trawl permit" based on prior participation and landings in the area of interest. Each subsequent trawl vessel selected will also tow the "best BRD net" for 30 trials, while data on all bycatch is taken just as in Phase 1 trials. These tows will be conducted in a depth-stratified manner, illustrating bycatch by depth strata and assisting in the delineation of depths at which spot prawn trawling may occur on these soft bottom habitats that minimizes bycatch of rebuilding groundfish stocks.

By the end of these trials, somewhere between 100 and 180 individual one-hour net tows (depending on Phase 1 total required tow number under the 10-20-30 protocol) will be completed. It is expected that bycatch of rebuilding rockfish species will be near zero, and bycatch of other non-marketable finfish and invertebrates will have been reduced to extremely low levels as well. Further, it is expected that the data will demonstrate that habitat-forming species such as corals, sponges, and/or kelp, are not taken in appreciable quantities in this soft-bottom spot prawn trawl habitat along the mainland coast of the Channel.

Description of Trawl Net BRD modifications

Santa Barbara-based trawlers have been in contact with researchers from other parts of the West Coast, Newfoundland and the Gulf of Mexico doing similar research, trading notes and designs in order to arrive at the best possible combinations of devices and trawling techniques to minimize bycatch. Preliminary results from a similar set of tests of various BRDs on ridgeback prawn trawl nets indicate that, using ranked probabilities of the test net catching less bycatch than the "standard" prawn trawl net, the fish-eye with double cod end appears to have the advantage for small trawl vessels such as those in the Santa Barbara Channel that originally began the spot prawn trawl fishery there (report in preparation). Five modifications to a standard or typical 70-foot prawn net will be compared initially in the Phase 1 testing, including:

1. "fish-eye" excluder device (See Figure 2 and Photo A)
2. "dropped footrope" on 5" bobbins (Figure 3).
3. Hard Grate fish excluder (Photo B)

4. 5" mesh double cod end (Figure 5, Photo C)
5. "Soft-panel" fish excluder (Figure 6)

Observer/Monitoring Protocol
NOAA Fisheries-certified observers will accompany each fishing trip under the auspices of this EFP research proposal. Collection of data on target and incidental species taken in each and all trawl tows will be recorded according to NOAA-certified guidelines, principles and practices, including, but not limited to:

- general environmental setting during trawl trip (weather, sea conditions, etc.)
- geographic coordinates of each trawl tow (set and retrieve locations)
- weight of target species
- weight/number of each species of groundfish taken incidental to target fishery
- weight/number of other species of fish and invertebrates taken incidental to target fishery

NOAA Fisheries-approved forms for recording bycatch will be used for these purposes.

Locations and Schedule for Research
Locations: (See Figure 7). The area to be used for the purposes of this demonstration/data collection EFP is generally between Point Conception and Point Mugu, along the coastline of the Santa Barbara Channel. The habitat to be trawled is generally sandy/mud or mud bottom in depths from the three-mile state waters boundary (which ranges from 36 to 83 fathoms in the Channel) out to 165 fathoms of water, in selected locations where concentrations of spot prawns have historically been high enough to warrant commercial take. Figure 7 depicts the areas to be used for these test trawls. Note that depths currently prohibited from trawling in the Rockfish Conservation Area will be tested, to be inclusive of all possible depths that historically were trawled for spot prawns, and the potential overlap of these depths with groundfish of concern. This may assist in the more accurate delineation of depths at which spot prawn trawling may be conducted and not take appreciable numbers of rebuilding groundfish species.
Schedule: February 1, 2006 to September 30, 2006. This represents the former trawl season, which avoids the bulk of the spot prawn spawning time period.

Description of Species to be Harvested, with Harvest Estimates for Target and Incidental Species
The species likely to be taken in this EFP research include

Invertebrates:	**Total Harvest Estimates**	
Spot prawn	10,000 lbs	
Ridgeback shrimp	1,500 lbs	
Various species of sea cucumbers, sea urchins, sea stars,	1,000 lbs	
Various crab species	400 lbs	
Finfish:		
Groundfish under rebuilding plans:		
Rockfish		
Bocaccio	500 lbs	Groundfish Plan Rebuilding Species
Cowcod	50 lbs	Groundfish Plan Rebuilding Species
Canary	20 lbs	Groundfish Plan Rebuilding Species
Yelloweye	20 lbs	Groundfish Plan Rebuilding Species
Widow	20 lbs	Groundfish Plan Rebuilding Species
Darkblotched	20 lbs	Groundfish Plan Rebuilding Species
Other rebuilding groundfish		
Lingcod	200 lbs	Groundfish Plan Rebuilding Species

Groundfish not under rebuilding plans:

Rockfish	
Shortbelly	30 lbs
Stripetail	500 lbs
Vermillion	30 lbs
Chilipepper	80 lbs
Rarely taken, but possible rockfish	
Greenstripe rockfish	50 lbs
Other abundant groundfish	
Sole	
English	800 lbs
Petrale	300 lbs
Sanddabs	1,000 lbs
Blackcod	100 lbs
Pacific Hake	600 lbs

Other finfish:

Common, abundant	
Stargazer	100 lbs
Combfish	
shortspine	500 lbs
longspine	500 lbs
Slender Sole	300 lbs
Skates, rays	300 lbs
Midshipman	1,000 lbs
Rarely taken, but possible finfish	
Sole	
Slender	100 lbs
Dover	100 lbs
Rex	60 lbs
Fantail	50 lbs
Tonguefish	50 lbs

These data are adapted for depth and seasonal differences from preliminary bycatch results of a 2003-2004 ridgeback prawn bycatch reduction study done in the Santa Barbara Channel (report in preparation). These estimates yield a calculated estimate for total-bycatch-to-spot-prawn ratio of 0.86:1, a non-marketable-bycatch-to-spot-prawn ratio of 0.35:1, and a rebuilding-groundfish-to-spot-prawn ratio of 0.07:1.

Data Collection and Analysis Methods

As noted above, all bycatch data will be collected by NOAA Fisheries-certified observers on every trawl made during this exempted fishery permit field work. NOAA-Fisheries observer data recording forms will be used for this purpose. Bycatch data will then be synthesized and summarized into tables to allow easy comparison between paired BRD/net trials, and a summary table will present average per-trawl and overall bycatch for each species of concern.

Figure 1: Illustration of One Possible Order of Paired Nets Trawl Test Design

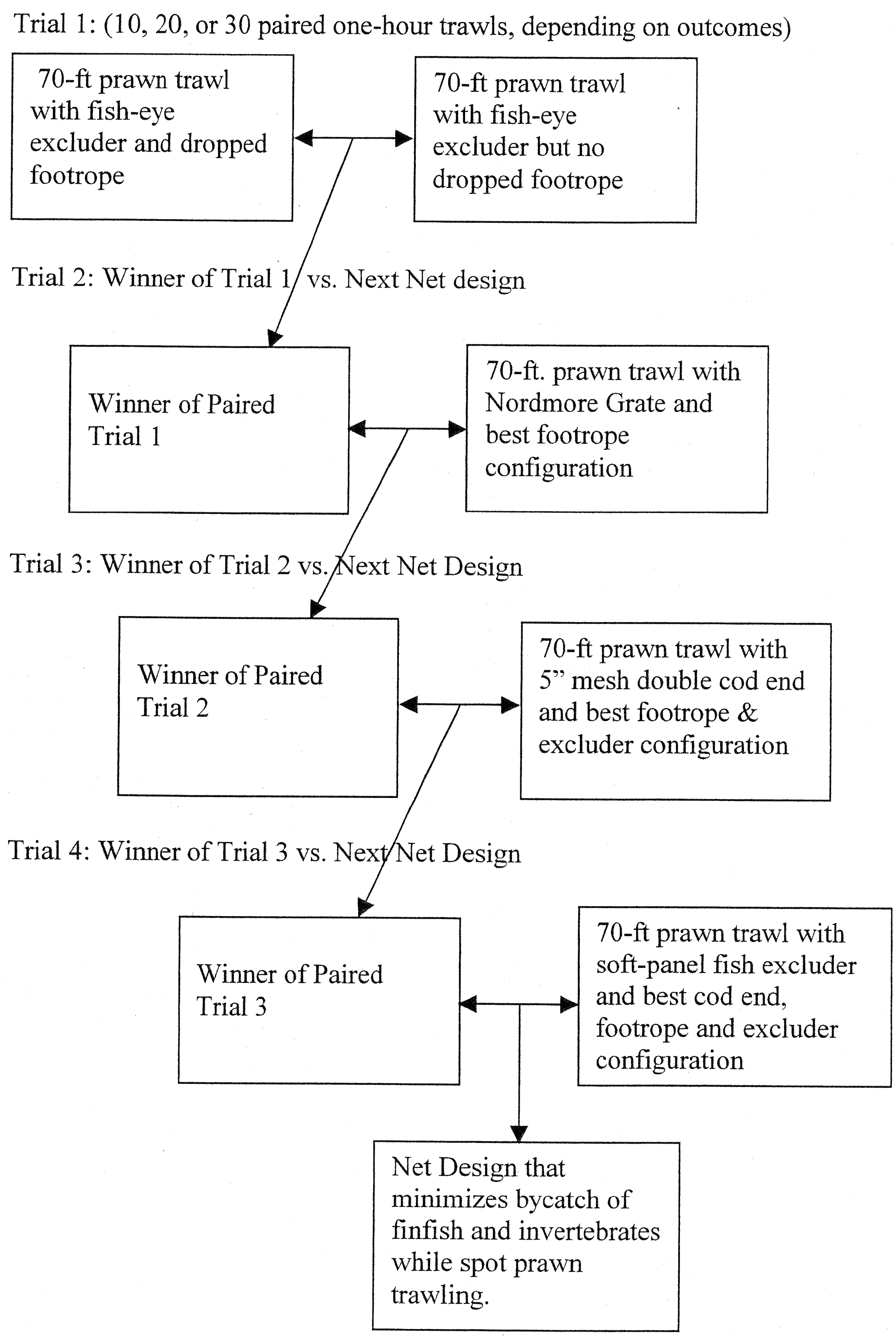


Figure 2. Fish-Eye Excluder Device

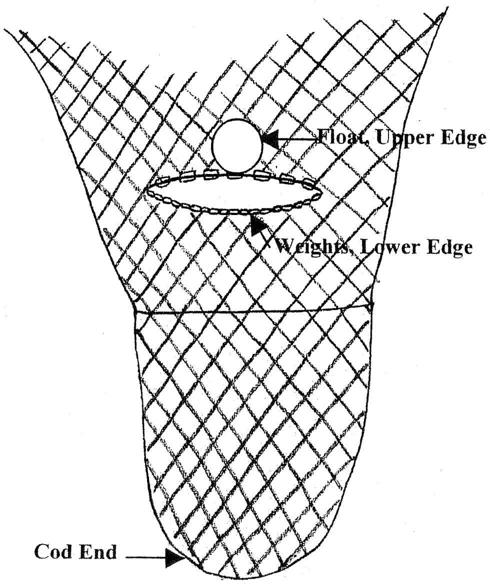


Photo A: Fish-Eye Excluder Device

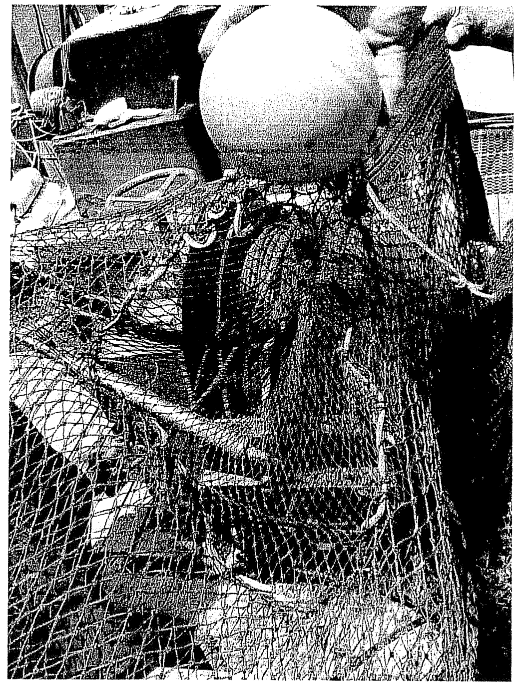


Figure 3. Dropped footrope on 5” bobbins

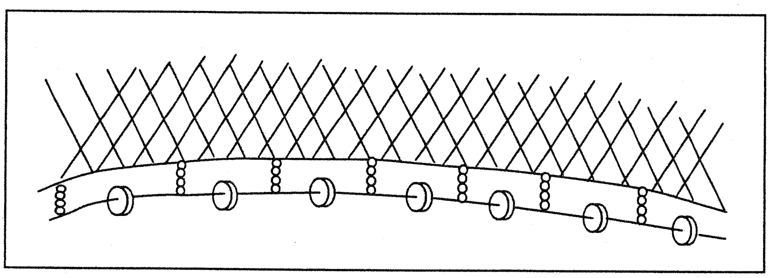


Figure 4. Traditional footrope

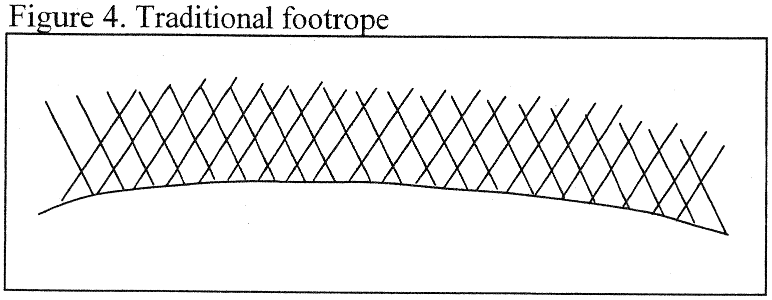


Photo B. Hard Grate BRD

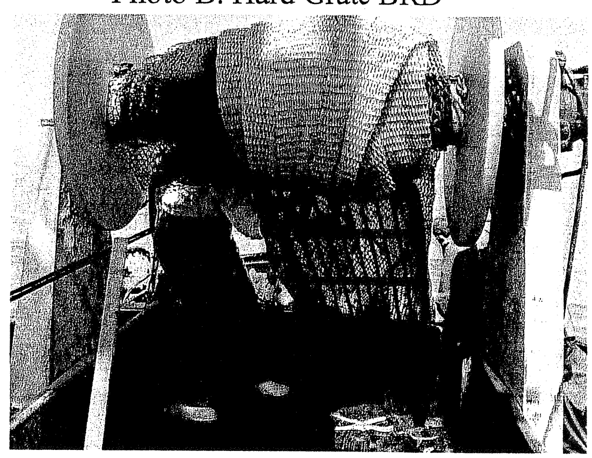


Photo C. Double Mesh Layer Cod End

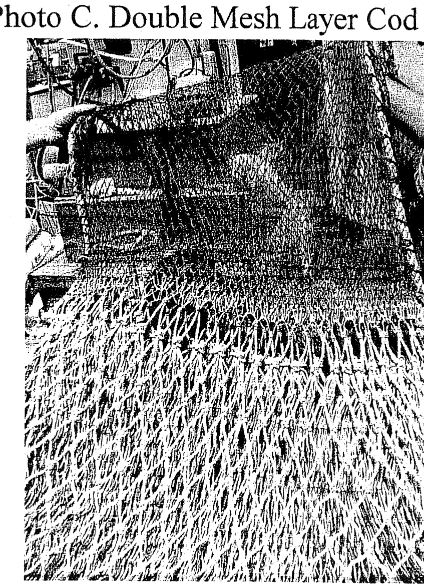


Figure 5. Double Mesh Layer Cod End

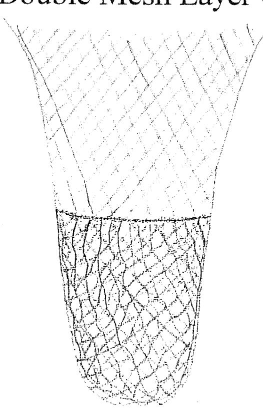


Figure 6. Soft Panel BRD

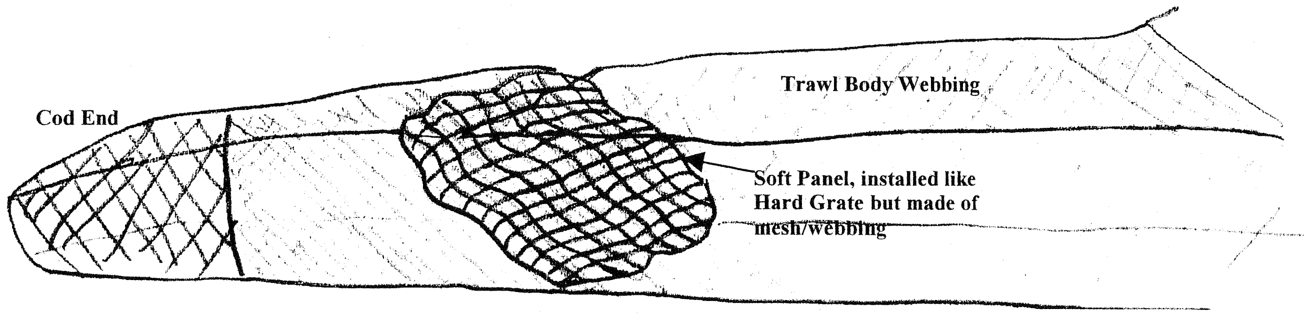
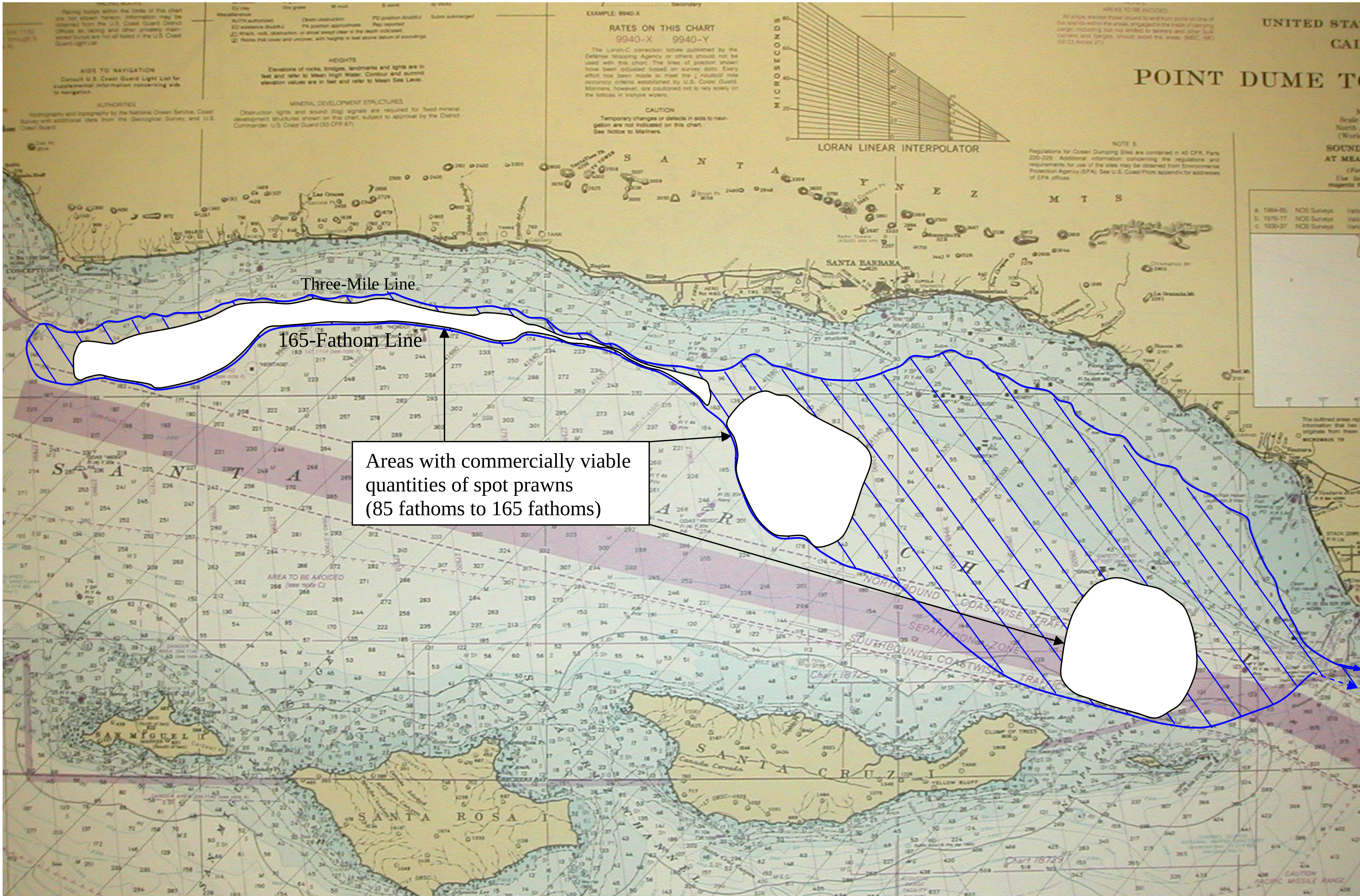


Figure 7

Artisanal Spot Prawn Trawl Grounds, Mainland Coast, Santa Barbara Channel
Federal Waters out to 165 fathoms, Point Conception to Point Dume



GAP STATEMENT ON EFP PROPOSALS FOR 2006

The Groundfish Advisory Subpanel (GAP) reviewed exempted fishing permit (EFP) proposals for Bycatch Reduction Devices in the California Spot Prawn fishery, California Whiting EFP, and continuation of current Shoreside Whiting EFP.

The GAP recommends the Council move ahead with the Spot Prawn EFP as written with one correction. The shortbelly rockfish cap is to be revised to 300 pounds instead of 30 pounds. The GAP requests that the EFP adhere to the bycatch caps by species as specified and close if any of those caps are exceeded.

The GAP also recommends the Council continue the Shoreside Whiting EFP for 2006 as written.

The GAP recommends approving the California Shoreside Whiting EFP as written, though there were concerns voiced about the incidence of Klamath and Sacramento salmon stocks, and the need for this EFP to secure properly trained or certified observers. The GAP also notes that after the April 15 end date this fishery would continue under the 2006 Shoreside Whiting EFP.

The GAP has been notified by industry that the funds for monitoring the 2006 Shoreside Whiting EFP may not yet be in place, and asks the Council to look for funding options so this EFP can continue for the next year.

PFMC
11/02/05

GROUNDFISH MANAGEMENT TEAM REPORT ON EXEMPTED FISHING PERMIT (EFP) APPLICATIONS FOR 2006

The Groundfish Management Team (GMT) reviewed three proposals for exempted fishing permits (EFPs) to be conducted in 2006, and has the following comments and recommendations:

Shore-based Whiting EFP

The GMT is aware that the availability, efficacy, and cost burden of electronic monitoring are still being explored, and anticipates that other details of implementing the EFP will be worked out over the winter. The GMT recommends approval of the EFP with the assumption that these issues will be resolved.

Early Season start date for shore-based whiting EFP south of 40°30’ N latitude

This application requests an EFP to change the start date of the California early season shore-based whiting fishery from April 15 to March 15 south of 40°30’ N latitude to access whiting during their northerly migration in the spring.

For historic reference, an early shore-based whiting EFP fishery was created in northern California (north of 40˚30’ N. latitude to 42° N. latitude) in 1997 to accommodate regional whiting availability. At that time, this was the only area of California with an active fishery. There has been recent interest in fishery participation south of 40˚30’ N. latitude, which still maintains a start date of April 15, two weeks after the northern California fishery. In 2005, the applicant was designated as a processor under the shore-based whiting EFP and attempted to prosecute the fishery after the start date. The applicant reported that only one small landing was made in early May, and attributed this to starting after whiting had already moved through the area. Therefore, he requests the opportunity to commence fishing two weeks prior to the northern California fishery (from 40°30' N. latitude to 42° N. latitude), which is one month earlier than the current regulations allow, to match the timing of the whiting migration through this area.

The GMT reviewed the application submitted by the applicant at the September Council meeting, and recommended changes to be made to the EFP proposal. These included 100% at-sea observer coverage by National Marine Fisheries Service (NMFS)-certified or NMFS-contracted observers, in addition to the 100% shoreside plant coverage proposed; continued state shoreside biological sampling coverage of 10-15% consistent with the shoreside whiting EFP program north of 40°30' N. latitude; “maximized” retention” of all species caught during the EFP; a total whiting cap of 1% of the overall shoreside allocation to avoid early attainment of the overall California allocation of 5%. The revised EFP application (Agenda Item H.8.a Attachment 2) incorporated these requests.

The application contains bycatch caps for overfished groundfish, and bycatch caps for Chinook and coho salmon from within the overall whiting salmon bycatch allocation. The salmon bycatch caps in the application were developed in consultation with Peter Dygert, NMFS Northwest Region. Provided that the California Department of Fish and Game (CDFG) is able to oversee the monitoring, data collection, data analysis, and final reporting requirements, the GMT recommends approval of this EFP.

Much like the coastwide whiting EFP, CDFG will be developing specifics over the winter on coordinating, training, logistics and access to observer coverage. It is our understanding that the applicant intends for one vessel to fish at a time so that a single observer would be required for the EFP period.

<u>California Spot Prawn Trawl EFP</u>

The EFP application proposes to allow up to three specific vessels to use trawl gear modified to reduce bycatch of groundfish to target spot prawns in three geographically-specified areas in the Santa Barbara Channel. The intent is to conduct a test spot prawn trawl fishery through a federal EFP and a state experimental fishery permit in 2006.

The applicant provided a thorough and detailed application, which includes provisions for 100% observer coverage, reasonable statistical study design, and methods to test the effectiveness of three bycatch reduction devices (BRDs) to minimize bycatch of rockfish. The applicant identified three areas he describes as soft-bottom habitat unsuitable for pot (trap) gear. The GMT notes that one of the areas in the original EFP proposal overlaps with an area closed to bottom trawl fishing under the Council's Essential Fish Habitat (EFH) protection measures adopted in June 2005. This particular area was closed to provide protection for deep-sea corals and sponges, and allowing an EFP in this area would be in conflict with habitat protection measures adopted.

The GMT had extensive discussions regarding the merits and broader implications of this particular EFP proposal at our August and October meetings. The GMT would like to remind the Council that all three states endured a long, arduous process to end spot prawn trawl fishing along the West Coast due to concerns over high bycatch levels and bottom habitat impacts. Each state went through its respective Fish and Wildlife Commissions to seek regulatory action to require all of their respective spot prawn trawl fishery participants to convert to pot (trap) gear. The GMT appreciates the efforts of industry members seeking means to address impact concerns and operate fisheries more cleanly. Yet, by allowing a few former spot prawn trawl participants to conduct an EFP/experimental fishery, the GMT is concerned about the potential of future EFP applicants requesting opportunities to restore similar spot prawn trawl fisheries in other areas. Therefore, the GMT recommends that the Council take this into consideration in making their decision.

The GMT identified concerns at our August meeting, and communicated our concerns to the applicant with a request that the application be modified to address the following concerns:

1. Require full retention of rockfish, with a provision to allow landings in excess of specified limits.

2. Require that rockfish exceeding current trip limits or rockfish catch not subject to trip limits would be surrendered to the state of California.
3. Adhere to current trip limits for open access fishery exempted trawl, which is 300 pounds groundfish per two months.
4. Adhere to the closed areas adopted under Essential Fish Habitat.
5. Maintain GPS record of locations fished to associate with tow catch.
6. Specify EFP fishing areas by coordinates, in coordination with California Department of Fish and Game staff.
7. Identify gear restrictions that would be appropriate for soft bottom habitat only.
8. Require the vessels participating in the EFP have vessel monitoring systems (VMS) to ensure compliance with the area restrictions.

The GMT met with the applicant at our October meeting and noted that the application had not been modified. During the meeting, the GMT reiterated our concerns and the applicant agreed to the modifications. However, the application contained in the November briefing book was not revised. The GMT notes that COP #19 – EFP Protocol specifies that if an EFP is approved by the Council at the November meeting, it refers specifically to the version of the application contained in the briefing book, and therefore the GMT does not recommend approval of the application in its current form. However, COP #19 does provide an option to grant provisional approval, with final approval contingent on incorporation of specifically-prescribed modifications into the EFP application.

If the Council decides to approve the EFP, then the GMT recommends the approval be provisional, until the eight items identified by the GMT above are incorporated.

The applicant will go before the California Fish and Game Commission during the winter to request approval of a state experimental fishing permit with the intent that a limited entry spot prawn trawl fishery could be developed in these areas based on the EFP results, and proposes that the same qualifications and moratorium date be set as was established for a limited entry ridgeback prawn fishery. The GMT notes that a thorough review of the results of the EFP, including bycatch rates associated with BRDs tested, would be required to consider any extension of this fishery beyond the initial EFP period.

GMT RECOMMENDATIONS:

1. Approve the shore-based whiting EFP.
2. Approve the early season date for the shore-based whiting EFP south of 40°30' N. latitude
3. Decide whether to approve the California spot prawn EFP.

PFMC
11/03/05

PACIFIC COAST FEDERATION of FISHERMEN'S ASSOCIATIONS

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By Electronic Mail, Hand Delivery

28 October 2005

Mr. Donald Hanson, Chair
Pacific Fishery Management Council
7700 NE Ambassador Drive
Portland, OR 97220-1384

RE: Exempted Fishing Permit (EFP) Applications for 2006
Small Trawl Spot Prawn Fishery Between Point Conception and Point Magu, California

Dear Chairman Hanson:

The Pacific Coast Federation of Fishermen's Associations (PCFFA), representing working fishing men and women in the U.S. West coast commercial fishing fleet, strongly <u>supports</u> the application by the Southern California Trawlers Association for an experimental trawl fishery, under the Pacific Fishery Management Council's Exempted Fishing Permit (EFP) program, for the take of spot prawn in specified areas between Point Conception and Point Magu.

The proposal calls for the use of three small trawlers with full observer coverage in an area where the seafloor is a soft and muddy bottom, where traps tend to be ineffective. Trawls have previously been used in this area for spot prawn, so they are expected to be effective and produce a highly desirable product. The questions to be answered by this experiment are whether such a fishery can be conducted with minimum (and acceptable) levels of bycatch and with minimal impacts on bottom habitat. Proponents, including PCFFA, believe this can be done; the purpose of this exemption is to allow for an experiment to bear out whether this belief on the part of proponents and their past experience can be borne out. Moreover, unlike other areas of the coast where traps are an effective method for the taking of spot prawn, trawling on the mud bottoms between Point Conception and Point Magu appears to be the only effective method of take for spot prawns.

PCFFA respectfully requests the PFMC approve this EFP request when it is taken up at your November meeting. If you have any questions, please do not hesitate to contact either Mr. Mike McCorkle or PCFFA staff. Your attention to this matter is appreciated.

Sincerely,

Chuck Wise
President

EXEMPTED FISHING PERMIT (EFP) APPLICATIONS FOR 2006

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. Because the EFP fisheries harvest or impact a portion of the overall available harvest, preliminary Council approval and harvest set asides for EFPs in 2006 (and 2005) were adopted along with 2005-2006 management measures at the June 2004 Council meeting. The preliminary 2006 EFP harvest set-asides were 2.9 mt of canary rockfish, 0.5 mt of darkblotched rockfish, 6.5 mt of lingcod, 0.2 mt of Pacific ocean perch, and 0.2 mt of yelloweye rockfish. However, the Council should reconsider these EFP harvest set-asides at this meeting and recommend new harvest set-asides to the National Marine Fisheries Service (NMFS) in accordance with the bycatch needs of those EFPs recommended for 2006.

Applications for EFPs proposed for 2006 were provided in the June and September briefing books to give Council members, Council advisory bodies, and the general public an opportunity to review these applications and prepare their recommendations for this meeting. Three EFP applications were reviewed and are considered for approval at this meeting: a coastwide shoreside whiting EFP allowing that sector of the whiting fishery to fully retain their catch and land species in excess of their allowable landing limits (Agenda Item H.8.a, Attachment 1), a California shoreside whiting EFP to examine effects of beginning that fishery south of 40° 30' N. Latitude earlier than the current April 15 start date (Agenda Item H.8.a, Attachment 2), and a California spot prawn trawl EFP designed to test finfish bycatch excluder devices (Agenda Item H.8.a, Attachment 3).

The coastwide shoreside whiting EFP (Agenda Item H.8.a, Attachment 1) has been the vehicle to prosecute the shoreside fishery in recent years. The states, Council, and NMFS have yet to resolve details on how to implement the 2006 shoreside whiting EFP and fishery given uncertainties in funding, bycatch caps, and new salmon bycatch limitations.

Under this agenda item, the Council will review and approve EFP applications and EFP harvest set-asides for 2006. Council-approved applications are then submitted by the applicants to NMFS for permit development and issuance.

Council Action:

1. **Consider EFP applications for 2006 and recommend approval to NMFS.**
2. **Recommend EFP harvest set-asides (or bycatch caps) to NMFS for 2006 EFPs.**

Reference Materials:

1. Agenda Item H.8.a, Attachment 1: Shoreside Whiting Fishery Exempted Fishing Permit Application.
2. Agenda Item H.8.a, Attachment 2: California Shoreside Whiting Experimental Fishing Permit Application.
3. Agenda Item H.8.a, Attachment 3: Application for Exempted Fishing Permit to Test Bycatch Reduction Devices in Experimental Spot Prawn Trawl Fishery.

Agenda Order:

a. Agenda Item Overview John DeVore
b. State Proposals
c. Reports and Comments of Advisory Bodies
d. Public Comment
e. **Council Action:** Approve Final EFPs for 2006, Including Caps for Overfished Species

PFMC
10/14/05

GROUNDFISH MANAGEMENT TEAM REPORT ON MANAGEMENT SPECIFICATIONS FOR SPINY DOGFISH AND PACIFIC COD FOR 2006

At the June Council meeting, based on recommendations from the Groundfish Management Team (GMT), the Council decided to include on its September agenda, consideration of setting an acceptable biological catch (ABC) and optimum yield (OY) for spiny dogfish, and management measures (i.e., trip limits) for both Pacific cod (which already has an OY) and dogfish. After further discussion, the GMT recommends that the setting of an ABC and OY for spiny dogfish be considered through the 2009-10 specifications process, following the completion and approval of a stock assessment in 2007, and that the Council only consider management measures for these two species for 2006 (and 2007-2008). The GMT notes that other species, such as California scorpionfish, have had trip limits in place prior to a formal assessment and the setting of an ABC and OY. Therefore, the GMT developed alternatives for management measures for Pacific cod and spiny dogfish for the Council's consideration, which would be effective in 2006. The GMT would like to stress that, once adopted, changes to the trip limit amounts may be considered for 2007-2008, as well as through inseason adjustments.

Process and Timeline

It is our understanding that given the timing of the federal rule-making process, it is unlikely that measures would be in place for the January 1, 2006, start date of the fishing year. Therefore, the alternatives developed by the GMT all have an implementation date of March 1, 2006, which is the beginning of the second two-month cumulative period. The National Marine Fisheries Service and the Washington Department of Fish and Wildlife are preparing a draft Environmental Assessment (EA), which is tiered from the 2005-2006 specifications Environmental Impact Statement (EIS). The EA will include environmental and economic analyses of the alternatives selected by the Council for consideration.

Intersector Allocations

Because there is not a separate ABC and OY for spiny dogfish, and given that this species is targeted by all commercial sectors—limited entry and open access, and both trawl and fixed gear—the GMT is not proposing differential trip limits by sector. Rather, the trip limits across Alternatives 2 and 3 are the same for all commercial sectors in all periods.

While there is an OY for Pacific cod, the recent and historical landings are almost all trawl. A review of the 2000-2004 data indicates that a minimal trip limit (~ 1,000 lbs/2 months) would accommodate all of the limited entry and open access fixed gear landings; therefore, the trip limits for these sectors remain static across Alternatives 2 and 3. The GMT would like to note that these trip limits were developed to accommodate existing fisheries and are not intended to represent any long-term allocation among sectors.

Range of Alternatives

In general, the GMT's approach in developing the range of alternatives was to review the amount of fish needed to accommodate current harvest levels on a two-month cumulative basis. We did not structure alternatives to provide for higher harvest levels for future developing fisheries, as these proposals are for the 2006 fishing year only. If, in the future, there are markets and/or gears developed to allow new, targeted fisheries, then the Council could consider liberalizing trip limits for different sectors, as appropriate.

In order to analyze a full range of alternatives, the GMT is using Alternative 1 (status quo), which is unlimited amounts of Pacific cod and dogfish, to represent the high end of the range.

The GMT did trip frequency analyses for both Pacific cod and dogfish using fish ticket data from the 2000-2004 fisheries. Alternative 2 in each case represents trip limits which would accommodate practically all of the commercial fishing activity that occurred during this timeframe. It is anticipated that, if participation in the directed Pacific cod fishery remains at the current level, these trip limits would result in approaching, but not exceeding, the Pacific cod OY. Given that spiny dogfish would remain under the "Other Fish" category and would not have a separate OY, it is anticipated that the trip limits under Alternative 2 would not result in exceeding the "Other Fish" OY. The GMT notes that the data reviewed include periods when the West Coast groundfish fisheries were not subject to rockfish conservation areas (RCAs); therefore, the resulting harvest levels in 2006 (with RCAs in place) may be lower due to the inaccessibility of these species by one or more gear groups.

Alternative 3, in each case, represents the more conservative end of the range and could be constraining on one or more fisheries. These alternatives would be the most likely to ensure that the Pacific cod and "Other Fish" OYs would not be exceeded inseason; however, these alternatives would not maximize utilization of these species. The GMT's recommended alternatives are:

Spiny Dogfish

Table 1. Limited Entry Trawl; Limited Entry Fixed Gear; Open Access

	Alt 1 (status quo)	Alt 2	Alt 3
Period 1	Status quo – unlimited (rule effective March 1, 2006)		
Period 2	Unlimited	150,000 lbs/2 mo	150,000 lbs/2 mo
Period 3	Unlimited	150,000 lbs/2 mo	150,000 lbs/2 mo
Period 4	Unlimited	100,000 lbs/2 mo	80,000 lbs/2 mo
Period 5	Unlimited	100,000 lbs/2 mo	80,000 lbs/2 mo
Period 6	Unlimited	100,000 lbs/2 mo	80,000 lbs/2 mo

Pacific Cod

Table 2. Limited Entry Trawl

	Alt 1 (status quo)	Alt 2	Alt 3
Period 1	Status quo – unlimited (rule effective March 1, 2006)		
Period 2	Unlimited	30,000 lbs/2 mo	30,000 lbs/2 mo
Period 3	Unlimited	70,000 lbs/2 mo	70,000 lbs/2 mo
Period 4	Unlimited	70,000 lbs/2 mo	70,000 lbs/2 mo
Period 5	Unlimited	70,000 lbs/2 mo	45,000 lbs/2 mo
Period 6	Unlimited	30,000 lbs/2 mo	30,000 lbs/2 mo

Table 3. Limited Entry Fixed Gear and Open Access

	Alt 1 (status quo)	Alt 2	Alt 3
Period 1	Status quo – unlimited (rule effective March 1, 2006)		
Period 2	Unlimited	1,000 lbs/2 mo	1,000 lbs/2 mo
Period 3	Unlimited	1,000 lbs/2 mo	1,000 lbs/2 mo
Period 4	Unlimited	1,000 lbs/2 mo	1,000 lbs/2 mo
Period 5	Unlimited	1,000 lbs/2 mo	1,000 lbs/2 mo
Period 6	Unlimited	1,000 lbs/2 mo	1,000 lbs/2 mo

Analysis of Alternatives

As noted in the Situation Summary, setting management measures for spiny dogfish and Pacific cod proactively addresses unanticipated participants in the open access fisheries, and the estimated amounts of targeted species harvest and potential bycatch of overfished rockfish. This concern is currently addressed through bycatch caps on canary and yelloweye rockfish that were established for the open access sector through emergency rule. If the Council ultimately decides to implement trip limits for spiny dogfish and Pacific cod for 2006, then the GMT would recommend that the bycatch caps for canary and yelloweye for the open access sector not be extended into 2006.

GMT Recommendations

1. Approve the management measure alternatives listed for spiny dogfish and Pacific cod for public review, with final adoption scheduled for the November Council meeting.

2. Defer the consideration of setting specifications (ABC and OY) for spiny dogfish until the 2009-2010 management cycle, following approval of a formal assessment in 2007.

PFMC
09/20/05

Agenda Item H.9.a
Supplemental Attachment 2
November 2005

DRAFT

Replaces

ENVIRONMENTAL ASSESSMENT

AND

REGULATORY IMPACT REVIEW

OF

MANAGEMENT MEASURES

FOR SPINY DOGFISH (*Squalus acanthias*) AND PACIFIC COD (*Gadus macrocephalus*)

November 2005

Prepared by
Washington Department of Fish and Wildlife and
National Marine Fisheries Service

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1.0 INTRODUCTION

1.1 How This Document is Organized

This document provides background information about, and analysis of, management measures for the spiny dogfish (*Squalus acanthias*) and Pacific cod (*Gadus macrocephalus*) fisheries covered by the Pacific Coast Groundfish Fishery Management Plan (FMP) and developed by the Pacific Fishery Management Council (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 assessment (EA), pursuant to the National Environmental Policy Act (NEPA) of 1969, as amended.

This document tiers from the environmental impact statement prepared for the 2005-2006 groundfish harvest specifications and management measures titled, "Proposed Acceptable Biological Catch and Optimum Yield Specifications and Management Measures for the 2005-2006 Pacific Coast Groundfish Fishery, Final Environmental Impact Statement including Regulatory Impact Review and Initial Regulatory Flexibility Analysis" (Council, October 2004) (hereafter, 2005-2006 Specs EIS). Federal regulations (40 CFR 1508.28) state "Tiering is appropriate when the sequence of statements or analyses is: (a) From a program, plan, or policy environmental impact statement to a program, plan, or policy statement or analysis of lesser scope or to a site-specific statement or analysis…." In this case, the tiered EA focuses on spiny dogfish and Pacific cod management measures for 2006 where the EIS covered harvest specifications and management measures for the entire Pacific Coast groundfish fishery during 2005-2006.

This document is organized so that it not only contains the analyses required under NEPA, but also 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 EA, 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.

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. (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. This EA is organized with Chapters 1 and 2 covering the purpose and need and describing 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 the following chapters:

- The rest of this chapter, Chapter 1, discusses the reasons for new federal management measures for spiny dogfish and Pacific cod fisheries beginning in 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.
- Chapter 3 describes the **affected environment**, including West Coast marine ecosystems and essential fish habitat (EFH), groundfish species, non-groundfish species, protected species and the socioeconomic environment.
- Chapter 4 describes the **predicted impacts of the alternatives** on the physical and biological environment. Chapter 4 also describes the socioeconomic environment and how it would be affected by the different alternatives.
- Chapter 5 provides information on those **laws and EOs**, in addition to NEPA, that an action must be consistent with, and how this action has satisfied those mandates.
- Chapter 6 addresses the **Regulatory Flexibility Act and EO 12866** (Regulatory Impact Review).
- Chapter 7 describes the **list of preparers** and the **bibliography**.

1.2 Purpose and Need for the Proposed Action

The proposed action falls within the management framework described in the Groundfish FMP, which enumerates objectives that management measures must satisfy (organized under three broad goals) and authorizes the range and type of measures that may be used to achieve optimum yield (OY). The management regime described in the Groundfish FMP is itself consistent with 10 National Standards described in the MSA. Management measures must be consistent with the goals, objectives, and management framework described in the Groundfish FMP (see Chapter 5.1).

1.2.1 The Proposed Action

The *proposed action*, evaluated in this document, is to establish management measures to constrain total fishing mortality to within harvest specifications for spiny dogfish and Pacific cod, and co-occurring species. These management measures will be established for the calendar year 2006, although they are considered within the context of past management and long-term sustainability of managed fish stocks. Separate harvest specifications (acceptable biological catch (ABC)/OY) are established for each year, 2005 and 2006; management measures like those considered in this EA are intended to keep total fishing mortality during each year within the ABC/OY established for that year. 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 harvests in 2006 to levels that will ensure the spiny dogfish and Pacific cod stocks, and co-occurring species, 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 spiny dogfish and Pacific cod are harvested within ABC/OY limits during 2006 and in a manner consistent with the aforementioned Groundfish FMP and National Standards Guidelines (NSGs) (50 CFR 600 Subpart D), using routine management tools available to the specifications and management measures process (FMP at 6.2.1, 50 CFR 660.370(c)). Chapter 5.1 of this EA describes how the proposed action (preferred alternative) is consistent with the FMP and MSA.

1.3 Background to Purpose and Need

For a background to overall groundfish management and the specifications process, refer to Chapter 1.3 of the 2005-2006 Specs EIS. A background to the purpose and need for spiny dogfish and Pacific cod follows.

Spiny dogfish and Pacific cod are considered "groundfish" and are managed under the Pacific Coast groundfish FMP. Recent harvest levels and the potential for new markets developing off the West Coast has highlighted the potential need for further management measures, such as trip limits, to control harvest of these species in 2006.

Both of these stocks have harvest specifications (also known as ABC/OY) set for 2005 and 2006. Pacific cod has it's own ABC/OY and spiny dogfish is included in the "other fish" ABC/OY. Under the groundfish FMP, Pacific cod and "other fish" is considered a Category 2 stocks, where the ABC is based on a nonquantitative assessment, average of past landings, or other qualitative information and a numerical OY, with a precautionary adjustment, is determined from the ABC.

The ABC levels for Pacific cod and "other fish" have been based on historical landings. When determining numerical OYs for individual species and species groups for which the ABC is based on a non-quantitative assessment, the Council may apply precautionary adjustments. Since 2000, the Council has adjusted the OYs for several unassessed stocks to 50 percent of the historical average catch levels. Although the ABCs for Pacific cod and "other fish" have been based on historical landings, precautionary adjustments were not used to establish OYs until the 2005-2006 biennial management cycle.

For 2005 and 2006, the OYs for Pacific cod and "other fish" were reduced based on a 50 percent precautionary adjustment. The OY for Pacific cod in both 2005 and 2006 is 1,600 mt, which represents the ABC (3,200 mt) with a 50 percent precautionary adjustment. In most years since the mid-1990s, less than 500 mt of Pacific cod have been landed. Recent harvest levels for the Canadian fishery have been set as low as 240 mt to allow for the stock to rebuild and have been combined with closed areas during the spawning season. During the 2005-2006 biennial groundfish specifications and management measures process, the Council considered recent harvest levels as well as harvest specifications established for what is believed to be the same Pacific cod stock in Canadian waters and recommended that an OY of 1,600 mt be adopted for Pacific cod. An OY of 1,600 mt was estimated to be adequate to accommodate recent landings, while not being so high as to encourage targeting. The OY for "other fish," including spiny dogfish, in both 2005 and 2006 is 7,300 mt, which represents the ABC (14,600 mt) with a 50 percent precautionary adjustment. The Council considered the recent landings, which ranged between approximately 2,500 mt in 1999 and 1,300 mt in 2002, prior to recommending that an OY of 7,300 mt be adopted for "other fish."

Neither Pacific cod nor spiny dogfish have ever been formally assessed on the West Coast. A formal stock assessment for West Coast spiny dogfish is recommended for the next assessment cycle (2007). Even in the absence of a formal assessment, life history information indicates that characteristics of the spiny dogfish (slow growing, late maturing, low fecundity) make it susceptible to overfishing. Dogfish populations have been depressed as a result of fishing in areas of Puget Sound and have been declared overfished off the East Coast. Pacific cod, on the other hand, is a transboundary stock with most of its biomass distributed north of the U.S.-Canada border. Pacific cod stocks are depressed off the West Coast of Canada.

Spiny dogfish is an important species to West Coast groundfish fisheries, primarily off the Washington coast, and fishermen and processors have worked aggressively to develop and maintain strong markets for this species. A number of trawl and longline fishers and at least one major processor are heavily dependent upon spiny dogfish. Pacific cod is harvested primarily in the limited entry trawl fleet north of 40°10' N. latitude.

In recent years, commercial fishermen targeting spiny dogfish have been constrained by their assumed bycatch of yelloweye and canary rockfish, two species considered by the Council to be overfished, and are managed under rebuilding plans. To provide protection for these overfished stocks, NMFS implemented rockfish conservation areas (RCAs), which are large areas closed to fishing with designated gear types. The boundaries of the RCAs change, depending upon the fishing period. The trawl RCA generally encompasses the area between 100 fms and 200 fms north of 40°10' N. latitude. The non-trawl RCA, which pertains to other gears, such as longline and pot fisheries, extends from the shore seaward to 100 fms year-round north of 40°10'N. latitude. The spiny dogfish fishery occurs around the 100-fathom isobath, and dogfish are targeted by both trawl and non-trawl gears. While there are limited entry programs in place for trawl and fixed gear, there is also an open access fishery, which is allowed to target groundfish with fixed gear.

Since effort is not limited, there is a potential to overharvest spiny dogfish and Pacific cod and/or exceed the projected bycatch associated with the fisheries inseason, even with the RCAs in place. To address the potential of exceeding the estimated amounts of canary and yelloweye rockfish bycatch, which was anticipated for the open access fishery in 2005, the NMFS adopted an emergency rule to set bycatch limits for the directed groundfish open access fishery. These limits were originally set at 1.0 mt for canary rockfish and 0.6 mt for yelloweye rockfish; these limits were raised inseason to 3.0 mt of each species, based on updated projections using NMFS West Coast Groundfish Observer Program data.

Given the life history characteristics of spiny dogfish and their status in other areas, the Council's Groundfish Management Team (GMT) recommended that the Council consider adopting harvest control regulations (i.e., trip limits), beginning in 2006. Given that a spiny dogfish assessment is likely to occur in 2007, the Council decided to set a separate ABC and OY for spiny dogfish following the next assessment cycle (i.e., for the 2009-2010 management period).

Neither stock has had management measures, such as trip limits, specified in the past. This is a potential management concern given the conservation issues of these stocks and, for Pacific cod, 2004 harvests that approached the 2005 OY off the West Coast.

1.4 Public Participation

Spiny dogfish and Pacific cod management are administered through the Pacific Fishery Management Council. At their June 2005 meeting, the Council requested that trip limits for spiny dogfish and Pacific cod be developed for initial consideration at their September 2005 meeting. The Council's Groundfish Management Team developed and analyzed trip limit alternatives for spiny dogfish and Pacific cod at their August and September 2005 meetings; these alternatives were discussed with the Council's Groundfish Advisory Subpanel and the public at the Council's September 2005 meeting. The Council and public will review these alternatives again at the November 2005 meeting, when the Council will consider final action on the alternatives.

Following the November Council meeting, the public will have an additional opportunity to review and comment on the alternatives when NMFS publishes the preferred alternative for review in the Federal Register.

Specification alternatives, including for Pacific cod and the "Other Fish" category, and proposals related to protection for overfished groundfish stocks underwent scoping through the Council's annual management process for groundfish, which began at the November 2003 Council meeting and continued with subsequent Council, Allocation Committee, Groundfish Management Team meetings and state-sponsored meetings through to the Council's June 2004 meeting. At its June 2004 meeting, the Council made final recommendations for 2005 and 2006 groundfish management and recommendations for management of fisheries targeting non-groundfish species that have the potential to incidentally harvest overfished groundfish species. A full description of the Council's scoping process, alternatives considered, and analyses of those alternatives is provided in the 2005-2006 Specs EIS.

1.5 Related National Environmental Policy Act (NEPA) Documents

Final EIS for the Proposed Acceptable Biological Catch and Optimum Yield Specifications and Management Measures for the 2005-2006 Pacific Coast Groundfish Fishery, October 2004 (2005-2006 Specs EIS). This EIS for the 2005-06 specifications and management measures discusses the full suite of optimum yield specifications and regulatory measures proposed to protect overfished groundfish species from directed and incidental harvest.

2.0 ALTERNATIVES, INCLUDING THE PROPOSED ACTION

At the June 2005 Council meeting, based on recommendations from the Groundfish Management Team (GMT), the Council decided to include on its September and November 2005 agendas, consideration of setting management measures (i.e., trip limits) for spiny dogfish and Pacific cod, which would be effective beginning in 2006. If adopted, changes to these trip limit amounts may occur through inseason adjustments, as well as being considered for the 2007-08 biennial groundfish specifications and management measures process.

Given the timing of the federal rulemaking process, it is unlikely that measures would be in place for the January 1, 2006, start date of the fishing year. Therefore, the alternatives considered by the Council and NMFS all have an implementation date of March 1, 2006, which is the beginning of the second two-month cumulative period (Period 2).

In general, the approach in developing the range of alternatives was to review the amount of fish needed to accommodate current harvest levels on a two-month cumulative basis. Alternatives were not structured to provide for higher harvest levels for future developing fisheries. If, in the future, there are markets and/or gears developed to allow new, targeted fisheries, then the Council and NMFS may consider liberalizing trip limits for different sectors, as appropriate.

2.1 Establish Trip Limits for Spiny Dogfish

Spiny dogfish is included in the ABC/OY for "Other Fish." Because there is not a separate ABC and OY for spiny dogfish, and given that this species is targeted by all commercial sectors—limited entry and open access, and both trawl and fixed gear—the Council and NMFS are not proposing differential trip limits by sector. Rather, the trip limits across Alternatives 2 and 3 are the same for all commercial sectors in all periods. Table 2.1 shows Alternatives 1 through 3 for spiny dogfish by two-month cumulative trip limit period. Period 1 is for January through February, Period 2 is for March through April, etc.

2.1.1 Spiny dogfish - Alternative 1 (status quo)

Alternative 1 (status quo) is unlimited amounts of spiny dogfish, which represents the high end of the range.

2.1.2 Spiny dogfish - Alternative 2

The GMT did trip frequency analyses for spiny dogfish using fish ticket data from the 2000-2004 fisheries. Alternative 2 represents trip limits that would accommodate practically all of the commercial fishing activity that occurred during this timeframe. Given that spiny dogfish would remain under the "Other Fish" category and would not have a separate OY, it is anticipated that the trip limits under Alternative 2 would result in nearly achieving, but not exceeding, the "Other Fish" OY. The GMT notes that the data reviewed include periods when the West Coast groundfish fisheries were not subject to RCAs; therefore, the resulting harvest levels in 2006 (with RCAs in place) may be lower due to the inaccessibility of these species by one or more gear groups.

2.1.3 Spiny dogfish - Alternative 3

Alternative 3 represents the more conservative end of the range and could be constraining on one or more fisheries. This alternative would be the most likely to ensure that the "Other Fish" OY would not be exceeded inseason; however, this alternative would not maximize utilization of this species.

Table 2.1. Spiny dogfish trip limit alternatives for the limited entry trawl, limited entry fixed gear, and open access fisheries coastwide.

	Alt 1 (status quo)	Alt 2	Alt 3
Period 1	Status quo – unlimited (rule effective March 1, 2006)		
Period 2	Unlimited	150,000 lbs/2 mo	150,000 lbs/2 mo
Period 3	Unlimited	150,000 lbs/2 mo	150,000 lbs/2 mo
Period 4	Unlimited	100,000 lbs/2 mo	80,000 lbs/2 mo
Period 5	Unlimited	100,000 lbs/2 mo	80,000 lbs/2 mo
Period 6	Unlimited	100,000 lbs/2 mo	80,000 lbs/2 mo

2.2 Establish Trip Limits for Pacific cod

While there is an OY for Pacific cod, the recent and historical landings are almost all trawl. A review of the 2000-2004 data indicates that a minimal trip limit (~ 1,000 lbs/2 mo.) would accommodate all of the limited entry fixed gear and open access landings. Therefore, the trip limits for limited entry fixed gear and open access remain static across Alternatives 2 and 3. These trip limits were developed to accommodate existing fisheries and are not intended to represent any long-term allocation among sectors. Table 2.2 shows Alternatives 1 through 3 for Pacific cod by two-month cumulative trip limit period.

2.2.1 Pacific cod - Alternative 1 (status quo)

Alternative 1 (status quo) is unlimited amounts of Pacific cod, which represents the high end of the range.

2.2.2 Pacific cod - Alternative 2

The GMT did trip frequency analyses for Pacific cod using fish ticket data from the 2000-2004 fisheries. Alternative 2 represents trip limits that would accommodate practically all of the commercial fishing activity that occurred during this timeframe. Because historical landings are higher by the trawl sector, trip limits for limited entry trawl are higher than limits for limited entry fixed gear and open access. It is anticipated that, if participation in the directed Pacific cod fishery remains at the current level, these trip limits would result in approaching, but not exceeding, the Pacific cod OY. The GMT notes that the data reviewed include periods when the West Coast groundfish fisheries were not subject to RCAs; therefore, the resulting harvest levels in 2006 (with RCAs in place) may be lower due to the inaccessibility of these species by one or more gear groups.

2.2.3 Pacific cod - Alternative 3

Alternative 3 represents the more conservative end of the range and could be constraining on one or more fisheries. Alternative 3 differs from Alternative 2 in the limited entry trawl trip limit for Period 5 (September-October) only. The trip limit for limited entry trawl during Period 5 is lower in Alternative 3. This alternative would be the most likely to ensure that the Pacific cod OY would not be exceeded inseason; however, this alternative would not maximize utilization of this species.

Table 2.2. Pacific cod trip limit alternatives for the limited entry trawl, limited entry fixed gear, and open access fisheries coastwide. (LET= limited entry trawl, LEFG= limited entry fixed gear, OA= open access)

	Alt 1 (status quo)	**Alt 2**		**Alt 3**	
	LET/LEFG/OA	LET	LEFG/OA	LET	LEFG/OA
Period 1	Status quo – unlimited (rule effective March 1, 2006)				
Period 2	Unlimited	30,000 lb/2 mo	1,000 lb/2 mo	30,000 lb/2 mo	1,000 lb/2 mo
Period 3	Unlimited	70,000 lb/2 mo	1,000 lb/2 mo	70,000 lb/2 mo	1,000 lb/2 mo
Period 4	Unlimited	70,000 lb/2 mo	1,000 lb/2 mo	70,000 lb/2 mo	1,000 lb/2 mo
Period 5	Unlimited	70,000 lb/2 mo	1,000 lb/2 mo	45,000 lb/2 mo	1,000 lb/2 mo
Period 6	Unlimited	30,000 lb/2 mo	1,000 lb/2 mo	30,000 lb/2 mo	1,000 lb/2 mo

3.0 AFFECTED ENVIRONMENT

This section describes the affected environment for the action addressed in this EA. Section 3.1 describes the marine ecosystem on the U.S. West Coast, including essential fish habitat. Section 3.2 describes the groundfish species affected by this action, including spiny dogfish and Pacific cod. Section 3.3 describes the nongroundfish species affected by this action and Section 3.4 describes the protected species covered by the Endangered Species Act, Marine Mammal Protection Act, and the Migratory Bird Treaty Act. Section 3.5 describes the socioeconomic environment.

3.1 West Coast Marine Ecosystems and Essential Fish Habitat

Appendix A, Section 2.3.1 of the 2005-2006 Specs EIS 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 fewer 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 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.

The MSA, as amended by the 1996 SFA, requires NMFS and federal fishery councils to describe EFH for the species they manage. They must also enumerate potential threats to EFH from both fishing and nonfishing 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 (NWR) is currently preparing an EIS to address this challenge. The completion date for this project is early 2006. In the 2005-2006 Specs EIS, 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. EFH must be identified for each life stage of each species in the fishery management unit. Thus, 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 Groundfish Species

There are over 80 species of groundfish managed under the Groundfish FMP. Management of these groundfish species is based on principles outlined in the MSA, Groundfish FMP, and NSGs, 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. In the 2005-2006 Specs EIS, 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 of the 2005-2006 Specs EIS depicts the latitudinal and depth distributions of groundfish species managed under the Groundfish FMP.

This section describes the groundfish species that may be directly or indirectly affected by the alternatives.

3.2.1 Spiny Dogfish

Spiny dogfish (*Squalus acanthias*) occur in temperate and subarctic latitudes in both the northern and southern hemispheres, ranging from the Bering Sea to Baja California (Allen & Smith 1988, Castro 1983, Eschmeyer et al. 1983). Dogfish tend to migrate in large schools, and can travel long distances, feeding avidly on their journeys (Bannister 1989). The schools, numbering in the hundreds, exhibit north-south coastal movements and onshore-offshore movements that are not completely understood (Castro 1983, Ferguson & Cailliet 1990, Lineaweaver & Backus 1984). The schools tend to divide up according to size and sex, although the young, both male and female, tend to stay together (Ferguson & Cailliet 1990, NOAA 1990). They also make diel migrations from near bottom during the day to near surface at night (NOAA 1990).

For the North Pacific and Bering Sea, Allen and Smith (1988) report that the spiny dogfish is an inner shelf-mesobenthal species with a depth range up to 900 m. From survey data, they determined that most dogfish inhabit waters 350 m. They occur from the surface and intertidal areas to greater depths (Allen & Smith 1988, Bannister 1989, Castro 1983, Lineaweaver & Backus 1984, NOAA 1990), and are common in estuaries, such as Puget Sound (Allen & Smith 1988) and San Francisco Bay (Ebert 1986), and in shallow bays from Alaska to central California (Eschmeyer et al. 1983). Small juveniles (< 10 years old) are neritic while subadults and adults are mostly sublittoral-bathyal. Subadults are found on muddy bottoms when not found in the water column. Known physical and chemical requirements are euhaline waters of 3.7-15.6°C, with a preferred range of 6-11°C (NOAA 1990).

Spiny dogfish are ovoviviparous, and fecundity is 1-26 eggs per female, per season (Castro 1983, Eschmeyer et al. 1983, Jones & Geen 1977a, NOAA 1990). Males mate annually after reaching sexual maturity at 11-19 years. Females reach sexual maturity at 23-35 years and mate biannually (Jones & Geen 1977a, NOAA 1990). Their gestation period last 18-24 months (usually 23 months), the longest of any vertebrate (Bannister 1989, Jones & Geen 1977a, Nammack et al. 1985, NOAA 1990, Pratt & Casey 1990). Females release their young during the spring in shallow waters (Jones & Geen 1977b, NOAA 1990). Small litters (4-7 pups) are common, but litter size may range from 2-20 pups. Newborn pups range in length from 20-23 cm (Castro 1983, Jones & Geen 1977a, Ketchen 1972, Lineaweaver & Backus 1984, NOAA 1990). Females live longer than males; the maximum age of females is about 70 years, compared with a maximum of 36 years for males (Bannister 1989, Castro 1983, Eschmeyer et al. 1983, Ferguson & Cailliet 1990, Jones & Geen 1977a, Ketchen 1972, Lineaweaver & Backus 1984, McFarlane & Beamish 1986, NOAA 1990). Spiny dogfish seem to be larger at the northern end of their range. Adults usually range in size from 75-103 cm, although they may reach a maximum size of 130 cm (10 kg) (Allen & Smith 1988, Bannister 1989, NOAA 1990). Their growth rate is 1.5-3.5 cm per year (Castro 1983, Ebert 1986). For defense purposes, spiny dogfish possess a strong spine in front of its two dorsal fins that is partially sheathed by toxic tissue (Castro 1983, Jones & Geen 1977a, NOAA 1990).

Spiny dogfish are carnivorous, opportunistic feeders (NOAA 1990). They are voracious predators that can be quite aggressive in pursuit of prey (Castro 1983, Eschmeyer et al. 1983, Ferguson & Cailliet 1990, Jones & Geen 1977b). They are important predators on many commercial fishes and invertebrates (NOAA 1990). Their diet consists primarily of fish and crustaceans, especially sandlance, herrings, smelts, cods, capelin, hake, ratfish, shrimps, and crabs. Fish become a more important dietary source as they grow larger (Castro 1983, Ferguson & Cailliet 1990, Jones & Geen 1977b, NOAA 1990). Other food items include worms, krill, squid, octopus, jellyfish, algae, and any carrion (Bannister 1989). Although most of their diet consists of pelagic prey, they also feed on benthic organisms (NOAA 1990). Based on occurrences, 55% of the diet of dogfish off British Columbia was teleosts, 35% crustaceans and 5% mollusks. The principal food items consisted of herring and euphausiids (Jones & Geen 1977b). Pelagic prey consisted of 80% of their diet and they consumed twice as much food in the summer as in the winter (Jones & Geen 1977b, NOAA 1990). They have few natural predators, except blue and tiger sharks and some marine mammals (Castro 1983, Jones & Geen 1977a, NOAA 1990).

3.2.2 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).

3.2.3 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 & Beamish 1983a, McFarlane & Beamish 1983b, NOAA 1990).

Adults are found as deep as 1,900 m, but are most abundant between 200 and 1,000 m (Beamish & McFarlane 1988, Kendall & Matarese 1987, Mason et al. 1983). Off southern California, sablefish were abundant to depths of 1500 m (MBC 1987). Adults and large juveniles commonly occur over sand and mud (McFarlane & 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 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 the yolk sac is absorbed, the age-0 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 & Yoklavich 1985, Mason et al. 1983). Older juveniles and adults inhabit progressively deeper waters. The best estimates indicate that 50% of females are mature at 5-6 years (24 inches), and 50% of males are mature at 5 years (20 inches).

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 & 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 Orca whales (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).

3.2.4 Yelloweye Rockfish

Yelloweye rockfish *(Sebastes ruberrimus)* range from the Aleutian Islands, Alaska to northern Baja California; they are common from central California northward to the Gulf of Alaska (Eschmeyer et al. 1983, Hart 1973, Love 1991, Miller & Lea 1972, O'Connell & Funk 1986). Yelloweye rockfish occur in water 25-550 m deep; 95% of survey catches occurred from 50 to 400 m (Allen & Smith 1988).

Yelloweye rockfish are bottom dwelling, generally solitary and sedentary, rocky reef fish, found either on or just over reefs (Eschmeyer et al. 1983, Love 1991, O'Connell & 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 & 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 & Carlile 1993).

Yelloweye rockfish are ovoviviparous and give birth to live young in June off Washington (Hart 1973). The age of first maturity is estimated at 6 years and all are estimated to be mature by 8 years (Echeverria 1987). Yelloweye rockfish can grow to 91 cm (Eschmeyer et al. 1983, Hart 1973). Males and females probably grow at the same rates (Love 1991, O'Connell & Funk 1986). The growth rate of yelloweye rockfish levels off at approximately 30 years of age (O'Connell & Funk 1986). Yelloweye rockfish can live to be 114 years old (Love 1991, O'Connell & Funk 1986). Yelloweye rockfish are a large predatory reef fish that usually feeds close to the bottom (Rosenthal et al. 1988). They have a widely varied diet, including fish, crabs, shrimps and snails, rockfish, cods, sand lances and herring (Love 1991). Yelloweyes 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).

3.2.5 Canary Rockfish

Canary rockfish (*Sebastes pinniger*) are found between Cape Colnett, Baja California, and southeastern Alaska (Boehlert 1980, Boehlert & Kappenman 1980, Hart 1973, Love 1991,Miller & Lea 1972, Richardson & Laroche 1979). There is a major population concentration of canary rockfish off Oregon (Richardson & Laroche 1979). Canary primarily inhabit waters 91-183 m deep (Boehlert & 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 tend to be more mobile than yelloweye rockfish and have been known to congregate in schools. Canary rockfish are most abundant above hard bottoms (Boehlert & 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 & Kappenman 1980, Richardson & Laroche 1979). Off California, canary rockfish spawn from November-March and from January-March off Oregon and, Washington, (Hart 1973, Love 1991, Richardson & 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 & 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 the dominant prey and the frequency of empty stomachs is lower (Boehlert et al. 1989).

3.3 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. See Appendix A, Chapter 3, of the 2005-2006 Specs EIS for more information on nongroundfish species and fisheries.

3.3.1 Pacific Halibut

The spiny dogfish and Pacific cod fisheries occasionally intercepts Pacific halibut, a prohibited species, because they are easily caught with trawl and longline gears. Pacific halibut (*Hippoglossus stenolepis*) range from the Hokkaido, Japan to the Gulf of Anadyr, Russia on the Asiatic Coast and from Nome, Alaska to Santa Barbara, California on the North American (Pacific) Coast. They are among the largest teleost fishes in the world, measuring up to 8 ft (2.4 m). With flat, diamond-shaped bodies, Pacific halibut are able to migrate long distances. However, most adults tend to remain on the same grounds year after year, making only a seasonal migration from the more shallow feeding grounds in summer to deeper spawning grounds in winter (IPHC 1998.)

The major spawning grounds for Pacific halibut are in the north Pacific Ocean within the Gulf of Alaska and Bering Sea (IPHC 1998.) During spawning, which generally occurs from November to March, halibut move into deep water, where the eggs are fertilized. The eggs develop into larvae and grow, drifting slowly upward in the water column. During development, the larvae drift great distances with the ocean currents around the northeast Pacific Ocean in a counterclockwise direction (IPHC 1998.) Young fish then settle to the bottom in the shallow feeding areas. Following two to three years in the nursery areas, young halibut generally countermigrate, moving into more southerly and easterly waters. Because the West Coast includes the southern most range of Pacific halibut and the major spawning grounds are north and west of this area, the population of halibut off the West Coast is significantly smaller than in other areas of its range. Pacific halibut reach maturity at approximately 8 years for males and 12 years for females. The average age of Pacific halibut in the West Coast commercial fishery was 9.6 lb in 1996 (IPHC 1998.)

Adult halibut are demersal, living on or near the bottom. They prefer water temperatures ranging from 3 to 8 degrees Celsius and are generally caught between 90 and 900 feet (27 and 274 m), but have been caught as deep as 1,800 ft (549 m) (IPHC 1998.) Adult halibut prey on cod, sablefish, pollock, rockfish, sculpins, flatfish, sand lance, herring, octopus, crab, and clams (IPHC 1998.) Adult halibut are not generally preyed upon by other species due to their size, active nature and bottom dwelling habits.

3.4 Protected Species

Protected species fall under three overlapping categories, reflecting four mandates: the Endangered Species Act (ESA), the Marine Mammal Protection Act (MMPA), the Migratory Bird Treaty Act (MBTA), and Executive Order 13186 on Responsibilities of Federal Agencies to Protect Migratory Birds. Chapter 5 in Appendix A of the 2005-2006 Specs EIS describes species that 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. 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.

ESA-listed species that may interact with spiny dogfish and Pacific cod 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 (USFWS).

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 USFWS 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.) Marine mammals, whose abundance falls below the optimum sustainable population, 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. Of the 25 marine mammal species known to occur of the West Coast, 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.

The USFWS is the primary federal agency responsible for seabird conservation and management. Four species found off the West Coast are listed under the ESA. In 2002, the USFWS 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 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 EO, Responsibilities of Federal Agencies to Protect Migratory Birds, (EO 13186), directs federal agencies to negotiate Memoranda of Understanding with the USFWS that would obligate agencies to evaluate the impact on migratory birds as part of any NEPA process. The USFWS 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 WCGOP (September 2001 through 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.) Over 60 seabird species occur off the West Coast. Three of these species—the shorttailed albatross, California brown pelican, and California least tern—are listed as endangered under the ESA. One species, the marbled murrelet, is listed as threatened.

3.5 Socioeconomic 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 the 2005-2006 Specs EIS.

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 sets overall OYs and allocates harvest limits 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, Hoh 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.

The socioeconomic environment section is subdivided into sub-sections, describing fishery management and fishery sectors for spiny dogfish and Pacific cod. Section 3.5.1 provides an overview of fisheries management for spiny dogfish and Pacific cod. Section 3.5.2-3.5.4 provides an overview of fishery sectors that catch spiny dogfish and Pacific cod as either a target species or incidentally.

3.5.1 Fisheries Management

Spiny dogfish and Pacific cod are included in Groundfish FMP, with implementing regulations set by NMFS for federal waters (from 3 to 200 miles offshore). Council has not reviewed nor adopted a formal stock assessment for spiny dogfish, therefore, dogfish fall under the "Other Fish" complex of the Groundfish FMP. The Other Fish stock complex contains all of the unassessed Groundfish FMP species that are neither rockfish (family *Scorpaenidae*) nor flatfish. These species include big skate, California skate, leopard shark, longnose skate, soupfin shark, spiny dogfish, finescale codling, Pacific rattail, ratfish, cabezon (north of the California-Oregon border at 42°N. lat.), and kelp greenling.

For many years, the Council and NMFS have taken a precautionary approach in managing unassessed and poorly assessed stocks and stock complexes. Specifically, for unassessed stocks, Council and NMFS have adjusted OYs to 50% of the historical average catch levels; for poorly assessed stocks, the Council has applied a 25% reduction to the assessment value. Council recently discovered that this adjustment had not been applied to Pacific cod and species in the "Other Fish" and "Other Flatfish" complexes. Council rectified this, beginning in 2005, and reduced the "Other Fish" OY from 14,600 mt (which is the ABC) to 7,300 mt and reduced the Pacific cod OY from 3,200 mt (which is the ABC) to 1,600 mt.

Beginning in 2002, the West Coast targeted dogfish fisheries, have been constrained by provisions to protect overfished rockfish species, primarily yelloweye rockfish and canary rockfish. In 2002, dogfish were prohibited for fixed gear (longline and pot) due to the assumed associated bycatch of yelloweye rockfish. (Note: Bycatch information was collected from fish ticket landings when yelloweye and canary catches were allowed as direct observer information was not available to determine an actual bycatch ratio in an exclusive dogfish fishery.) There are also no longline logbook data to determine the historical area of operation of the fishery. In 2003, the RCA for non-trawl (i.e., fixed gear) fisheries was implemented coastwide. North of 40°10' N. lat., where the longline dogfish fishery occurs, the current non-trawl RCA extends from the shoreline seaward to 100 fms, and the majority of the dogfish catch occurs just inside this closed area.

To date, limited bycatch data have been collected through the NMFS West Coast Groundfish Observer Program on fixed gear fisheries, and data on targeted dogfish fisheries (both longline and trawl) is even more sparse. Updated NMFS observer data enter the Council process annually in April for the previous January-August period, and NMFS has indicated that higher coverage levels on fixed gear fisheries is anticipated. However, even with higher coverage levels, as groundfish fisheries are constrained by their respective RCA boundaries, and fishers are prohibited from retaining overfished species, data collected from areas outside the RCA will become even more limited.

West Coast trawl and fixed gear groundfish fisheries occur coastwide, year-round; however, the targeted longline dogfish fishery has historically taken place between February and May, and primarily off the northern Washington coast. About 8-10 Washington-based longline fishers participate in the longline targeted dogfish fishery per year. Trawl vessels have historically targeted dogfish, and a few vessels will sporadically land dogfish throughout the year. There is one major processor, located in Bellingham, that is heavily dependent upon spiny dogfish. These fishers and this processor have worked aggressively to develop and maintain strong markets for dogfish, primarily overseas.

Pacific cod are primarily caught with trawl gear off Washington's northern coast.

3.5.2 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). 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, such as spiny dogfish and Pacific cod, 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.

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 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 midwater trawl gear. Since 1996, a portion of the U.S. whiting OY has been allocated to the Pacific Coast treaty tribes. 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.

In Appendix A of the 2005-2006 Specs EIS, 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.

A specific tribal allocation for spiny dogfish or Pacific cod has not been developed nor implemented. Tribal dogfish landings have been relatively insignificant from 1990 to present (see Table 3.1). For example, tribal landings of spiny dogfish were 1.2 mt in 2002, compared to 875.9 mt total West Coast landings (0.1% of total West Coast landings). Tribal landings of Pacific cod are generally higher than landings of spiny dogfish (see Table 3.1). Tribal Pacific cod landings were 58.3 mt in 2002, compared to 751.7 mt total West Coast landings (8% of total West Coast landings).

Table 3.1. Washington coastal tribal spiny dogfish landings (mt), 1990-2004, and Pacific cod landings (mt) 1995-2002. (Note: Years not listed for dogfish had zero to trace amounts of spiny dogfish landings.)

Year	Spiny dogfish Landings (mt)	Pacific cod Landings (mt)
1990	0.4	
1991	3.5	
1995		1.3
1996	2.5	0.7
1997		1.0
1998		2.2
1999	0.4	1.2
2000	2.8	2.1
2001		4.0
2002	1.2	58.3
2003	3.8	
2004	40.1	

3.5.3 Non-Tribal Commercial Fisheries

The non-tribal commercial fisheries include limited entry and open access fisheries and trawl and non-trawl gears. The non-tribal commercial fishery sectors are limited entry trawl, limited entry fixed gear, and open access. See 6.1.1-6.1.3 of Appendix A of the 2005-2006 Specs EIS for more information on these sectors.

Spiny dogfish are targeted by trawl and longline fisheries on the West Coast, and are generally limited by market availability. By far, the majority of the spiny dogfish fishing activity occurs in the International North Pacific Fisheries Commission (INPFC) Vancouver area (see Table 3.2). Pacific cod are also predominately caught in the Vancouver INPFC area. Pacific cod are caught with both line and trawl gear, with the majority being caught with trawl gear.

Table 3.2. Coastal spiny dogfish landings (mt) by INPFC area and gear type (setnet included with trawl for Monterey and Conception areas).

		Vancouver	Columbia	Eureka	Monterey	Conception	Total
1990	Longline	132	3	-	-	-	476
	Trawl	340	1	-	-	-	
1991	Longline	208	-	-	-	-	901
	Trawl	669	24	-	-	-	
1992	Longline	177	-	-	-	-	1094
	Trawl	868	47	-	1	1	
1993	Longline	416	-	-	-	-	1259
	Trawl	808	35	-	-	-	

1994	Longline	337	-	-	-	-	1392
	Trawl	959	96	-	-	-	
1995	Longline	7	-	-	-	-	366
	Trawl	316	43	-	-	-	
1996	Longline	53	-	-	-	-	250
	Trawl	182	15	-	-	-	
1997	Longline	82	-	1	-	3	425
	Trawl	335	4	-	-	-	
1998	Longline	-	-	-	-	-	458
	Trawl	405	50	1	1	1	
1999	Longline	44	-	-	-	-	495
	Trawl	406	32	1	7	5	
2000	Longline	318	-	-	-	-	625
	Trawl	279	19	1	6	2	
2001	Longline	218	-	-	-	-	566
	Trawl	334	11	-	1	2	
2002	Longline	409	-	-	-	-	875
	Trawl	439	11	-	16	-	
2003	Longline	237	-	-	-	-	443
	Trawl	195	-	-	1	10	
2004	Longline	225	-	-	-	-	404
	Trawl	145	8	-	20	6	

Source: PacFIN extraction 1/18/05

Non-tribal trawl and longline dogfish landings into Washington, by far, have made up the majority of the West Coast-wide dogfish landings, and have been a significant portion of the total coastwide landings, in recent years (Table 3.3).

Table 3.3. Non-tribal spiny dogfish longline landings (mt) into Washington, 2000-2004.

Year	Landings	% of Longline	% of Total
2000	268	84%	43%
2001	188	86%	33%
2002	376	92%	43%
2003	231	97%	52%
2004	205	91%	51%

3.5.4 Recreational Fisheries

Spiny dogfish are generally not targeted by sport fisheries on the West Coast. However, due to the voracious feeding nature of spiny dogfish, they tend to be caught incidentally in all recreational fisheries, and are generally considered a nuisance by anglers. Pacific cod are also not targeted by recreational anglers, though some incidental catch occurs, primarily off

Washington.

4.0 ENVIRONMENTAL CONSEQUENCES OF THE ALTERNATIVES

This section examines the environmental consequences that could be expected to result from adoption of each of the alternatives. As discussed in Chapter 1.0, Purpose and Need for Action, the purpose in and need for considering the actions analyzed in this document are to:

- Constrain commercial harvests in 2006 to levels that will ensure the spiny dogfish and Pacific cod stocks, and co-occurring species, 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

- Ensure spiny dogfish and Pacific cod are harvested within ABC/OY limits during 2006 and in a manner consistent with the aforementioned Groundfish FMP and NSGs, using routine management tools available to the specifications and management measures process.

Therefore, this section will consider the environmental effects of establishing trip limits for spiny dogfish and Pacific cod, beginning in 2006.

This section forms the analytic basis for the comparison of issues across the alternatives detailed in Chapter 2.0. The potential of each alternative to affect one or more components of the human environment is discussed in this section; direct and indirect effects of the alternatives are discussed in this analysis. Direct effects are caused by an action and occur at the same time and place as the action, while indirect effects occur later in time and/or further removed in distance from the direct effects (40 CFR 1508.27).

4.1 Physical Impacts of the Alternatives

Physical impacts generally associated with fishery management actions are effects resulting from changes in the physical structure of the benthic environment as a result of fishing practices (e.g. gear effects and fish processing discards). Although fishing activity has some affect on the physical environment, including the marine ecosystem and essential fish habitat, none of the alternatives to any of the issues detailed in this EA are expected to have notable or measurable effects on the physical environment, either individually or cumulatively. Establishing trip limits for spiny dogfish and Pacific cod is expected to maintain or slow the harvest rate from status quo (which is unlimited fishing, year-round); therefore, this action could result in neutral to potential positive effects on the physical environment.

4.2 Biological Impacts of the Alternatives

The biological impacts generally associated with fishery management actions are effects resulting from: 1) harvest of fish stocks that may result in changes in food availability to predators; 2) entanglement and/or entrapment of non-target organisms in active or inactive fishing gear; 3) major shifts in the abundance and composition of the marine community as a result of fishing pressure.

In this section, the alternatives in this EA are examined for their potential effects on the biological environment. The primary areas where the establishment of trip limits could affect the environment are the effects on: 1) the portion of the spiny dogfish and Pacific cod stocks occurring off the West Coast; 2) overfished groundfish stocks, particularly yelloweye and canary rockfish; and 3) protected species, particularly threatened and endangered salmon stocks and seabirds. However, since trip limits are proposed to limit the harvest rate from that which is possible under status quo (which is an unlimited, year-round fishery), the effects on these areas would likely be neutral to positive, rather than negative.

Table 4.1 Effects of the Alternatives on the Biological Environment

	Effects on Spiny Dogfish and Pacific cod Stocks	**Effects on Yelloweye and/or Canary Rockfish**	**Effects on Protected Species**
Alternative 1 (Status quo/No Action) No trip limits; unlimited harvesting year-round	Harvest may increase over time; may negatively impact stocks. Potential negative effects if future stock assessment shows spiny dogfish population low.	Status quo is not expected to have any change in effects on yelloweye or canary rockfish. Potential negative effects if harvest of target species continues to increase.	Status quo is not expected to have any change in effects on protected species.
Alternative 2 Establishment of trip limits that generally accommodate current harvest levels	Establishing trip limits is expected to slow down the harvest rate, and potential overall harvest above Alt. 1, which may have a neutral to positive effect. Potential negative effects if future stock assessment shows spiny dogfish population too low for trip limit levels.	Establishing trip limits is expected to have neutral to positive effects on yelloweye or canary rockfish.	Establishing trip limits is not expected to have neutral to positive effects on protected species.
Alternative 3 Establishment of more conservative trip limits that may be constraining	Establishing trip limits is expected to slow down the harvest rate, and potential overall harvest above Alt. 1 & 2, which may have a positive effect. Potential negative effects if future stock assessment shows spiny dogfish population low for trip limit levels.	Establishing trip limits is expected to have neutral to positive effects on yelloweye or canary rockfish.	Establishing trip limits is not expected to have neutral to positive effects on protected species.

4.2.1 Effects of the Alternatives on the Spiny Dogfish and Pacific cod

As discussed above in Chapter 3.0, the spiny dogfish and Pacific cod populations off the West Coast are a portion of the overall stock range. The Council sets annual harvest amounts for Pacific cod and for the "Other Fish" stock complex, which includes spiny dogfish. None of the alternatives considered within this EA are expected to have a negative effect on the amount of spiny dogfish and Pacific cod taken off the West Coast, when compared to the amounts that have been historically harvested. However, Alternative 1 may have a negative impact if harvest continues to expand over time and reaches levels that are unsustainable for the resource.

In addition, all of the alternatives, Alternatives 1 through 3, may have a negative effect on spiny dogfish if a future stock assessment shows the stock to be at levels that are too low to sustain harvest at current levels. Currently, the first stock assessment for this species is planned for 2007.

The alternatives consider the amount of dogfish that can be harvested in a two-month period, under current regulations (i.e., while adhering to the boundaries of the applicable RCA). Given the migratory nature of dogfish, which travel in large schools typically following feed, the locations of dogfish are somewhat unpredictable from year to year. Fishers who have historically targeted dogfish operate in a general area in which dogfish congregate during the early spring months (from mid-February through early May) which is around the 100-fm isobath. Since there is currently no trip limit established for dogfish, having trip limits in place could positively affect the spiny dogfish population off the West Coast.

4.2.2 Effects of the Alternatives on Yelloweye and Canary Rockfish

In recent years, fishermen have been constrained by their assumed bycatch of yelloweye and canary rockfish, two overfished species managed under rebuilding plans. To provide protection for these overfished stocks, seasonally-variable and gear-specific closed areas, or rockfish conservation areas (RCAs), have been implemented. The RCAs off the Washington coast generally encompass the area between 100-200 fm for trawl gears and 0-100 fm for limited entry and open access fixed gears.

Since effort is not limited, especially in the open access fishery, there is a potential to overharvest spiny dogfish and Pacific cod and/or exceed the projected bycatch associated with these fisheries, even with the RCAs in place. To address the potential of exceeding the estimated amounts of canary and yelloweye rockfish bycatch, which was anticipated for the open access fishery in 2005, the National Marine Fisheries Service (NMFS) adopted an emergency rule in early May to set bycatch limits for the directed groundfish open access fishery. These limits were originally set at 1.0 mt for canary rockfish and 0.6 mt for yelloweye rockfish, and subsequently raised inseason to 3.0 mt of each species, based on updated projections using NMFS West Coast Groundfish Observer Program data. If achieved, those bycatch caps could constrain other open access fisheries.

It is expected that the proposed trip limits in Alternatives 2 and 3 would represent a deterrent to large factory vessels to participate in the open access fishery. Under status quo, such unanticipated participation could result in overharvest of spiny dogfish and Pacific cod, as well as exceeding the estimated bycatch amounts of overfished species. It is anticipated that, if either Alternative 2 or 3 were selected, the Council could manage bycatch in the open access fishery by projecting amounts preseason, rather than continue the use of bycatch limits in 2006.

None of the alternatives are expected to have any measurable effects on yelloweye or canary rockfish, although Alternatives 2 and 3 may reduce bycatch from status quo. Both stocks are widely distributed off the West Coast of North America, with yelloweye rockfish occurring from the Aleutian Islands to Baja California and canary rockfish occurring from southeastern Alaska to Baja California. Establishing trip limits for spiny dogfish and Pacific cod, Alternatives 2 and 3, within a small portion of the ranges of both of these rockfish species should have little to no effect on the populations of either species; in any event, the effects are expected to be neutral to positive on the population of canary and yelloweye rockfish, as fishers may be constrained by the trip limit and may take fewer and/or shorter fishing trips as a result. Alternative 1 may have negative effects on canary and yelloweye rockfish if harvest of spiny dogfish and Pacific cod continues to increase over time.

4.2.3 Effects of the Alternatives on Protected Species

None of the alternatives are expected to have any measurable effects on protected species, including threatened or endangered salmon stocks, marine mammals and seabirds. Alternatives 2 and 3, establishing trip limits, may have slightly positive effects on protected species if it limits the time and effort spent fishing. Alternative 1 may have negative effects on protected species if harvest of spiny dogfish and Pacific cod continues to increase over time.

During the spring months when spiny dogfish are congregated in large schools, both wild and hatchery salmon stocks are found feeding off the northern West Coast, particularly fall run stocks, which are those runs of salmon that travel upriver to spawn in the fall. Establishing trip limits is not expected to have any measurable effects on salmon; the difference among the alternatives in their effects on salmon is not measurable and is expected to be negligible.

The alternatives would not alter the number of vessels participating in fisheries off theWest Coast; thus, neither of these alternatives is expected to have any measurable effects on West Coast seabirds. To the extent that the targeted dogfish and Pacific cod fisheries affect seabirds, the difference among the alternatives in how they affect seabirds is likely not measurable.

There is little data now available on the bycatch of seabirds in West Coast groundfish fisheries. However, the NMFS Northwest Fisheries Science Center is collecting information on bycatch of seabirds and other protected species as one component of its new observer program for the West Coast groundfish fisheries. This observer program began in August 2001 and, as the observer program develops a larger information base on groundfish fisheries interactions with seabirds, the agency will be better able to evaluate the effects of fisheries management changes on seabirds.

4.3 Socio-Economic Impacts of the Alternatives

The socio-economic impacts generally associated with fishery management actions are effects resulting from: 1) changes in harvest availability and processing opportunities that may result in unstable income opportunities; 2) changes to access privileges associated with license limitation and individual quota systems; 3) fishing season timing or structure restrictions that may improve or reduce the safety of fishing activity; 4) fishing season timing or structure restrictions that may or may not take into account the social and cultural needs of fishery participants. Of these elements, proposed alternatives and implementing regulations would not affect current access privileges.

In this section, alternative regulations are examined for their potential socio-economic effects. The primary areas where the alternatives could affect fishing industries and communities are: 1) on fishery participant safety; 2) on harvest and income opportunities; and, 3) on the costs to vessels of participating in the fishery. In addition to these industry and community effects, the alternatives could affect the management of the fishery and enforcement of regulatory measures. Table 4.2 details these effects in a matrix format.

Table 4.2 Effects of the Alternatives on the Socio-Economic Environment

	Effects on Fishery Participant Safety	**Effects on Harvest and Income Opportunities**	**Effects on Cost of Participating in Fishery**	**Effects on Management and Enforcement**
Alternative 1 (Status quo/No Action) No trip limits; unlimited harvesting year-round	Status quo is not expected to have any effect on vessel safety.	Status quo is not expected to have any change in effects on harvest and income opportunities.	Is not expected to have any effect on cost of participating in fishery	Status quo is not expected to have any effect on management or enforcement.
Alternative 2 Establishment of trip limits that generally accommodate current harvest levels	Is not expected to have any effect on vessel safety.	Fishing opportunity and incomes is not expected to vary from status quo as trip limits accommodate current harvest levels.	Is not expected to have any effect on cost of participating in fishery	Expected to effect enforcement by increasing the number of species with trip limits that need to be tracked for compliance and effect management of the groundfish fishery by increasing the number of species that need to be actively monitored and managed.
Alternative 3 Establishment of more conservative trip limits that may be constraining	Is not expected to have any effect on vessel safety.	Fishing opportunity and incomes may be slightly constrained for a few vessels in one or more fisheries.	Is not expected to have any effect on cost of participating in fishery	Expected to effect enforcement by increasing the number of species with trip limits that need to be tracked for compliance and effect management of the groundfish fishery by increasing the number of species that need to be actively monitored and managed.

4.3.1 Effects on Fishery Participant Safety

Alternative 2 establishes trip limits that accommodate current harvest levels and Alternative 3 establishes more conservative trip limits; however, both alternatives retain the current boundaries of the trawl and non-trawl RCAs. Because of this, access to fishing grounds is the same as under status quo. All of the alternatives are not expected to have any effect on vessel safety.

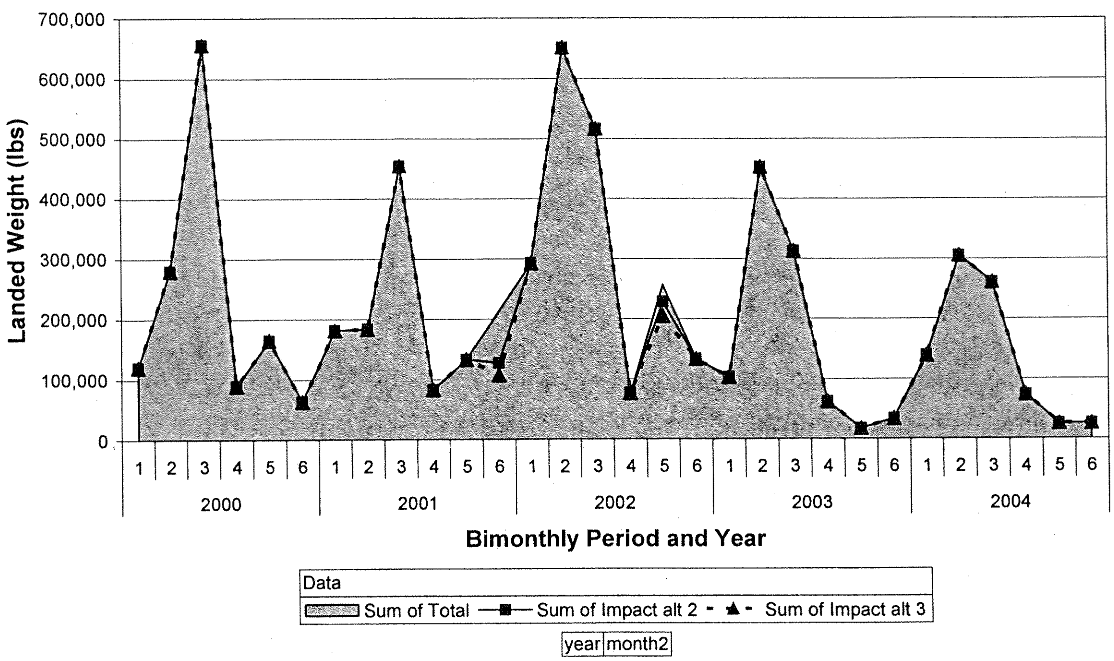
4.3.2 Effects on Fishery Participant Harvest and Income Opportunities

As Alternative 2 generally accommodates current harvest levels, it is not anticipated to have any effect on fishing harvest and income opportunities for those vessels that have historically targeted spiny dogfish and/or Pacific cod. Alternative 3 establishes more conservative trip limits, which may be constraining for a few vessels in one or more fisheries. New entrants in the open access fishery, especially larger factory vessels, may be constrained by both Alternatives 2 and 3.

Spiny Dogfish

Bimonthly limits for dogfish are designed to largely preserve current harvest levels while ensuring that excessive harvests do not take place that could result in increased take of co-occurring overfished species, or jeopardize the health of the spiny dogfish stock off the Pacific coast. In large part, both Alternative 2 and 3 preserve current harvest rates, though a small number of vessels are slightly constrained by these alternatives if past harvests are a reasonable estimate for future harvests. The figure below, Figure 4.1., shows past landings of spiny dogfish (shaded grey), and imposes bimonthly limits under Alternative 2 and 3 against those past harvests (the results are in black lines). This shows that only in the largest years do the alternatives constrain the fishery to a level that is less than what actually occurred, and the reduction in landings in this case is relatively minor.

Figure 4.1. **Landed Weight of Dogfish by Bimonthly Period, Year, and Alternative**

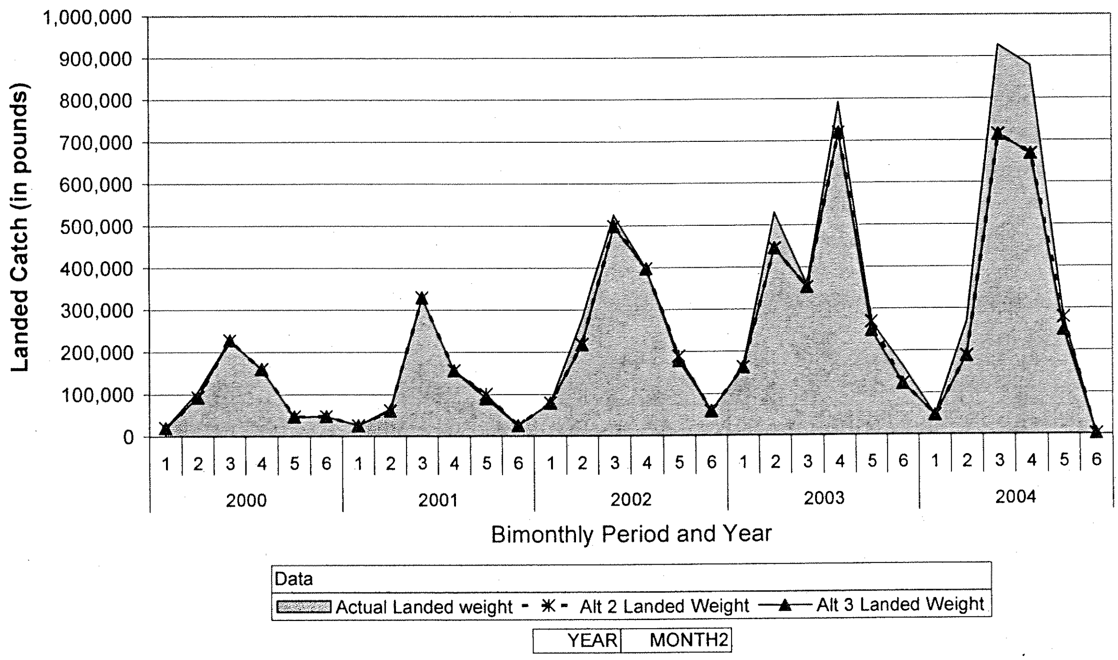


Pacific cod- Limited Entry Trawl Proposed Limits

Trip limit alternatives for Pacific cod are designed to largely preserve the current status of the fishery, but will constrain a small number of trawl vessels. By constraining the catch of some vessels, the OY for pacific cod is not expected to be exceeded and aggregate catch remains near status quo.

The figure below, Figure 4.2., shows the landings of Pacific cod made with trawl gear by year and two month period. It is evident from this figure that trawl landings of Pacific cod have been growing over the past several years (historic landings are in shaded grey). After imposing Alternative 2 and 3 cumulative limits upon historic landings, it is evident that the growth in landings stops or slows substantially (catch projections by each alternative are indicated with black lines). Both alternatives appear to achieve the goal of halting the growth of landings while maintaining historic revenues, but Alternative 3 is slightly more precautionary than Alternative 2, and slightly reduce catches in period 5 compared to Alternative 2.

Figure 4.2. **Landings of Pacific Cod with Trawl Gear by Alternative, Year, and Period**



The vessels and ports most impacted by Alternatives 2 and 3 are in the Puget Sound and Strait of Juan de Fuca area. Some vessels and ports in the northern Oregon area are also impacted, but to a lesser degree. The following tables, Tables 4.3 and 4.4, show landings and exvessel revenue of Pacific cod over the past several years, and measures those landings and revenues against what they would have been if Alternative 2 and 3 were in place during those years. This analysis assumes that future catch of Pacific cod will be similar to recent years.

Table 4.3. Trawl Gear Landings by Port Group, Year, and Alternative (units in lbs)

Port Group	YEAR	Actual Landed Weight	Landed Weight under Alt 2	Landed Weight under Alt 3
Puget Sound / Strait of Juan de Fuca	2000	581,765	568,928	568,928
	2001	626,502	622,152	611,609
	2002	1,447,586	1,359,718	1,349,289
	2003	1,623,381	1,562,100	1,465,815
	2004	1,141,896	790,779	782,834
WA Coast	2000	1,330	1,330	1,330
	2001	4,054	4,054	4,054
	2002	20,068	20,068	20,068
	2003	14,428	14,428	14,428
	2004	74,166	74,166	74,166
N Oregon	2000	24,899	24,899	24,899
	2001	70,472	70,472	70,472
	2002	59,198	59,198	59,198
	2003	616,840	592,916	592,916
	2004	1,175,676	1,022,088	999,628
S Oregon	2000	47	47	47
	2001	1,028	1,028	1,028
	2002	C	C	C
	2003	21,018	21,018	21,018
	2004	11,612	11,612	11,612
California	2000	C	C	C
	2001	30	30	30
	2002	C	C	C
	2003	1,258	1,258	1,258
	2004	103	103	103

C indicates data is restricted due to confidentiality

Table 4.4. Trawl Gear Exvessel Revenue by Port Group, Year, and Alternative (units in USD)

Port Group	YEAR	Actual Exvessel Rev	Exvessel Rev under Alt 2	Exvessel Rev under Alt 3
Puget Sound / Strait of Juan de Fuca	2000	270,512	265,103	265,103
	2001	309,461	307,373	302,222
	2002	731,578	687,120	681,906
	2003	798,021	774,686	726,544
	2004	542,645	374,706	370,574
WA Coast	2000	845	845	845
	2001	2,631	2,631	2,631
	2002	12,659	12,659	12,659
	2003	9,357	9,357	9,357
	2004	36,260	36,260	36,260
N Oregon	2000	14,978	14,978	14,978
	2001	40,947	40,947	40,947
	2002	34,181	34,181	34,181
	2003	369,694	356,745	356,745
	2004	564,298	493,108	482,311
S Oregon	2000	28	28	28
	2001	512	512	512
	2002	C	C	C
	2003	12,720	12,720	12,720
	2004	5,808	5,808	5,808
California	2000	C	C	C
	2001	20	20	20
	2002	C	C	C
	2003	795	795	795
	2004	52	52	52

C indicates data is restricted due to confidentiality

Both Alternative 2 and 3 constrain the majority of trawl vessels with a principal port of landing in the Puget Sound / Strait of Juan de Fuca area. In this area, both alternatives could potentially constrain 6 trawl vessels (see Table 4.5). The other area along the west coast where vessels may be constrained by proposed Pacific cod limits is in the northern Oregon coast area, though the portion of vessels that may be constrained by the proposed limits represents less than ten percent of the total number of boats landing Pacific cod where their principal port of landing is in that area.

Table 4.5. Number of Trawl Vessels Constrained by Alternative and Principal Port Group

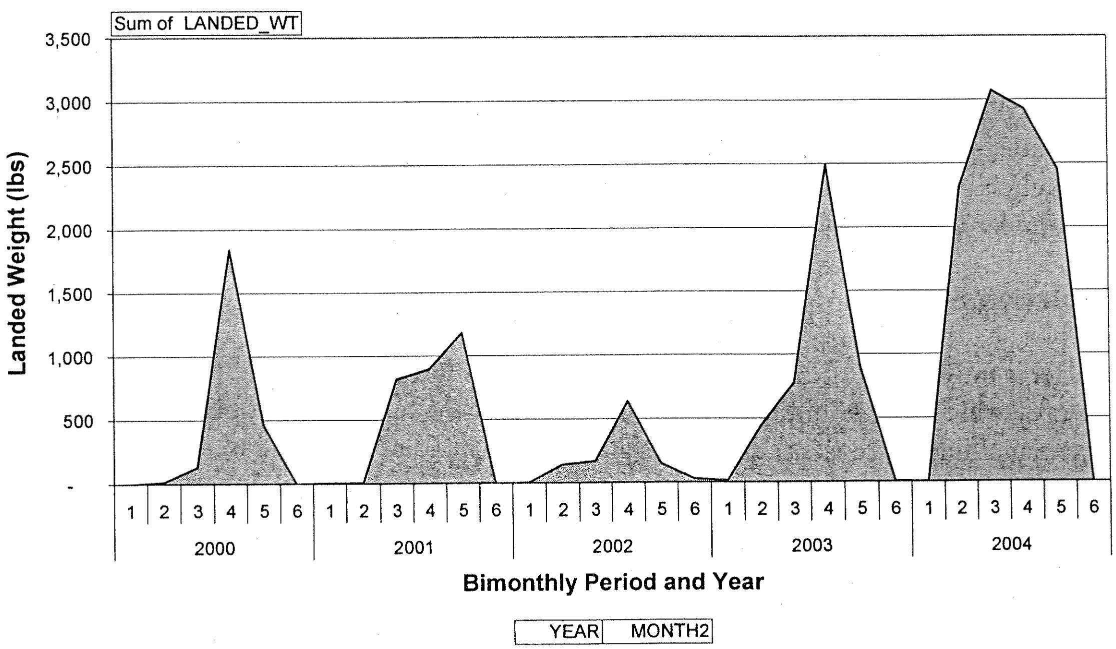
	Alt 2	Alt 3	Total Vessels Landing Pcod
Puget Sound / Strait of Juan de Fuca	6	6	9
WA Coast	0	0	8
N Oregon	3	4	46
S Oregon	0	0	8
California	0	0	5

Pacific cod- Fixed Gear Proposed Limits for Limited Entry and Open Access

Bimonthly limits proposed for fixed gear fisheries are designed to accommodate current fishing practices, but limit the growth of Pacific cod landings by vessels using fixed gear. Under the proposed Pacific cod limits for fixed gear, no vessels are expected to be constrained assuming past fishing practices are an indicator of future fishing practices. However, in the case that interest in Pacific cod grows or is growing, the proposed limits are designed to constrain the fishery to a level that prevents the OY from being exceeded.

In the figure below, Figure 4.3., it is evident that landings of Pacific cod have increased from 2002 – 2004, though these landings are minor compared to trawl landings. The proposed limits are designed to allow the fishery to continue landing Pacific cod at a level similar to 2004, but some modest growth may still occur if proposed limits are met.

Figure 4.3. Landings of Pacific Cod with Fixed Gear by Year and Period



4.3.3 Effects on Cost of Participating in the Fishery

Costs of participating in this fishery are not expected to change under the different alternatives.

4.3.4 Effects on Management and Enforcement

Under the current management regime, Council adopts annual OYs for groundfish stocks and stock complexes managed under the Groundfish FMP. Using the NMFS observer data and catch data from other sources (e.g., state-sponsored EFPs, NMFS triennial trawl survey, and independent research efforts), the Council's Groundfish Management Team develops and recommends management measures for the commercial and recreational directed groundfish fisheries. Management measures are typically based on bycatch assumptions of overfished rockfish, so as to not exceed a rebuilding OY for an overfished stock.

Routine monitoring of the fishing fleet is used to ensure that vessel operators comply with fisheries regulations. Traditional monitoring techniques include the monitoring of fisheries from air and surface craft, observer programs and analysis of catch records and vessel logbooks. The efficiency of these surveillance techniques can be dramatically enhanced by the addition of vessel monitoring systems (VMS). VMS is a tool that is commonly used to monitor vessel activity in relationship to geographically defined management areas where fishing activity is restricted. VMS transmitters installed aboard each vessel automatically determine the vessel's location and transmit that position to a processing center via a communication satellite where the information is validated and analyzed before being disseminated for fisheries management, surveillance and enforcement purposes. Transmitters are designed to be tamper resistant and automatic. All alternatives require the enforcement of area restrictions, depicted by a series of waypoints. Currently, VMS is required on all limited entry vessels, but not open access vessels. The Council is addressing expanded VMS coverage to apply to one or more of the open access sectors.

Alternatives 2 and 3 are expected to effect enforcement by increasing the number of species with trip limits that need to be tracked for compliance. Alternatives 2 and 3 are also expected to similarly effect management of the groundfish fishery by increasing the number of species that need to be actively monitored and managed. Alternative 1, status quo, is not expected to change the effect on enforcement and management.

4.4 Cumulative Effects

Cumulative effects must be considered when evaluating the alternatives considered in the EA. Cumulative impacts are those combined effects on quality of the human environment that result from the incremental impact of the action when added to other past, present, and reasonably foreseeable future actions, regardless of what Federal or non-Federal agency or person undertakes such other actions (40 CFR 1508.7, 1508.25(a), and 1508.25(c)).

Potential direct and indirect effects of the alternatives being considered are detailed above and summarized in Tables 4.1 and 4.2.

Of the past, proposed, and reasonably foreseeable future actions that are expected to also affect these same waters, the most notable is the action to implement Pacific Coast groundfish fishery management measures for 2006. Fishing for spiny dogfish and Pacific cod occurs in the same waters and affects the same habitats as fishing for other Pacific Coast groundfish species. The effects of the 2006 groundfish specifications and management measures have been described and analyzed by Council staff in an Environmental Impact Statement (completed in October 2004). Actions considered in this EA on spiny dogfish and Pacific cod management are not expected to have effects on the environment that, when considered in combination with groundfish specifications and management measures, measurably alter the effects of the groundfish specifications and management measures. The alternatives are intended to keep spiny dogfish and Pacific cod management compatible with groundfish management of similar commercial fisheries. Trip limits considered in this document are primarily intended to manage the harvest rate of spiny dogfish and Pacific cod and to protect overfished groundfish species.

5.0 OTHER APPLICABLE LAW

5.1 Consistency with the Groundfish FMP and MSA National Standards

5.1.1 FMP Goals and Objectives

The Groundfish FMP goals and objectives are listed below. The way in which the management measures for spiny dogfish and Pacific cod address 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 Alternatives employ 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 WCGOP (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 VMS was implemented at the beginning of 2004, providing real-time location information for participating vessels.

> Objective 2. Adopt harvest specifications and management measures consistent with resource stewardship responsibilities for each groundfish species or species group.

Management measure alternatives are intended to constrain total fishing mortality at or below the OY.

> 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.

Overfished species are subject to rebuilding plans published in the Groundfish FMP. The alternatives may affect incidental harvest levels of overfished species, but are not expected to cause effects beyond those that are already accounted for in the groundfish fishery.

> <u>Objective 4</u>. 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.

> <u>Objective 5</u>. 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 alternatives are not expected to change any impacts from the groundfish fishery on EFH.

<u>Economics</u>.

> <u>Objective 6</u>. 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 under each alternative would be the best way to compare net benefits. 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, the best economic use of resources in the future cannot be predicted.

> <u>Objective 7</u>. Identify those sectors of the groundfish fishery for which it is beneficial to promote yearround 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. 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.

None of the alternatives consider additional gear restrictions. The alternatives are structured according to different gears used to target spiny dogfish and Pacific cod.

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.

Trip limits under all the alternatives are set through model projections that include estimated bycatch, based on data derived from the WCGOP. 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.

The Council process facilitates input from resource user groups, state and federal agencies, and the general public. This promotes the formulation of management measures that should 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.

The alternatives do notsubstantially change harvest from status quo levels for spiny dogfish and Pacific cod. However, they may limit future harvest levels from the current status quo.

> Objective 16. Avoid unnecessary adverse impacts on small entities.

Chapter 6 evaluates the impact of the proposed action on small entities, as required by the Regulatory Flexibility Act. The alternatives are not predicted to result in adverse impacts to 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.

The impacts of all the alternatives on communities are evaluated in Chapter 4. All of the alternatives allow continued fishing opportunity.

> Objective 18. Promote the safety of human life at sea.

These alternatives do not affect safety.

5.1.2 National Standards

An FMP or plan amendment and any pursuant regulations must be consistent with ten national standards contained in the MSA (§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 management measures being proposed, trip limits for spiny dogfish and Pacific cod, are intended to keep harvest of these species at or near current harvest levels. For Pacific cod, this is intended to attain the OY, without exceeding it on a continuing basis. For spiny dogfish, this *is intended to prevent increased effort in the fishery until a stock assessment can inform management decisions. In addition, trip limits for both species are intended to limit the effects of these fisheries on overfished species.*

> National Standard 2 states that conservation and management measures shall be based on the best scientific information available.

Trip limits under all the alternatives are set through model projections that include estimated bycatch, based on data derived from the WCGOP. This provides the best estimates of total fishing-related mortality and bycatch currently available.

> 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 multispecies 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, landings of many species in groundfish fisheries were not recorded individually. Nongroundfish fisheries also may not report incidental groundfish catches at the species level.

This limits the amount of time-series data available for individual species stock assessments. However, whenever possible individual stocks are assessed. 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.

> 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 response, the Council and NMFS implemented a fixed gear permit stacking program through Amendment 14 to the FMP. NMFS has also completed a trawl vessel buyback program to reduce the size of the limited entry fleet. Additionally, the Council has begun to explore the potential for individual quotas, in part, as a means of providing regulatory flexibility and economically viable fishing communities.

> 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.

> 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 VMS, 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.

The impacts of all the alternatives on communities are evaluated in Chapter 4. All of the alternatives allow continued fishing opportunity. The 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. Trip limits under all the alternatives are set through model projections that include estimated bycatch, based on data derived from the WCGOP. This provides the best estimates of total fishing-related mortality and bycatch currently available.

> National Standard 10 states that conservation and management measures shall, to the extent practicable, promote the safety of human life at sea.

None of the alternatives effect safety.

5.2 Endangered Species Act

Section 7(a)(2) of the Endangered Species Act, as amended, requires that federal agencies "shall, in consultation with and with the assistance of the Secretary [of Commerce or Interior], insure that any action authorized, funded, or carried out by such agency ... is not likely to jeopardize the continued existence of any endangered species, or result in the destruction or adverse modification of habitat of such species...." Based on this section of the law (Section 7), action agencies consult with NMFS (for marine species) or FWS (for terrestrial and freshwater species) in cases where a "major construction activity" (which is considered equivalent to the "major federal action" standard under NEPA) could "jeopardize the continued existence" of an endangered species. For fishery management actions in federal waters, NMFS is both the action and consulting agency (although different divisions fulfill these two roles.) Consultations can begin informally, through "phone contacts, meetings, conversations, letters, project modifications and concurrences..." {USFWS and NMFS, 1998 #557}. During consultations, if the lead agency is informed that listed species or critical habitat may be present in the action area, it prepares a biological assessment to disclose the likely adverse effects. This EA contains the information necessary for a biological assessment of the effects of the proposed action on ESA-listed species occurring in the action area. If the action agency determines that the proposed action may affect listed species or designated critical habitat, formal consultation is required. The consulting agency (in this case, NMFS) must issue a Biological Opinion (or BiOp) within 135 days of the initiation of formal consultation. The BiOp may contain "reasonable and prudent measures" that the action agency must implement (in addition to any proposed mitigation) to ensure the proposed action does not jeopardize the continued existence of the species in question. (These may be referred to as "no jeopardy standards." The Council manages ocean salmon fisheries in part based on such standards for listed salmon species.)

The proposed alternatives do not constitute an action that may affect endangered/threatened species listed under the Endangered Species Act (ESA) or their habitat within the meaning of the regulations implementing Section 7 of the ESA.

5.3 Marine Mammal Protection Act

The Marine Mammal Protection Act (MMPA) of 1972 and the ESA are the principle federal laws guiding 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, seals, sea lions, and fur seals while the FWS is responsible for walrus, sea otters, and the West Indian manatee.

Section 118 of the MMPA requires that NMFS publish, at least annually, a list of fisheries placing all U.S. commercial fisheries into one of three categories describing the level of incidental serious injury and mortality of marine mammals in each fishery, with Category I having the highest level of injury and mortality. Definitions of the fishery classification criteria for Categories I, II, and III fisheries are found in the implementing regulations for section 118 of the MMPA (50 CFR part 229.) Groundfish longline fisheries off the West Coast are considered Category III fisheries, where the annual mortality and serious injury of a stock by the fishery is less than or equal to 1% of the PBR level.

Under the MMPA, marine mammals whose abundance falls below the optimum sustainable population level (usually regarded as 60% of carrying capacity or maximum population size) can be listed as "depleted." Populations listed as threatened or endangered under the ESA are automatically depleted under the terms of the MMPA. Currently off the West coast of the United States, the Stellar sea lion (*Eumetopias jubatus*) Eastern stock, Guadalupe fur seal (*Arctocephalus townsendi*), and the Southern sea otter (*Enhydra lutris*) California stock are listed as threatened under the ESA and the sperm whale (*Physeter macrocephalus*) WOC stock, humpback whale (*Megaptera novaeangliae*) WOC-Mexico stock, blue whale (*Balaenoptera musculus*) Eastern north Pacific stock, and Fin whale (*Balaenoptera physalus*) WOC 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.

Based on its Category III status, incidental takes of these protected species in the spiny dogfish and Pacific cod fisheries are well under their annual PBR levels. None of the proposed alternatives, discussed above, are likely to affect the incidental mortality levels of species protected under the MMPA.

5.4 Migratory Bird Treaty Act and EO 13186

The Migratory Bird Treaty Act (MBTA) of 1918 was enacted 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 in the longline groundfish fishery does occur.

Executive Order 13186 (Responsibilities of Federal Agencies to Protect Migratory Birds) supplements the MBTA by requiring Federal agencies to work with the U.S. Fish and Wildlife Service to develop memoranda of understanding (MOU) to conserve migratory birds. NMFS is scheduled to implement its MOU by January 2003. The protocols developed by this consultation will guide agency regulatory actions and policy decisions in order to address this conservation goal. EO 13186 also directs agencies to evaluate the effects of their actions on migratory birds in environmental documents prepared pursuant to the National Environmental Policy Act.

The proposed alternatives are not expected to increase the incidental take of seabirds.

5.5 Paperwork Reduction Act

In response to public complaints about the burden of federal paperwork, the Paperwork Reduction Act (PRA) and its implementing regulations require federal agencies to obtain clearance from the OMB if they plan to collect information from the public. Collecting facts and opinions from ten or more people, by means of a survey for example; requiring individuals to provide information to the general public or to some third party; requiring items (e.g., boxes of fish, fishing gear) or vessels to be labeled or marked; or using technological methods to monitor public compliance with government requirements, including automated collection techniques such as VMS, are all covered by the law and regulations.

The PRA requires agencies to compile an Information Collection Budget (ICB), the total burden the agency will be placing on the public, and to obtain OMB clearance by submitting an OMB-83I form (Paperwork Reduction Act Submission) and a supporting statement. The ICB is submitted annually and lists all new information collecting the agency plans for the upcoming fiscal year. As part of the ICB, for each planned collection the agency must describe the purpose of the collection, the approximate number of respondents, and the estimated time taken per respondent. If a proposed rule contains an information collection requirement needing clearance under the PRA, a clearance request needs to be submitted to OMB on or before the date the proposed rule is published in the Federal Register. Once OMB receives the request, it has 60 days to review and act on it.

None of the proposed alternatives contain a collection of information and are, therefore, not subject to the requirements of the Paperwork Reduction Act, 44 U.S.C. 3501 et seq.

5.6 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 proposed action is consistent to the maximum extent practicable with applicable State coastal zone management programs. This determination has been submitted to the responsible state agencies for review under section 307(c)(1) of the CZMA by forwarding a copy of this EA to each of the relevant state agencies.

5.7 EO 12898 (Environmental Justice)

Executive Order 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 analysis associated with an action. NOAA guidance, NAO 216-6, at '7.02, states that "consideration of E.O. 12898 should be specifically included in the NEPA documentation for decision-making purposes." Agencies should also encourage public participation, especially by affected communities 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 factor 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 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.

The proposed alternatives are not expected to affect minority and low-income communities. West Coast groundfish tribes are part of the Council's decision-making process on groundfish management issues and tribes with treaty rights to salmon, groundfish, or halibut have a seat on the Council. None of the proposed alternatives affect the timing or management flexibility of any of the tribal fisheries for groundfish.

5.8 EO 13132 (Federalism)

Executive Order 13132 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 Executive Order 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 and IPHC processes offer 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.

None of the proposed alternatives would have federalism implications subject to EO 13132.

5.9 EO 13175 (Consultation and Coordination with Indian Tribal Governments)

Executive Order 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 on Indian tribes.

The Secretary of Commerce recognizes the sovereign status and co-manager role of Indian tribes over shared Federal and tribal fishery resources. At '302(b)(5), the Magnuson-Stevens Fishery Conservation and Management 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 that the four Washington Coastal Tribes (Makah, Quileute, Hoh, and Quinault) have treaty rights to fish for groundfish. Each of the treaty tribes has the discretion to administer their fisheries and to establish their own policies to achieve program objectives. Accordingly, tribal groundfish allocations and regulations have been developed in consultation with the affected tribe(s) and, insofar as possible, with tribal consensus.

6.0 REGULATORY FLEXIBILITY ACT AND EO 12866

In order to comply with Executive Order (EO) 12866 and the Regulatory Flexibility Act (RFA), this document also serves as a Regulatory Impact Review (RIR).

6.1 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, they should choose those approaches that maximize net benefits to society.

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 that the benefits of the intended regulation justify the costs. In reaching its decision, the 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, including any changes to West Coast groundfish management. 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, including a description of the management objectives, description of the fishery, statement of the problem, description of the alternatives and economic analysis, and have, therefore, been combined in this document.

The proposed alternatives are not a significant action according to EO 12866. This action will not have a cumulative effect on the economy of $100 million or more nor will it result in a major increase in costs to consumers, industries, government agencies, or geographical regions. No significant adverse impacts are anticipated on competition, employment, investments, productivity, innovation, or competitiveness of U.S.-based enterprises. The gross revenues generated from dogfish fisheries coastwide are not expected to differ substantially as a result of the proposed alternatives.

6.2 Regulatory Flexibility Act

The RIR is also designed to determine whether the proposed rule has a "significant economic impact on a substantial number of small entities" under the Regulatory Flexibility Act. The Regulatory Flexibility Act (RFA), 5 U.S.C. 603 et seq., requires government agencies to assess the effects that various 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 (SBA) if it has annual receipts not in excess of $3.0 million. For related fish-processing businesses, a small business is one that employs 500 or fewer persons. For marinas and charter/party boats, a small business is one with annual receipts not in excess of $5.0 million. All of the businesses that would be affected by this action are considered small businesses under SBA guidance.

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 that 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."

Proposed alternatives will affect directed non-tribal commercial fisheries off the northern coast of Washington. The proposed alternatives are insignificant and are expected to result in either no impact at all, or a modest increase in access to spiny dogfish fishing areas for commercial fishermen and operators. These changes do not include any reporting or recordkeeping requirements. These changes will also not duplicate, overlap or conflict with other laws or regulations. Consequently, these alternatives are not expected to meet any of the RFA tests of having a "significant" economic effect on a "substantial number" of small entities. Therefore, a regulatory flexibility analysis was not prepared.

7.0 LIST OF PREPARERS AND BIBLIOGRAPHY

7.1 List of Preparers

Michele Culver and Brian Culver, WDFW, provided fishery-specific data and background information, with administrative oversight and contributions from Merrick Burden and Jamie Goen, NMFS.

This EA/RIR was prepared in coordination and consultation with the National Marine Fisheries Service, Pacific Fishery Management Council, the Northwest Indian Fisheries Commission, the California Department of Fish and Game, and the Oregon Department of Fish and Wildlife.

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Agenda Item H.9.b
Supplemental GAP Report
November 2005

GROUNDFISH ADVISORY SUBPANEL REPORT ON MANAGEMENT MEASURES FOR SPINY DOGFISH AND PACIFC COD FOR 2006

The Groundfish Advisory Subpanel (GAP) heard a presentation from Ms. Michele Culver of the Groundfish Management Team (GMT), on the proposals to regulate spiny dogfish and Pacific cod through trip limits in the limited entry and open access fisheries and has the following comments.

Pacific Cod
The GAP supports the GMT preferred alternatives for Pacific cod (Alternative 2 for Limited Entry Trawl and Alternative 2 for Limited Entry Fixed Gear and Open Access).

Spiny Dogfish
The GAP supports the GMT preferred alternative (Alternative 2) with one exception. For Period 2, the limit should be increased to 200,000 lbs for two months. The limit proposed by the GMT actually constrains some vessels which have documented landings of more than 150,000 lbs during the two month period.

PFMC
11/02/05

GROUNDFISH MANAGEMENT TEAM REPORT ON MANAGEMENT MEASURES FOR SPINY DOGFISH AND PACIFIC COD FOR 2006

This summer, the Groundfish Management Team (GMT) raised concerns regarding the management of two West Coast groundfish managed under the Groundfish Fishery Management Plan—spiny dogfish and Pacific cod. The GMT believes current harvest controls are inadequate to effectively manage these species and recommends the Council adopt management measures for 2006 fisheries. Again, as noted in the September GMT report, it is our understanding that these management measures would have an implementation date of March 1, 2006; therefore, all of the proposed trip limits begin in Period 2 across all alternatives. The alternatives that were approved for public review are:

Spiny Dogfish

Table 1. Limited Entry Trawl; Limited Entry Fixed Gear; Open Access

	Alt 1 (status quo)	Alt 2	Alt 3
Period 1	Status quo – unlimited (rule effective March 1, 2006)		
Period 2	Unlimited	150,000 lbs/2 mo	150,000 lbs/2 mo
Period 3	Unlimited	150,000 lbs/2 mo	150,000 lbs/2 mo
Period 4	Unlimited	100,000 lbs/2 mo	80,000 lbs/2 mo
Period 5	Unlimited	100,000 lbs/2 mo	80,000 lbs/2 mo
Period 6	Unlimited	100,000 lbs/2 mo	80,000 lbs/2 mo

Pacific Cod

Table 2. Limited Entry Trawl

	Alt 1 (status quo)	Alt 2	Alt 3
Period 1	Status quo – unlimited (rule effective March 1, 2006)		
Period 2	Unlimited	30,000 lbs/2 mo	30,000 lbs/2 mo
Period 3	Unlimited	70,000 lbs/2 mo	70,000 lbs/2 mo
Period 4	Unlimited	70,000 lbs/2 mo	70,000 lbs/2 mo
Period 5	Unlimited	70,000 lbs/2 mo	45,000 lbs/2 mo
Period 6	Unlimited	30,000 lbs/2 mo	30,000 lbs/2 mo

Table 3. Limited Entry Fixed Gear and Open Access

	Alt 1 (status quo)	Alt 2	Alt 3
Period 1	Status quo – unlimited (rule effective March 1, 2006)		
Period 2	Unlimited	1,000 lbs/2 mo	1,000 lbs/2 mo
Period 3	Unlimited	1,000 lbs/2 mo	1,000 lbs/2 mo
Period 4	Unlimited	1,000 lbs/2 mo	1,000 lbs/2 mo
Period 5	Unlimited	1,000 lbs/2 mo	1,000 lbs/2 mo
Period 6	Unlimited	1,000 lbs/2 mo	1,000 lbs/2 mo

In preparation for the September GMT report, the GMT did trip frequency analyses for both spiny dogfish and Pacific cod using fish ticket data from the 2000-2004 fisheries. The GMT's approach in developing the range of alternatives was to review the amount of fish needed to accommodate current harvest levels on a two-month cumulative basis. We did not structure alternatives to provide for higher harvest levels for future developing fisheries, as these proposals are for the 2006 fishing year only.

In each case, Alternative 2 represents trip limits, which could accommodate practically all of the commercial fishing activity that occurred during this time period. It is anticipated that, if participation in these fisheries remain at the current level, these trip limits would result in approaching, but not exceeding, the Pacific cod optimum yield (OY). Therefore, the GMT recommends the Council adopt Alternative 2, in each case, for spiny dogfish and Pacific cod.

The GMT tribal representative indicated that the coastal treaty tribes have requested from the National Marine Fisheries Service a specific set aside of the Pacific cod OY on the order of 300-400 mt to accommodate the tribal fisheries. The GMT notes that the tribal harvest of Pacific cod was 254 mt in 2003 and 350 mt in 2004, which is a substantial portion of the harvest off the northern Washington coast. Currently, this tribal harvest is accounted for in the overall OY, which is shared by tribal and non-tribal fisheries. If approved, the tribal set aside would need to be subtracted from the overall OY, and would reduce the amount available for non-tribal fisheries. As the total catches have been approaching the Pacific cod OY, the proposed trip limits for the non-tribal fisheries may need to be adjusted inseason to stay within the non-tribal portion of the OY.

In 2005, concerns over unanticipated participants in the open access fisheries, and the estimated amounts of targeted species harvest and potential bycatch of overfished rockfish, were addressed through bycatch limits for canary and yelloweye rockfish that were established for the open access sector through emergency rule. If the Council decides to implement trip limits for spiny dogfish and Pacific cod for 2006, then the GMT would recommend that the bycatch limits for canary and yelloweye rockfish for the open access sector not be extended into 2006.

GMT Recommendation

1. Adopt Alternative 2, in each case, for trip limits for spiny dogfish and Pacific cod for 2006.

PFMC
11/02/05

TRIBAL COMMENTS ON MANAGEMENT MEASURES FOR SPINY DOGFISH AND PACIFIC COD FOR 2006

The Makah Tribe is proposing some changes in management of Pacific cod and spiny dogfish for 2006. I would direct the Council's attention to Agenda Item D.1.b Supplemental Tribal Comments 2.

Pacific cod
The Makah Tribe notes that the Pacific cod trip limits being recommended for the non-treaty fleet for 2006 would be constraining for their fisheries. The majority of tribal landings are taken by a few Makah trawl vessels during brief seasonal fisheries. A small amount is also landed incidentally in other treaty fisheries. As such, the Makah Tribe is currently seeking a tribal harvest guideline from National Marine Fisheries Service of 350 mt - 400 mt. This amount is similar to recent landings and would approximate an equal treaty/non-treaty sharing of harvest on the northern Washington Coast.

Spiny dogfish
The Makah Tribe is also proposing a dogfish fishery for one or two vessels for 2006. This fishery would be managed within the trip limits being developed by the Council. The Tribe will meet with Washington Department of Fish and Wildlife to ensure the fishery is prosecuted in times and areas of lowest bycatch of overfished species (i.e. yelloweye).

PFMC
11/02/05

MANAGEMENT MEASURES FOR SPINY DOGFISH AND PACIFIC COD FOR 2006

The Groundfish Management Team (GMT) has recently raised concerns regarding the management of two West Coast groundfish species managed under the Groundfish Fishery Management Plan-spiny dogfish and Pacific cod. The GMT believes current harvest controls are inadequate to effectively manage these species and recommended Council consideration of management measures for 2006 fisheries at the last Council meeting (Agenda Item H.9.a, Attachment 1).

The Council adopted the GMT-recommended alternative management measures for analysis and public review at their September meeting. Washington Department of Fish and Wildlife staff began preparation of a preliminary draft Environmental Assessment (EA) (Agenda Item H.9.a, Attachment 2), which will analyze the effects of alternative management measures to control the future harvest of spiny dogfish and Pacific cod. This draft EA will be tiered off the Final Environmental Impact Statement developed to decide the 2005-2006 groundfish harvest specifications and management measures. The Council should use this preliminary draft EA and any other supplemental information to decide a preferred alternative for managing these species in 2006. New regulations for managing spiny dogfish and Pacific cod are expected to be implemented by March 1, 2006.

Council Action:

Adopt Final Recommendations for 2006 Management Measures for Spiny Dogfish and Pacific Cod.

Reference Materials:

1. Agenda Item H.9.a, Attachment 1: September 2005 Groundfish Management Team Report on Management Specifications for Spiny Dogfish and Pacific Cod For 2006.
2. Agenda Item H.9.a, Attachment 2: Preliminary Draft Environmental Assessment and Regulatory Impact Review of Management Measures for Spiny Dogfish (*Squalus acanthias*) and Pacific Cod (*Gadus macrocephalus*).

Agenda Order:

a. Agenda Item Overview — John DeVore
b. Reports and Comments of Advisory Bodies
c. Public Comment
d. **Council Action:** Adopt Final Recommendations for 2006 Management Measures

PFMC
10/17/05

Expanded Coverage of the Program to Monitor Time-Area Closures in the Pacific Coast Groundfish Fishery

(Tiered from "The Program to Monitor Time-Area Closures in the Pacific Coast Groundfish Fishery" - July 2003)

Draft Environmental Assessment, Regulatory Impact Review & Regulatory Flexibility Analysis

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Abstract: This environmental assessment examines alternative Vessel Monitoring System (VMS) coverage levels for vessels that fish pursuant to the harvest guidelines, quotas, and other management measures governing the open access (OA) groundfish fishery in federal waters. To ensure the integrity of groundfish conservation areas (GCAs), a pilot VMS program was implemented on January 1, 2004. The pilot program requires vessels registered to Pacific Coast groundfish fishery limited entry (LE) permits to carry and use NMFS type-approved VMS transceiver units while fishing off the coasts of Washington, Oregon and California.

Large-scale depth-based management areas, referred to as GCAs, are used to prohibit or restrict commercial groundfish fishing. These areas were specifically designed to protect overfished species while allowing healthy fisheries to continue in areas and with gears where little incidental catch of overfished species occurs. Groundfish conservation area boundaries are defined by points of latitude and longitude. The rockfish conservation areas, a sub-group of groundfish conservation areas, are defined by points that approximate fathom curves for depth ranges where overfished rockfish species are commonly found. It is difficult and costly to effectively enforce these large scale area closures using traditional enforcement methods, particularly when the boundaries are defined by numerous points of latitude and longitude and when management measures allow some gear types and target fishing in all or a portion of the conservation area. Scarce state and federal resources also limit the use of traditional enforcement methods. Expanding coverage of the current VMS monitoring program to the OA fisheries is expected to enhance state and federal enforcement's ability to monitor vessel compliance with depth-based conservation areas.

October 2005

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1.0 INTRODUCTION

The groundfish fishery in the Exclusive Economic Zone (EEZ), 3 to 200 nautical miles (nm) off of the Washington-Oregon-California (WOC) coast is managed under the Pacific Coast Groundfish Fishery Management Plan (FMP). The Pacific Coast Groundfish FMP was prepared by the Pacific Fishery Management Council (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 was approved by the Assistant Administrator for Fisheries, National Oceanic and Atmospheric Administration, on January 4, 1982 and became effective on September 30, 1982.

Actions taken to amend FMPs or to implement regulations to govern the groundfish fishery must meet the requirements of various 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 (MBTA).

The regulations that implement NEPA requirements permit NEPA documents to be combined with other agency documents to reduce duplication (40 CFR§1506.4). 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 identified issue. The purpose and need for this action and general background materials are included in Section 1 of this document. Section 2 describes a reasonable range of alternative management actions that may be taken to address the identified issue. In accordance with NEPA requirements, Section 3 contains a description of the physical, biological and socio-economic characteristics of the affected environment. Section 4 examines the physical, biological and socio-economic impacts of the management options as required by NEPA, E.O. 12866 and the RFA. Section 5 addresses the consistency of the proposed actions with the FMP, Magnuson-Stevens Act, ESA, MMPA, CZMA, PRA, E.O. 12866, E.O. 13175 and the MBTA. Section 6 provides: a Regulatory Impact Review, which is required by E.O. 12866 to address the economic significance of the action, and; a Regulatory Flexibility Analysis, which is required by the RFA to addresses the impacts of the proposed actions on small businesses. Section 7 presents a list of individuals who assisted in preparing the Environmental Assessment (EA) and Section 8 is the list of references. The NEPA conclusions are addressed in a memorandum that accompanies this document.

1.1 Proposed Action

The proposed action is to expand the existing VMS program into the OA sectors of the groundfish fishery. This EA examines alternative VMS coverage levels for vessels that are used to fish pursuant to the harvest guidelines, quotas, and other management measures governing the OA fishery in federal waters. With VMS coverage, vessels would be required to carry and use a mobile VMS transceiver unit, and to identify their intent to fish within a conservation area, in a manner that is consistent with federal conservation area requirements.

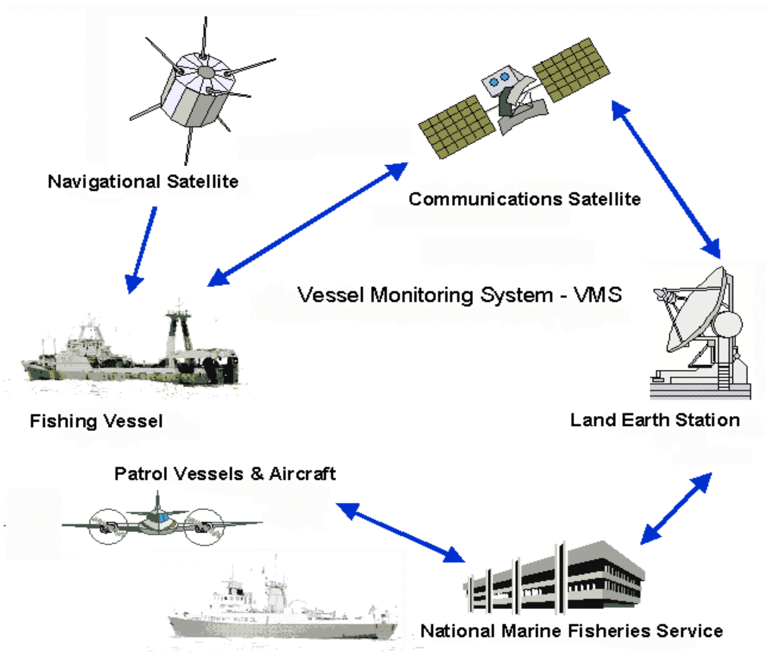

Figure 1.1. Example VMS Scenario

1.2 Background

VMS is a tool that is commonly used to monitor vessel activity in relationship to geographically defined areas. VMS transceivers are installed aboard vessels and use Global Positioning System (GPS) satellites to determine the vessel's position and to transmit that position to a communications satellite. From the communications satellite, the vessel's position is transmitted to a land-earth station operated by a communications service company. From the land-earth station, the position is transmitted to the NMFS Office for Law Enforcement (OLE) processing center. At the OLE processing center, the information is validated and analyzed before being disseminated for surveillance, enforcement purposes, and fisheries management. Figure 1.1 illustrates the flow of information through a VMS system.

VMS transceivers document a vessel's position at a specific period in time. The frequency at which position reports are sent depends on the defined need. Position transmissions can be made on a predetermined schedule, such as hourly, or upon request from the processing center. The vessel operator is unable to alter the VMS transmission signal or the time of transmission. In most cases, the vessel operator is unaware of exactly when the VMS unit is transmitting. VMS transceivers are designed to be tamper resistant.

To assure compatibility with the national monitoring center, NMFS requires that VMS systems meet defined standards (September 23, 1993, 58 FR 49285, March 31, 1994, 59 FR 151180), while recognizing the need to promulgate regulations and approve systems on a fishery-by-fishery basis. VMS transceiver units approved by NMFS are referred to as type-approved models. All type-approved models must have basic features identified and endorsed by NMFS; however, additional features may be added to better meet the needs of a particular fishery. On November 17, 2003 (68 FR 64860,) NMFS published a notice identifying VMS transceiver units and communication service providers that are type-approved for the Pacific Coast groundfish fishery.

Amendment 13 to the Pacific Coast Groundfish FMP recognized the value of VMS as a tool for enforcing closed areas that are established to reduce bycatch of overfished species. Amendment 13 also identified VMS as a technological tool that could be used to improve bycatch management by providing fishing location data that can be used in conjunction with observer data collections. Amendment 18 to the FMP would provide more specific details on the use of VMS as a vessel compliance monitoring tool (Section 6.4.2). Amendment 19 authorizes the Council to expand VMS coverage to fishery sectors that may be subject to groundfish habitat protection closures. The Council's final recommendations on both Amendments 18 and 19 are scheduled for their November 2005 meeting.

At its November 2002 meeting, the Council recommended that NMFS, in consultation with the ad hoc VMS Committee, prepare a rule to implement a pilot VMS program for monitoring compliance with large-scale depth-based management areas. The Council's preferred alternative was for a pilot program that required all vessels registered to Pacific Coast groundfish fishery LE permits to carry and use a basic VMS system (a system capable of one-way communications) and to provide declaration reports prior to fishing in specific depth-based management areas with gears that would otherwise be prohibited for groundfish fishing. Based on the Council's recommendation, NMFS prepared a proposed rule for a VMS program that was published on May 22, 2003 (68 FR 27972). The proposed rule was followed by a final rule that was published on November 4, 2003 (68 FR 62374). In addition, the rule required any vessel registered to a LE permit and any other commercial or tribal vessel using trawl gear, (including non-groundfish trawl gear used to take pink shrimp, spot and ridgeback prawns, California halibut and sea cucumber) to declare their intent to fish within a gear specific conservation area in a manner consistent with conservation area requirements (I.E. Fishing in a trawl RCA for pink shrimp with a finfish excluder or for Pacific whiting with mid-water trawl gear during the primary season)

1.3 Purpose and need for action

Large-scale depth-based management areas, referred to as GCAs, are used to prohibit or restrict commercial and recreational groundfish fishing. The boundaries used to define the GCAs can be complex, involving hundreds of points of latitude and longitude. The Rockfish Conservation Areas (RCAs) are a sub-group of the GCAs that were specifically designed to protect overfished rockfish species in times and locations where they are believed to be most abundant. RCAs are defined by points of latitude and longitude that approximate fathom curves for depth ranges where overfished rockfish species are commonly found. Each RCA is gear specific. Groundfish fishing (either directed or incidental) with a gear that is likely to catch a particular overfished species is restricted or prohibited in areas where those species are most vulnerable. The RCAs are vast, cover much of the continental shelf, and extend along the entire West Coast from Canada to Mexico.

Deep-water fisheries on the slope and nearshore fisheries have been permitted in areas seaward or shoreward of the RCAs. Vessels intending to fish in the deep-water slope fisheries seaward of the westernmost boundary of an RCA are allowed to transit through the areas, providing their gear is properly stowed. Target fisheries with relatively low catch rates of overfished species, such as midwater trawling for pelagic species, and shrimp trawling with finfish excluders, have been allowed to occur in the RCAs. Various state-managed fisheries where groundfish are incidentally taken also occur in the RCA.

To ensure the integrity of the RCAs and other conservation areas, a pilot VMS program was implemented on January 1, 2004. The pilot program requires vessels registered to Pacific Coast groundfish fishery LE permits to carry and use VMS transceiver units while fishing off the coasts of Washington, Oregon and California. Traditional enforcement methods (such as aerial surveillance, boarding at sea via patrol boats, landing inspections and documentary investigation) are especially difficult to use when the closed areas are large-scale and the lines defining the areas are irregular. Furthermore, when management measures allow some gear types and target fishing in all or a portion of the conservation area, while other fishing activities are prohibited, it is difficult and costly to effectively enforce closures using traditional methods. Scarce state and federal resources also limit the extent to which traditional enforcement methods can be used effectively.

Expanding coverage of the current VMS monitoring program to the OA fisheries will enhance state and federal enforcement's ability to monitor vessel compliance with depth-based conservation areas. Depth-based management areas were established so that healthy fisheries could continue in areas and with gears where little incidental catch of overfished species occurs. Therefore, maintaining the integrity of conservation areas is consistent with the conservation goals and objectives of the Pacific Coast Groundfish FMP. The purpose of this EA is to analyze a reasonable range of VMS program coverage levels for vessels that fish pursuant to the harvest guidelines, quotas, and other management measures governing the OA fishery.

1.4 Scoping Process

The scoping process, where stakeholder input on the issue is provided, aids in determining the range of issues that the NEPA document (in this case the EA) needs to address. Scoping 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 scoping process should: identify the public and agency concerns; clearly define the environmental issues and alternatives to be examined, including the elimination of nonsignificant issues; identify related issues, and; identify state and local agency requirements that must be addressed. An effective scoping process can help reduce unnecessary paperwork and time delays in preparing and processing the NEPA document. This EA tiers off the original VMS EA, titled “The Program to Monitor Time-Area Closures in the Pacific Coast Groundfish Fishery,” and therefore presents scoping activities that have occurred since September 2003.

In October 2003, the ad hoc VMS Committee, which is comprised of state, federal and industry representatives, held a public meeting to consider expanding the VMS program beyond the LE fisheries. During this meeting, the committee discussed criteria that would be used to prioritize the expansion of the VMS program. These criteria included: the impacts on overfished species if illegal groundfish fishing occurred in a GCA the ability of enforcement to identify fishery participants that are targeting groundfish; and the ability of enforcement to distinguish between LE vessels and other fishing vessels that look like LE vessels. The committee determined that commercial vessels operating in the EEZ at any time during the year and that land groundfish should be considered for the next phase of the VMS program. The ad hoc VMS Committee also recommended priorities for expanding VMS coverage to the different OA gear groups. Longline was given the highest priority, followed by groundfish pot, non-groundfish trawl (excluding pink shrimp), and line (excluding salmon). The committee considered expansion to the charter and private sectors of the recreational fishery, but determined that an area-by-area evaluation of the groundfish impacts by these participants was necessary before a final committee recommendation could be made.

At the Council’s November 2003 meeting, the ad hoc VMS Committee presented its report to the Council: (Exhibit D. 10b, Supplemental Attachment 2, November 2003). Following public testimony and consideration of the committee report, the Council indicated that further information on the success of the pilot phase of the program was needed before they would consider expansion into other fisheries. VMS reports were provided to the Council by OLE at its subsequent meetings.

At the Council’s September 2004 meeting, NMFS presented a draft EA that contained a range of five VMS coverage alternatives for the OA fishery. These alternatives were based on the ad hoc VMS committee’s October 2003 recommendation to the Council. The Council reviewed the alternatives, considered the input of its advisory bodies, and listened to public testimony, before adopting a revised range of eight alternatives for further analysis. The Council also recommended an October 1, 2005 implementation date for the expanded VMS program. To allow time for the affected public to review the alternatives, the Council delayed action on expanding the VMS program until its April 2005 Council meeting in Tacoma, Washington.

In October 2004, the ad hoc VMS Committee held a public meeting in Portland, Oregon, where the alternatives recommended by the Council were reviewed. At this same meeting, the ad hoc VMS Committee asked that a variation of one of the Council recommended alternatives be included in the analysis.

Between January 10, 2005 and March 5, 2005, NMFS held eight public meetings in coastal communities to provide the interested public with information regarding the current VMS systems, the expansion of the VMS program into the OA groundfish fisheries, and to provide information about how and when to provide comments to NMFS and the Council. These meetings occurred in the following communities with relatively high OA groundfish landings: Westport, WA; Astoria, OR; Newport, OR; Port Orford, OR; Fort Bragg, CA; Morrow Bay, CA; San Francisco, CA; and Los Alamitos, CA.

At the Council's April 2005 meeting, NMFS presented a revised draft EA that analyzed the nine VMS coverage alternatives for the OA fishery. The Council reviewed the alternatives, considered input from its advisory bodies, and listened to public testimony, before recommending that further analysis be conducted and brought back to the Council at its September 2005 meeting.

At the Council's June 2005 meeting, it adopted a preferred alternative for the "essential Fish Habitat Designation and Minimization of Adverse Impacts Draft Environmental Impact Statement (EIS)." The Council's preferred alternative included a recommendation that this EA be expanded to include an alternative that would require the used of VMS on all groundfish bottom trawl vessels. Background information and supporting documentation for that recommendation is found withing that EIS.

In September 2005, the ad hoc VMS Committee held a public meeting in Portland, Oregon, where the thirteen alternatives recommended for analysis were reviewed.

1.5 Other NEPA documents this EA relies on

This is a tiered EA that expands on information presented in the July 2003 EA, titled The Program to Monitor Time-Area Closures in the Pacific Coast Groundfish Fishery. This EA expands on the VMS program presented in the original VMS EA by considering alternative coverage levels for the OA fisheries.

This EA relies on three EIS documents that have been prepared for the groundfish fishery since November 2003. Two of the EIS documents pertain to the harvest specifications and management measures and are titled: 1) Acceptable Biological Catch and Optimum Yield Specifications and Management Measures for 2004, and 2) Acceptable Biological Catch and Optimum Yield Specifications and Management Measures for 2005-2006. The third EIS, which was available as a draft EIS in February 2005, concerns Essential Fish Habitat (EFH) and is titled: The Pacific Coast Groundfish Fishery Management Plan, EFH Designation and Minimization of Adverse Impacts. These three EISs have detailed descriptions of the affected environment, including: the geographical location in which the groundfish fisheries occur; various species that groundfish vessels harvest and interact with; the fish buyers and processors that are dependent on the fishery; the suppliers and services; and, ultimately the fishing-dependent communities where vessels dock and fishing families live who are dependent on these fisheries. Relevant information on the environment was summarized from these EISs for this document. In the sections where this information was summarized, readers who are interested in more detailed descriptions are encouraged to read these earlier NEPA documents.

2.0 ALTERNATIVE MANAGEMENT ACTIONS

2.1 Alternatives Previously Considered for Monitoring Time Area Closures

The July 2003 VMS EA ("A Program to Monitor Time-Area Closures in the Pacific Coast Groundfish Fishery") was prepared prior to implementing the pilot VMS program in the LE fisheries. The original VMS EA examined three primary issues relevant to the development of a program for monitoring the time-area closures: 1) the monitoring system, 2) appropriate coverage levels, and 3) the payment structure. The Council considered the alternative management actions for each of these issues before making recommendations to NMFS.

The monitoring system alternatives considered by the Council included: 1) declaration reports; 2) a basic VMS system with 1-way communications and declaration reports; 3) an upgraded VMS system with 2-way communications and declaration reports; and 4) fishery observers (one per vessel) with declaration reports. Declaration reports allow vessels to declare their intent to fish within a GCA specific to their gear type, providing the activity is consistent with the GCA restrictions. The primary difference between the two VMS alternatives was that the upgraded two-way system could allow messages to be sent to and from the vessels, including fully compressed data messages. The basic 1-way VMS system primarily transmits positions to a shore station.

At its November 2002 meeting, the Council recommended that NMFS move forward with a rulemaking to require a basic VMS system and declaration reports. The Council indicated that it considered a basic VMS system to be adequate for maintaining the integrity of the closed areas. A basic VMS system is more costly than declaration reports, but less costly than either the upgraded VMS system or observers.

The coverage alternatives considered by the Council defined sectors of the commercial and recreational groundfish fleets that would be required to carry the recommended monitoring system (either VMS or an observer). The coverage alternatives included: 1) all vessels registered to LE permits; 2) all LE vessels that fish in the EEZ at any time during the year; 3) all active LE, OA, and recreational charter vessels that fish in conservation areas; and 4) all LE, OA, and recreational charter vessels regardless of where fishing occurs. The Council recommended that vessels registered to LE permits fishing in the EEZ off the Washington, Oregon, and California coasts be required to have and use VMS transceiver units whenever they fish. In addition, the Council recommended declaration reporting requirements for any vessel registered to a LE permit, and any commercial or tribal vessel using trawl gear, including non-groundfish trawl gear used to take pink shrimp, spot and ridgeback prawns, California halibut, and sea cucumber. This level of VMS coverage would allow enforcement to effectively monitor LE trawl vessels for unlawful incursions into RCAs while allowing legal incursions, such as midwater trawling, for Pacific whiting, yellowtail and widow rockfish and non-groundfish target fisheries, to occur. A notable number of LE vessels also participate in non-groundfish fisheries, such as shrimp and prawn trawl fisheries, troll albacore and troll salmon fisheries, and the pot fisheries for crab. These fisheries would continue to be allowed to occur in the RCAs. However, vessels registered to LE permits would be required to have an operable VMS unit on board whenever the vessel was fishing in state or federal waters off the states of Washington, Oregon or California. This level of coverage was intended to be a pilot program that began with the sector of the fishery that is allocated the majority of the commercial groundfish resources.

The payment structure alternatives considered by the Council defined the cost responsibilities for purchasing, installing, and maintaining the VMS transceiver units, as well as the responsibilities for transmitting reports and data. The payment structure alternatives included: 1) the vessel pays all costs associated with purchasing, installing and maintaining the VMS transceiver unit, as well as the costs associated with the transmission of reports and data; 2) the vessel pays only for the VMS transceiver and NMFS pays all other costs; 3) NMFS pays for the initial transceiver, but all other associated expenses including installation, maintenance and replacement would be paid for by the vessel; and 4) NMFS pays for everything related to VMS. Although the Council recommended that NMFS fully fund a VMS monitoring program, to date, it has not been possible because neither state nor federal funding is available for purchasing, installing, or maintaining VMS transceiver units, nor is funding available for data transmission. Because of the critical need to monitor the integrity of conservation areas that protect overfished stocks while allowing for the harvest of healthy stocks, NMFS moved forward with the rulemaking. Should funds become available in the future, NMFS is not precluded from reimbursing participants for all or a portion of the costs associated with the VMS monitoring program.

2.2 Alternatives being considered

As stated in the previous section, this EA tiers off of the original VMS EA, titled “The Program to Monitor Time-Area Closures in the Pacific Coast Groundfish Fishery.” The intent of the EA is to analyze expanding the coverage of the initial VMS monitoring program to the OA fisheries to promote compliance with regulations that prohibit or restrict fishing activities in the RCAs and GCAs. Therefore, a range of VMS program coverage levels for vessels fishing pursuant to the harvest guidelines, quotas, and other management measures governing the OA fishery is defined and analyzed in this document.

The monitoring mechanism and payment structure that was implemented through the final rule published on November 4, 2003 (68 FR 62374) will not be affected by the proposed action. However, it must be noted that moving this rulemaking forward at this time will require OA fishery participants to bear the cost of purchasing, installing, and maintaining VMS transceiver units, VMS data transmissions, and reporting costs associated with declaration requirements. Neither state nor federal funding are available at this time. If money becomes available in the future, fishery participants may be reimbursed for all or a portion of their VMS expenses.

<u>Open access coverage alternatives</u>
At the Council’s September 2004 meeting, NMFS presented a draft EA that contained a range of five VMS coverage alternatives for the OA fishery. These alternatives were based on the ad hoc VMS Committee’s October 2003 recommendation to the Council. The coverage levels identified in Alternatives 2-4A and 5A are based on different combinations of the OA gear groups. In order of priority, the VMS ad hoc committee identified the need for VMS coverage for the following OA gear groups: longline, groundfish pot, trawl (excluding shrimp), and line (excluding salmon). Alternative 2 requires all vessels using longline gear to have and use a VMS transceiver. Each of the following Alternatives 3, 4 and 5A build on the previous alternative by adding the next OA gear group in order of priority. Each of these alternatives is described in detail below.

The Council reviewed the five alternatives (Alternatives 1-4A and 5A,) considered input from its advisory bodies, and listened to public testimony, before recommending a range of eight alternatives (Alternatives 1-4A, 5A, 5B, 6A & 7) for further analysis. The Council also recommended an October 1, 2005 implementation date for the expanded VMS program. Alternative 5B is based on the Enforcement Consultants recommendations to the Council. This alternative is the same as 5A except that it excludes vessels in fisheries where incidental catch of overfished species was considered to be very low, however it includes salmon troll vessels. Alternative 6A, though modified by the Council, was based on the Groundfish Advisory Panel’s (GAP) majority view. Under Alternative 6A, VMS would be required on any commercial fishing vessel for which an RCA restriction applied. This alternative was viewed by the GAP as a simple and straightforward way to maintain the integrity of the RCAs. Alternative 7, is the GAP minority alternative, and is basically the same as Alternative 6A, except that vessels under 12 feet (ft) in length are excluded. Though this alternative specifically excluded vessels that fish only in state waters, those vessels are already excluded because there is no link to federal authority at this time (federal nexus). Each of these alternatives is described in detail below.

In October 2004, the ad hoc VMS Committee met and reviewed the alternatives that the Council recommended for further analysis. At this same meeting, a variation of Alternative 6A was recommended by the ad hoc VMS Committee. Alternative 6B is the alternative that the ad hoc VMS Committee requested to be added to the EA for analysis. Alternative 6B is the same as Alternative 6A, except that only salmon troll vessels north of 40 °10 N. lat. that fish pursuant to the harvest guidelines, quotas, and other management measures governing the OA fishery for groundfish species other than yellowtail rockfish would be required to carry and use a VMS transceiver and provide declaration reports. These alternatives are described in detail below.

At the Council's April 2005 meeting, NMFS presented a revised draft EA that analyzed the nine VMS coverage alternatives for the OA fishery. The Council reviewed the alternatives, considered input from its advisory bodies, and listened to public testimony, before recommending that further analysis be conducted and brought back to the Council at its September 2005 meeting. The Council specifically asked that NMFS conduct further analysis to examine thresholds for identifying vessels that land insignificant amounts of groundfish and low impact fisheries that could be considered as exceptions to the VMS requirement. In addition, concerns about of the cost of a VMS system being borne by industry necessary to maintain the integrity of the RCA management regime for the OA fisheries were expressed by the Council. As a result of Council discussion at the April 2005 meeting, NMFS developed three additional alternatives and broadened the analysis. The three new alternatives, identified as Alternatives 8-10, and are described in detail below.

At the Council's June 2005 meeting, measures to protect groundfish EFH, as mandated by the Magnuson-Stevens Act, were considered. Though the habitat protection measure have been developed as a separate action from the VMS program, monitoring measures such as VMS were considered as a tool for monitoring incursions into the many new habitat protection areas. These areas are utilized by a wide variety of species, including overfished rockfish species. As part of the habitat protection measures, the Council requested that VMS requirements for pink shrimp trawlers operating in the OA sector (those pink shrimp trawl vessels that are registered to LE permits are already required to have VMS) be included in the OA VMS analysis. Therefore, Alternative 4 has been divided into Alternatives 4A (previously Alternative 4) and 4B, with the difference being the inclusion of all pink shrimp trawl vessels under Alternative 4B. The Council may choose to include pink shrimp trawl vessels with any one the alternatives when it makes its final recommendations. At its June 2005 meeting, the Council also decided to move its final decision on this action from September 2005 to November 2005.

Table 2.0.1 summarizes the alternative management actions for expanding coverage of the current VMS program into the OA fisheries. The first column of Table 2.0.1 presents a brief description of each alternatives being considered in this EA. The center column uses the average number of vessels from each fishery (fisheries are target species and gear specific groupings) from 2000-2004 as an estimate of the number of vessels that could be added as a result of each alternative. The RCA restrictions vary by fishery, with some vessels being allowed to fish within the RCAs for their non groundfish target species. To aid the reader, the last column describes the basic RCA restrictions for each the open access fisheries.

Table 2.0.1: Summary of the Alternative Management Actions for Expanding Coverage of the Monitoring System for Time-Area Closures in the Pacific Coast Groundfish Fishery for the Open Access Fisheries

<table>
<tr><th>VMS coverage alternatives</th><th>Estimated number of vessels meeting the VMS requirements (average number of vessels per/yr 2000-2004) a/</th><th>RCA restrictions by gear & target species</th></tr>
<tr><td>Alternative 1 -- Status quo. Require declaration reports from OA non-groundfish trawl vessels that fish within a trawl RCA</td><td>Only declaration reports required from nongroundfish trawl vessels fishing in the trawl RCAs</td><td rowspan="4">Groundfish directed fisheries
Longline, pot, line, and net gear - non-trawl gear RCA applies

Incidental fisheries using longline gear
Directed Pacific halibut - non-trawl RCA applies

CA halibut - non-trawl gear RCA applies when vessel takes and retains, possesses or lands federally-managed groundfish

HMS pelagic longline - currently prohibited gear in EEZ, not legal groundfish gear

Incidental fisheries using pot gear
Dungeness crab, prawn, & California sheephead - non-trawl RCA restrictions apply when vessel takes and retains, possesses or lands federally-managed groundfish

Incidental fisheries using trawl gear
Pink shrimp trawl gear - not subject to RCAs

Ridgeback Prawn - non-groundfish trawl RCAs for ridgeback prawn specified for south of 38°57.50' N. lat.

Sea cucumber and CA halibut - non-groundfish trawl RCAs for sea cucumber and CA halibut south of 40°10' N. lat.

Incidental fisheries using line gear
California halibut and HMS - RCA restrictions apply when vessel takes and retains, possesses or lands federally managed groundfish

Salmon troll - south of 40°10', the non-trawl RCA restrictions apply when vessel takes and retains or possesses federally managed groundfish; north of 40°10' , the non-trawl RCA restrictions apply when vessel takes and retains or possesses federally-managed groundfish other than yellowtail rockfish

Incidental fisheries using net gear
California halibut and HMS - non-trawl RCA restrictions apply south of 40°10' N. lat. when vessel takes and retains, possesses or lands federally managed groundfish</td></tr>
<tr><td>Alternative 2 -- longline vessels. Require all vessels using longline gear in federal waters fishing pursuant to the harvest guidelines, quotas, and other management measures governing the OA fishery to provide declaration reports and to activate and use a VMS transceiver.</td><td>Longline
Groundfish directed - 282 longline vessels/yr

Pacific halibut - 38 out of 65 vessels/yr landed groundfish

CA halibut - 2 out of 9 vessels/yr landed groundfish

HMS -pelagic longline gear currently prohibited in EEZ, not legal groundfish gear.</td></tr>
<tr><td>Alternative 3 -- longline or pot vessels Require all vessels using longline or pot gear in federal waters fishing pursuant to the harvest guidelines, quotas, and other management measures governing the OA fishery to provide declaration reports and to activate and use a VMS transceiver.</td><td>Longline - Same as Alt. 2 (322 vessels)

Pot
Groundfish directed - 145 pot gear vessels/yr

Dungeness crab - 21 out of 801 vessels/yr landed groundfish

Prawn - 6 out of 28 vessels/yr landed groundfish

California sheephead (CA nearshore.) - 21 out of 68 vessels/yr landed groundfish</td></tr>
<tr><td>Alternative 4A -- longline, pot, or trawl vessels, excluding pink shrimp trawl vessels. Require all vessels using longline, pot or trawl gear in federal waters fishing pursuant to the harvest guidelines, quotas, and other management measures governing the OA fishery to provide declaration reports and to activate and use a VMS transceiver. Pink shrimp vessels are excluded.</td><td>Longline - Same as Alt. 2 (322 vessels)

Pot - Same as Alt. 3 (193 vessels)

Trawl -
Spot prawn - trawl gear prohibited

California halibut - 40 vessels/yr

Sea cucumber - 14 vessels/yr

Ridgeback prawn - 23 vessels/yr</td></tr>
</table>

Table 2.0.1: Continued

VMS coverage alternatives	Estimated number of vessels meeting the VMS requirements (average number of vessels per/yr 2000-2004) a/	RCA restrictions by gear & target species
Alternative 4B -- longline, pot, or trawl vessels. Require all vessels using longline, pot or trawl gear in federal waters fishing pursuant to the harvest guidelines, quotas, and other management measures governing the OA fishery to provide declaration reports and to activate and use a VMS transceiver.	Longline - Same as Alt. 2 (322 vessels) Pot - Same as Alt. 3 (193 vessels) Trawl - Same as Alt. 4A (77 vessels), except 54 pink shrimp vessels are included (131 vessels)	Same as identified for Alt. 1 - 4A
Alternative 5A -- longline, pot, trawl and line gear vessels, excluding pink shrimp trawl and salmon troll vessels. Require all vessels using longline, pot, trawl, or line gear in federal waters fishing pursuant to the harvest guidelines, quotas, and other management measures governing the OA fishery to provide declaration reports and to activate and use a VMS transceiver. Vessels using pink shrimp trawl gear are excluded. Vessels using salmon troll gear are excluded.	Longline - Same as Alt. 2 (322 vessels) Pot - Same as Alt. 3 (193 vessels) Trawl - Same as Alt. 4A (77 vessels) Line Groundfish directed - 590 line gear vessels/yr California halibut - 58 out of 239 vessels/yr landed groundfish HMS - 10 out of 200 vessels/yr landed groundfish	
Alternative 5B – (Enf. Consultants) longline, pot, trawl and line gear vessels; excluding pink shrimp trawl, HMS longline and line gear and Dungeness crab pot gear. Require all vessels using longline, pot, trawl, or line gear in federal waters fishing pursuant to the harvest guidelines, quotas, and other management measures governing the OA fishery to provide declaration reports and to activate and use a VMS transceiver. Vessels using pink shrimp trawl gear are excluded. Vessels using gears where incidental catch of overfished species is projected to be minimal (HMS longline and line gear and Dungeness crab pot gear) are excluded.	Longline - Same as Alt. 2 (322 vessels) Pot - Same as Alt. 3, except 21 Dungeness crab vessels are excluded (172 vessels) Trawl - Same as Alt. 4A (77 vessels) Line - Same as Alt.5A, except 10 HMS line vessels are excluded, and 234 salmon troll vessels are included - (882 vessels)	

NOTE: Alternatives 6A-10 were developed as a result of the Council's recommendations at its April 2005 meeting following consideration of the draft VMS EA. Alternative 4B was developed following the Council's June meeting after consideration of VMS for monitoring trawl activities in relation to closed area that protect groundfish habitat. The Council may choose to include trawl with any one the following alternatives when it makes its final recommendations.

Table 2.0.1: Continued

VMS coverage alternatives	Estimated number of vessels meeting the VMS requirements (average number of vessels per/yr 2000-2004) a/	RCA restrictions by gear & target species
Alternative 6A – (GAP Majority with Council modifications) Any vessel engaged in commercial fishing to which a RCA restriction applies. Require all vessels engaged in a commercial fishery to which an RCA restriction applies to carry and use VMS transceivers. Vessels using salmon, Dungeness crab, CPS or HMS gear that do not take and retain groundfish are excluded. Pink shrimp vessels are excluded.	Longline - Same as Alt. 2, except that all 65 Pacific halibut vessels, vessels/yr are included (349 vessels) Pot - Same as Alt. 3 (193 vessels) Trawl - Same as Alt. 4A (77 vessels) Line - Same as Alt.5A, except 234 salmon troll vessels are included - (892 vessels) Net CPS gear not legal groundfish gear HMS south -25 out of 143 vessels/yr landed groundfish CA halibut 47 vessels/yr out of 62 landed groundfish	Same as identified for Alt. 1-4
Alternative 6B – (VMS committee) Any vessel engaged in commercial fishing to which a RCA restriction applies, except salmon troll vessels north of 40°10' N. lat. that only retain yellowtail rockfish. Require all vessels engaged in a commercial fishery to which an RCA restriction applies to carry and use VMS transceivers. Vessels using salmon, Dungeness crab, CPS or HMS gear that do not take and retain groundfish are excluded. Salmon troll vessels operating in waters north of 40°10' N. lat. that only retain yellowtail rockfish are excluded. Pink shrimp vessels are excluded. If an RCA requirement is discontinued during the year, mandatory VMS coverage would be discontinued for the affected vessels.	Longline - Same as Alt. 6A (349 vessels/yr) Pot - Same as Alt. 3 (193 vessels/yr) Trawl - Same as Alt. 4 (77 vessels/yr) Line - Same as Alt.6A, except 58 salmon troll vessels/yr operating in waters north of 40°10' N. lat. that retain only yellowtail rockfish are excluded (834 vessels/yr) Net - Same as Alt. 6A	
Alternative 7 – (GAP minority with Council modifications) Any vessel engaged in commercial fishing to which a RCA restriction applies, except vessels less than 12 feet in length. Require all vessels ≥12 ft in length that fish in federal waters for which there is an RCA requirement to carry and use VMS transceivers and to provide declaration reports. Vessels using salmon, Dungeness crab, CPS, or HMS gear that do not take and retain groundfish are excluded. Pink shrimp vessels are excluded. Vessels that fish exclusively in state waters are excluded.	Longline - Same as Alt. 6A except 6 vessels/yr <12' are excluded (343 vessels/yr) Pot - Same as Alt. 3 except 2 vessels/yr <12'are excluded (191 vessels/yr) Trawl - Same as Alt. 4 (77 vessels/yr) Line -Same as Alt.6A, except 14 vessels/yr <12' are excluded (878 vessels/yr) Net - Same as Alt. 6A	

Table 2.0.1: Continued

VMS coverage alternatives	Estimated number of vessels meeting the VMS requirements (average number of vessels per/yr 2000-2004) a/	RCA restrictions by gear & target species
Alternative 8 - **Low impact OA fisheries exempt.** Require all vessels that fish in federal waters for which there is an RCA requirement, to carry and use VMS transceivers and to provide declaration reports except that vessels where the incidental catch of overfished species is projected to be minimal. The following vessels are excluded from the VMS requirement: Dungeness crab pot, spot prawn pot, sea cucumber trawl, ridgeback prawn trawl, HMS line, HMS net, California sheephead pot gear and pink shrimp vessels.	<u>Longline</u> - 282 groundfish directed vessels/yr, 65 Pacific halibut vessels/yr (349 vessels/yr) <u>Pot</u> - 145 groundfish directed vessels/yr <u>Trawl</u> -40 CA halibut vessels/yr <u>Line</u> - 590 groundfish directed vessels/yr, 234 salmon troll vessels/yr, and 58 CA halibut vessels/yr (882 vessels/yr) <u>Net</u> - CA halibut 47 vessels/yr out of 62 landed groundfish	Same as identified for Alt 1 - 4A
Alternative 9 - Directed OA fisheries (includes all vessels landing more than a minimal amount of groundfish) - Require all vessels that fish in federal waters for which there is an RCA requirement, to carry and use VMS transceivers and to provide declaration reports if they land more than 500 lb of groundfish in a any calendar year. **NOTE**: If this alternative were defined as - "Require all vessels that fish in federal waters for which there is an RCA requirement, to carry and use VMS transceivers and to provide declaration reports if the sum of all groundfish in any landing exceeded 50% of the revenue on a fish ticket" -- it would include the following vessels: 282 groundfish directed longline vessels/yr, 142 groundfish directed pot gear vessels/yr, 590 groundfish directed vessels/yr	<u>Longline</u> - 282 groundfish directed longline vessels/yr, and 7 Pacific halibut vessels/yr -14 vessels/yr if only 2003 & 2004 data used (291 vessels/yr) HMS - longline gear prohibited in EEZ <u>Pot</u> - 145 groundfish directed pot gear vessels/yr, 1 Dungeness crab vessel/yr, 2 prawn vessels/yr, and 2 California sheephead (150 vessels/yr) <u>Trawl</u> - 9 CA halibut vessels/yr, 3 pink shrimp vessel/yr <u>Line</u> - 590 groundfish directed vessels/yr, no CA halibut vessels, 1 HMS vessel/yr, and 6 salmon troll vessels/yr (597 vessels/yr) <u>Net</u> - 15 CA halibut vessels/yr	
Alternative 10 - No Action Alternative No VMS requirements for vessels in federal waters fishing pursuant to the harvest guidelines, quotas, and other management measures governing the OA fishery. Discontinue use of RCA management and adjust trip limits and seasons accordingly. Require declaration reports from OA non-groundfish trawl vessels that fish within a trawl RCA	OA vessels would <u>not</u> be required to have VMS Declaration reports required from nongroundfish trawl vessels fishing in the trawl RCAs	No RCA restrictions

a/ The projected number vessels represents those that operated in both state and/or federal waters. The data does not allow vessels that only fished in federal waters to be identified.

Alternative 1: Status quo. Do not specify mandatory VMS program coverage requirements for vessels used to fish pursuant to the harvest guidelines, quotas, and other management measures governing the OA fishery.

Discussion: Vessels without LE permits that fish pursuant to the harvest guidelines, quotas, and other management measures governing the OA fishery would not be required to carry and use VMS transceiver units. However, vessels could elect to voluntarily carry a VMS transceiver unit and provide position reports to NMFS if they choose. Vessels registered to LE permits that operate in both LE and OA fisheries (fishing conducted with OA gear, by a vessel that has a valid LE permit with an endorsement for another type of gear) would continue to be required to carry and use a VMS transceiver and to provide declaration reports. Declaration reports would continue to be required from vessels using non-groundfish trawl gear whether or not groundfish are retained by the vessel.

Unlike Alternative 10, the no action alternative, Alternative 1 would allow for the continued use of the RCAs management for OA groundfish fisheries without a dedicated mechanism for monitoring compliance with depth-based conservation areas. Traditional enforcement methods (such as aerial surveillance, boarding at sea via patrol boats, landing inspections and documentary investigation) would be the primary means to monitor vessel compliance with the RCA restrictions. Scarce state and federal resources necessary to maintain the use of traditional enforcement methods will continue to be stretched to include monitoring OA vessel compliance with depth-based conservation areas.

Alternative 2: longline vessels. Require all vessels using longline gear that fish pursuant to the harvest guidelines, quotas, and other management measures governing the OA fishery to carry and use VMS transceiver units and provide declaration reports. Prior to leaving port on a trip in which a vessel identified under this alternative is used to take and retain, possess, or land federally managed groundfish in federal waters, the vessel would be required to activate a VMS transceiver unit and to continuously operate the unit (24 hours a day) for the remainder of the calendar year. A declaration report would be required prior to leaving port on a trip in which the vessel was used to fish in a GCA in a manner that is consistent with the requirements of the conservation area. VMS requirements defined at 660.312 and prohibitions defined at 660.306 would be expanded to include these vessels, as would the reporting requirements defined at 660.303 for vessels fishing in conservation areas.

Discussion: Between 2000 and 2004, an average of 282 vessels per year used longline gear for directed harvest of groundfish. These vessels targeted species such as sablefish, lingcod, and rockfish. For the purpose of this analysis, directed vessels were assumed to be those longline vessels where the sum of all groundfish in any landing exceeded 50% of the revenue on a fish ticket. The average annual exvessel revenue from groundfish for OA vessels that used longline gear for directed harvest of groundfish between 2000 and 2004 was $5,726 per vessel. Between 2000 and 2004, an average of 2 out of 9 vessels per year landed OA groundfish while using longline gear to target California halibut. The average annual revenue from groundfish taken with longline gear for each of these vessels was $20. An average of 38 out of 65 directed Pacific halibut vessels not registered to LE permits that fished south of Point Chehalis, WA and landed groundfish annually between 2000 and 2004, with an average annual value of $399. Longline gear (pelagic longline) is no longer allowed in federal waters off the West Coast by vessels harvesting Highly Migratory Species (HMS) species, nor is it legal groundfish gear.

Overfished species interactions for all OA directed groundfish gears were projected to include bocaccio, canary rockfish, cowcod, darkblotched rockfish, lingcod, POP and yelloweye rockfish (Table 3.3.3.5). However, gear specific overfished species catch projections were not available for the directed OA longline vessels. Canary rockfish and the other overfished shelf rockfish species are easily targeted using line gears. Because important target species (i.e. sablefish, dogfish) for OA longline vessels are also found seasonally on the shelf, if fishing were to occur within the nontrawl RCAs, they would likely encounter overfished shelf rockfish and incur an unacceptably high incidental mortality. California halibut fishery is most likely to interact with bocaccio, canary rockfish and lingcod. Groundfish are caught in the Pacific halibut fishery coastwide. Rockfish and sablefish are commonly intercepted, as they are found in similar habitat to Pacific halibut and are easily caught with longline gear. There is a strong correlation between directed line fisheries that target Pacific halibut (both commercial and recreational) and bycatch of yelloweye rockfish. In 2003, the Council used the depth-based results of the International Pacific Halibut Commission (IPHC) halibut survey data to estimate the impacts of the Pacific halibut fishery on yelloweye rockfish. Approximately 99.1% of the yelloweye rockfish catch and 7.7% of the commercial-sized Pacific halibut catch in the IPHC survey occurred in waters shallower than 100 fm. Therefore, the Council recommended restricting the commercial halibut fishery to waters deeper than 100 fm. No overfished species catch was projected for the HMS longline fishery for 2005 because it is currently a prohibited gear.

Vessels would be required to operate their VMS units continuously from the point at which a vessel leaves port on a trip in which the vessel uses longline gear to fish in the OA fishery in federal waters. The use of the term “fish” or “fishing” includes possessing federally managed groundfish in federal waters, even if the groundfish were taken and retained seaward of the EEZ or in state waters (50 CFR 600.10). Under this alternative, data would be available to monitor vessels using longline gear in the OA fisheries for unlawful incursions into conservation areas. Once the requirement is triggered, vessels must continue to operate the VMS units for the remainder of the calendar year; therefore, position data would be available for the vessels when they participate in other state and federal fisheries. Because of the mobility of vessels within the OA fleet to fish with alternative OA gears, some vessels, particularly directed vessels or those in fisheries where alternative gears are allowed, may change gear (I.E. a change from longline to pot or vertical line gear) to avoid the VMS requirements.

Alternative 3: longline or pot vessels. In addition to those vessels identified under Alternative 2, require all vessels using pot gear that fish pursuant to the harvest guidelines, quotas, and other management measures governing the OA fishery to carry and use VMS transceiver units and provide declaration reports. Prior to leaving port on a trip in which a vessel identified under this alternative is used to take and retain, possess, or land federally managed groundfish in federal waters, the vessel would be required to activate a VMS transceiver unit and to continuously operate the unit (24 hours a day) throughout the remainder of the calendar year. A declaration report would be required prior to leaving port on a trip in which the vessel is used to fish in a GCA in a manner that is consistent with the requirements of the conservation area. VMS requirements defined at 660.312 and prohibitions defined at 660.306 would be expanded to include these vessels, as would the reporting requirements defined at 660.303 for vessels fishing in conservation areas.

Discussion: The vessels identified under this alternative are in addition to those vessels identified under Alternative 2. Between 2000 and 2004, an average of 142 vessels per year used pot gear for directed harvest of groundfish in federal waters. For the purpose of this analysis, directed vessels were assumed to be those pot vessels where the sum of all groundfish in any landing exceeded 50% of the revenue on a fish ticket**.** The average annual exvessel revenue from groundfish for these vessels for the 2000-2004 period was $6,829 per vessel. Fisheries where pot gear is used and incidentally caught groundfish are landed include Dungeness crab, prawn, and California sheephead (currently part of the California nearshore species management group) fisheries. On average between 2000 and 2004, 21 out of 801 vessels landed OA groundfish while using pot gear to fish for Dungeness crab. The average annual exvessel revenue from groundfish landed by Dungeness crab vessels during the 2000-2004 period was $61 per vessel. On average between 2000 and 2004, 6 out of 28 vessels landed OA groundfish while using pot gear to fish for prawns. The average annual exvessel revenue from groundfish for prawn vessels during the 2000-2004 period was $949 per vessel. On average between 2000 and 2004, 21 out of 68 vessels per year landed OA groundfish taken in pot gear by vessels also fishing for California sheephead. The average annual exvessel revenue from groundfish for California sheephead vessels in the 2000-2004 period was $640 per vessel.

The overfished species interactions under this alternative are in addition to those identified under Alternative 2. Overfished species interactions in the directed groundfish fisheries are projected to include bocaccio, canary rockfish, cowcod, darkblotched rockfish, lingcod, POP and yelloweye rockfish (Table 3.3.3.5). Gear specific overfished species catch projections were not available for directed OA pot gear. Pots or traps are used in the incidental OA fisheries that target Dungeness crab, prawns, and California sheephead. Pots can be designed to be selective in the pursuit of various species. They can be rigged to be size selective, and in some cases, species selective. Fish pots can also be size selective through various means including mesh size, circular escape rings or rectangular escape vents. There is a low mortality for bycatch of unwanted species and juvenile fish in a pot fishery. Bycatch species are generally kept alive in the pot until it is hauled and then can be released alive. Despite the selectivity of pot gear, small amounts of overfished species are taken incidentally. Prior to RCA management, small amounts of lingcod and canary rockfish were landed in the Dungeness crab pot fishery, while small amounts of lingcod, darkblotched rockfish, bocaccio, canary rockfish, cowcod, widow rockfish and yelloweye rockfish were landed in the prawn fisheries (Table 3.3.3.6 and 3.3.3.7). Prior to RCA management small amounts of lingcod, bocaccio, and cowcod were landed by vessels targeting California sheephead.

Vessels would be required to operate their VMS units continuously from the point at which the vessel leaves port on a trip in which longline or pot gear is used to fish in the OA fishery in federal waters. The use of the term “fish” or “fishing” includes possessing federally managed groundfish in federal waters, even if the groundfish were taken and retained seaward of the EEZ or in state waters (50 CFR 600.10). Under this alternative, data would be available to monitor vessels using longline or pot gear in the OA fisheries for unlawful incursions into conservation areas. Once the requirement is triggered, vessels must continue to operate the VMS units for the remainder of the calendar year. Consequently, position data would be available for the vessels when they participate in other state and federal fisheries. Because of the mobility of vessels within the fleet to fish with alternative OA gears, some vessels, particularly directed vessels or those in fisheries where alternative gears are allowed, may change gear (I.E. a change from longline or pot gear to vertical line gear) to avoid the VMS requirements.

Alternative 4A: longline, pot, or non-groundfish trawl vessels, excluding pink shrimp trawl vessels. In addition to those vessels identified under Alternatives 2 and 3, require all vessels that use non-groundfish trawl gear to fish pursuant to the harvest guidelines, quotas, and other management measures governing the OA fishery, excluding pink shrimp vessels, to carry and use VMS transceiver units and to provide declaration reports. Prior to leaving port on a trip in which a vessel identified under this alternative takes and retains, possesses, or lands federally managed groundfish in federal waters with longline or pot gear; or uses non-groundfish trawl gear for prawns, sea cucumber or California halibut, the vessel would be required to activate a VMS transceiver unit and to continuously operate the unit (24 hours a day) throughout the remainder of the calendar year. A declaration report would be required prior to leaving port on a trip in which the vessel is used to fish in a GCA in a manner that is consistent with the requirements of the conservation area. VMS requirements defined at 660.312 and prohibitions defined at 660.306 would be extended to cover these vessels, as would the reporting requirements defined at 660.303 for vessels fishing in conservation areas.

Discussion: The vessels identified under this alternative are in addition to those vessels identified under Alternatives 2 and 3. This alternative adds the requirement for all non-groundfish trawl vessels that fish in federal waters, except those fishing for pink shrimp, to carry and use VMS transceiver units and to provide declaration reports. All vessels using non-groundfish trawl gear for sea cucumber, California halibut, and ridgeback (golden) prawns, would be included under this alternative, whether or not groundfish was retained.

On average between 2000 and 2004, 2 out of 14 vessels landed OA groundfish while using trawl gear to fish for sea cucumbers. The average annual exvessel revenue from groundfish landed by sea cucumber vessels during the 2000-2004 period was negligible. On average, between 2000 and 2004, 23 out of 40 vessels landed OA groundfish while using trawl gear to fish for California halibut. The average annual exvessel revenue from groundfish landed by California halibut vessels during the 2000-2004 period was $773 per vessel. On average between 2000 and 2004, 13 out of 23 vessels landed OA groundfish while using trawl gear to fish for ridgeback prawns. The average annual exvessel revenue from groundfish landed by ridgeback prawn vessels during the 2000-2004 period was $228 per vessel.

On average between 2000 and 2003, 7 out of 20 vessels landed OA groundfish while using trawl gear to fish for spot prawns. The average annual exvessel revenue from groundfish landed by ridgeback prawn vessels during the 2000-2003 period was $81 per vessel. After 2002, Washington State prohibited the use of trawl nets for harvesting spot prawns. On February 18, 2003, the California Fish and Game Commission adopted regulations prohibiting the use of trawl nets to take spot prawn. The regulations went into effect on April 1, 2003. After 2003, Oregon prohibited the use of trawl nets for harvesting spot prawns. Between 2000 and 2004, no trawl (beam trawl) vessels fishing for bait shrimp landed OA groundfish.

The overfished species interactions under this alternative are in addition to those identified under Alternative 2 and 3. The non-groundfish trawl fisheries primarily operate in nearshore and shelf areas. Ridgeback prawn trawls that operate south of Point Conception are required to used of finfish excluders or bycatch reduction devices (BRDs) to reduce the catch of finfish. In 1998, prior to implementation of the RCAs and the requirement to used BRDs, lingcod, bocaccio, cowcod, and widow rockfish were landed in the prawn fisheries (Amendment 16-3 EIS, July 2004). For nongroundfish trawl vessels where the primary target species was sea cucumber, no overfished species catch was projected for 2005. In 1998, prior to the implementation of RCAs, no overfished species catch was estimated to have been landed by sea cucumber vessels (Amendment 16-3 EIS, July 2004). Gear specific estimates for the nongroundfish trawl vessels where the primary target species was California halibut were not available for 2005; however small amounts of bocaccio (0.1 mt), canary rockfish (0.1 mt) and lingcod (2.0 mt) were projected to be taken by all California halibut gears combined. In 1998, prior to the implementation of RCAs, small amounts of bocaccio, yelloweye rockfish and lingcod were landed by vessels where the primary target species was California halibut (Amendment 16-3 EIS, July 2004).

Vessels using longline or pot gear would be required to operate their VMS units continuously from the point at which the vessel is used to fish in the OA fishery in federal waters. While, vessels using non-groundfish trawl gear would be required to operate their VMS units continuously from the point at which the vessel is used to fish in federal waters. The use of the term “fish” or “fishing” includes possessing federally managed groundfish in federal waters, even if the groundfish were taken and retained seaward of the EEZ or in state waters (50 CFR 600.10). Under this alternative, data would be available to monitor vessels using longline, pot, or non-groundfish trawl gear (except for pink shrimp trawl) for unlawful incursions into conservation areas. Vessels must continue to operate the VMS units once the requirement is triggered; therefore, position data would be available for the vessels when they participate in other state and federal fisheries. Mobility of vessels within the fleet to fish with alternative OA gears to avoid the VMS requirements is similar to Alternative 3, because vessels using non-groundfish trawl gears are less likely to avoid the VMS requirements by using line gear.

Alternative 4B: longline, pot, or non-groundfish trawl vessels. In addition to those vessels identified under Alternatives 2 and 3, require all vessels that use non-groundfish trawl gear fishing pursuant to the harvest guidelines, quotas, and other management measures governing the OA fishery, to carry and use VMS transceiver units and to provide declaration reports. Prior to leaving port on a trip in which a vessel identified under this alternative takes and retains, possesses, or lands federally managed groundfish in federal waters with longline or pot gear; or uses non-groundfish trawl gear for pink shrimp, prawns, sea cucumber or California halibut, the vessel would be required to activate a VMS transceiver unit and to continuously operate the unit (24 hours a day) throughout the remainder of the calendar year. A declaration report would be required prior to leaving port on a trip in which the vessel is used to fish in a GCA in a manner that is consistent with the requirements of the conservation area. VMS requirements defined at 660.312 and prohibitions defined at 660.306 would be extended to cover these vessels, as would the reporting requirements defined at 660.303 for vessels fishing in conservation areas.

Discussion: The vessels identified under this alternative are in addition to those vessels identified under Alternatives 2 and 3. This alternative adds the requirement for all non-groundfish trawl vessels that fish in federal waters to carry and use VMS transceiver units and to provide declaration reports. All vessels using non-groundfish trawl gear for sea cucumber, California halibut, ridgeback (golden) prawns, and pink shrimp would be included under this alternative whether or not groundfish was retained.

On average between 2000 and 2004, 2 out of 14 vessels landed OA groundfish while using trawl gear to fish for sea cucumbers. The average annual exvessel revenue from groundfish landed by sea cucumber vessels during the 2000-2004 period was negligible. On average, between 2000 and 2004, 23 out of 40 vessels landed OA groundfish while using trawl gear to fish for California halibut. The average annual exvessel revenue from groundfish landed by California halibut vessels during the 2000-2004 period was $773 per vessel. On average between 2000 and 2004, 13 out of 23 vessels landed OA groundfish while using trawl gear to fish for ridgeback prawns. The average annual exvessel revenue from groundfish landed by ridgeback prawn vessels during the 2000-2004 period was $228 per vessel.

On average between 2000 and 2003, 7 out of 20 vessels landed OA groundfish while using trawl gear to fish for spot prawns. The average annual exvessel revenue from groundfish landed by spot prawn vessels during the 2000-2003 period was $81 per vessel. After 2002, Washington State prohibited the use of trawl nets for harvesting spot prawns. On February 18, 2003, the California Fish and Game Commission adopted regulations prohibiting the use of trawl nets to take spot prawn. The regulations went into effect on April 1, 2003. After 2003, Oregon prohibited the use of trawl nets for harvesting spot prawns. Between 2000 and 2004, no trawl (beam trawl) vessels fishing for bait shrimp landed OA groundfish.

Although pink shrimp vessels are allowed to fish within the trawl RCA, providing a declaration report is sent prior to leaving port on a trip in which the vessel is used to fish within the RCA with shrimp trawl gear, they have been included under this alternative. State regulations require the use of approved finfish excluders by pink shrimp vessels. On average between 2000 and 2004, 33 out of 54 vessels landed OA groundfish while using trawl gear to fish for pink shrimp. The average annual exvessel revenue from groundfish landed by ridgeback prawn vessels during the 2000-2004 period was $1,474 per vessel. However, since the implementation of RCAs in 2003, the number of pink shrimp vessels landing groundfish has substantially declined. In 2003, 6 out of 44 pink shrimp vessels landed OA groundfish with an exvessel revenue from $136 per vessel. While in 2004, 4 out of 43 pink shrimp vessels landed OA groundfish with an exvessel value of $19 per vessel.

The overfished species interactions under this alternative are in addition to those identified under Alternative 2 and 3. Pink shrimp vessels are allowed to fish within the trawl RCA providing a declaration report is sent prior to leaving port on a trip in which the vessel is used to fish within the RCA with shrimp trawl gear. In addition, state regulations require the use of approved finfish excluders by pink shrimp vessels. Finfish excluders have been required in pink shrimp trawls in California since September 2001 and since July 1, 2002 in Oregon and Washington.

The non-groundfish trawl fisheries primarily operate in nearshore and shelf areas. BRDs or Finfish Excluders in pink shrimp trawls are used to reduce mortality of overfished species in that fishery. Ridgeback prawn trawls that operate south of Point Conception are required to used BRDs to reduce the catch of finfish. Prior to implementation of the RCAs and the requirement to used BRDs, lingcod, darkblotched rockfish, bocaccio, canary rockfish, cowcod, widow rockfish and yelloweye were landed in the prawn (trap and trawl for all prawn species) fisheries (Table 3.3.3.6 and Table 3.3.3.7) south of 40˚10' N. latitude. For nongroundfish trawl vessels where the primary target species was sea cucumber, no overfished species catch was projected for 2005. Prior to the implementation of RCAs, less than 0.5 mt of all overfished species combined were landed by sea cucumber vessels in a given year (Table 3.3.3.6 and Table 3.3.3.7). Gear specific estimates for the nongroundfish trawl vessels that were the primary target species was California halibut were not available. Lingcod, bocaccio, canary rockfish and widow rockfish were historically landed by all California halibut gears combined (Table 3.3.3.6 and Table 3.3.3.7). The projections for 2005 are similar in composition (Table 3.3.3.5).

Vessels using longline or pot gear would be required to operate their VMS units continuously from the point at which the vessel is used to fish in the OA fishery in federal waters. While, vessels using non-groundfish trawl gear would be required to operate their VMS units continuously from the point at which the vessel is used to fish in federal waters. The use of the term "fish" or "fishing" includes possessing federally managed groundfish in federal waters, even if the groundfish were taken and retained seaward of the EEZ or in state waters (50 CFR 600.10). Under this alternative, data would be available to monitor vessels using longline, pot, or non-groundfish trawl gear for unlawful incursions into conservation areas. Vessels must continue to operate the VMS units once the requirement is triggered; therefore, position data would be available for the vessels when they participate in other state and federal fisheries. Mobility of vessels within the fleet to fish with alternative OA gears to avoid the VMS requirements is similar to Alternative 3, because vessels using non-groundfish trawl gears are less likely to avoid the VMS requirements by using line gear.

Alternative 5A: longline, pot, trawl and line gear vessels, excluding pink shrimp trawl and salmon troll vessels. In addition to those vessels identified under Alternatives 2-4A, require all vessels that use line gear (excluding salmon troll gear) to fish pursuant to the harvest guidelines, quotas, and other management measures governing the OA fishery, to carry and use VMS transceiver units and provide declaration reports. Prior to leaving port on a trip in which a vessel identified under this alternative is used to take, retain, possess, or land federally managed groundfish in federal waters, the vessel would be required to activate a VMS transceiver unit and to continuously operate the unit (24 hours a day) throughout the remainder of the calendar year. A declaration report would be required prior to leaving port on a trip in which the vessel is used to fish in a GCA in a manner that is consistent with the requirements of the conservation area. VMS requirements defined at 660.312 and prohibitions defined at 660.306 would apply to these vessels, as would the reporting requirements defined at 660.303 for vessels fishing in conservation areas.

Discussion: The vessels identified under this alternative are in addition to those vessels identified under Alternative 2, 3 and 4A. Between 2000 and 2004, an average of 590 vessels per year used line gear to target groundfish in the OA fishery. For the purpose of this analysis, directed vessels were assumed to be those line vessels where the sum of all groundfish in any landing exceeded 50% of the revenue on a fish ticket**.** The average annual exvessel revenue from groundfish during this period was $4,235 per vessel. Other fisheries in which line gear is used and where incidentally caught groundfish are landed are the California halibut, HMS and salmon troll vessels. On average between 2000 and 2004, 58 out of 239 vessels landed OA groundfish while using OA line gear to fish for California halibut. The average annual exvessel revenue from groundfish landed by California halibut vessels during the 2000-2004 period was $105 per vessel. On average between 2000 and 2004, 10 out of 200 vessels landed OA groundfish while using line gear to fish for HMS. The average annual exvessel revenue from groundfish landed by HMS vessels during the 2000-2004 period was $75 per vessel. The salmon troll fisheries are allowed to fish within the nontrawl RCA and are allowed to retain yellowtail rockfish north of 40°N. Lat. on trips where the vessel conducts fishing in the RCA. The ad hoc VMS Committee initially did not consider VMS to be an effective enforcement tool for monitoring OA trip limit compliance by salmon troll vessels, because VMS cannot be used to determine where a particular species was caught when a fishing trip occurs both inside and outside an RCA.

The overfished species interactions under this alternative are in addition to those that were identified under Alternative 2, 3 and 4A.. Overfished species interactions in the directed groundfish fisheries were projected to include bocaccio, canary rockfish, cowcod, darkblotched rockfish, lingcod, POP and yelloweye rockfish (Table 3.3.3.5). Gear specific overfished species catch projections were not available for the directed OA line gears. No gear specific overfished species catch projections or historical data were available for the California halibut trawl fishery. No overfished species catch was projected for the HMS line gear fisheries for 2005. Historical landings data show that only small amounts of lingcod, widow rockfish, and bocaccio have been landed in the HMS fisheries. (Table 3.3.3.6 and Table 3.3.3.7)

Vessels using longline or pot gear would be required to operate their VMS units continuously from the point at which the vessel is used to fish in the OA fishery in federal waters. While, vessels using non-groundfish trawl gear would be required to operate their VMS units continuously from the point at which the vessel is used to fish in federal waters. The use of the term “fish” or “fishing” includes possessing federally managed groundfish in federal waters, even if the groundfish were taken and retained seaward of the EEZ or in state waters. Under this alternative, data would be available to monitor, for unlawful incursions into conservation areas, vessels using longline, pot, non-groundfish trawl gear (except for pink shrimp trawl), and line gear (except salmon troll) in the OA fisheries. Vessels must continue to operate the VMS units once the requirement is triggered; therefore, position data would be available for the vessels when they participate in other state and federal fisheries.

Alternative 5B: longline, pot, trawl and line gear vessels; excluding pink shrimp trawl, HMS longline and line gear and Dungeness crab pot gear. In addition to those vessels identified under Alternatives 2-4A, require all vessels that use line gear (including salmon troll) to fish pursuant to the harvest guidelines, quotas, and other management measures governing the OA fishery, to carry and use VMS transceiver units and provide declaration reports. Vessels using pink shrimp trawl gear are excluded under this alternative. In addition, vessels using HMS line gear, and Dungeness crab pot gear, where the incidental catch of overfished species is projected to be minimal, are excluded. Prior to leaving port on a trip in which a vessel identified under this alternative is used to take and retain, possess, or land federally managed groundfish in federal waters, the vessel would be required to activate a VMS transceiver unit and to continuously operate the unit (24 hours a day) throughout the remainder of the calendar year. A declaration report would be required prior to leaving port on a trip in which the vessel is used to fish in a GCA in a manner that is consistent with the requirements of the conservation area. VMS requirements defined at 660.312 and prohibitions defined at 660.306 would apply to these vessels, as would the reporting requirements defined at 660.303 for vessels fishing in conservation areas.

Discussion: The vessels identified under this alternative are the same vessels as those identified under Alternative 2, 3 and 4A, except that vessels using gears where the incidental catch of overfished species is projected to be minimal, are excluded. Vessels using pink shrimp trawl gear are excluded under this alternative. The legal groundfish gears with low incidental catch of overfished species are HMS line gear, and Dungeness crab pot gear. HMS longline gear is currently prohibited gear in the EEZ. Approximately 10 vessels per year between 2000 and 2004 landed groundfish taken with line gear while targeting HMS; and approximately 21 vessels per year between 2000 and 2004 landed groundfish taken with pot gear while targeting Dungeness crab. Under this alternative, vessels using salmon troll gear to fish pursuant to the harvest guidelines, quotas, and other management measures governing the OA fishery would also be required to carry and use VMS transceivers and provide declaration reports. Between 2000 and 2004, an average of 234 out of 1,099 vessels per year landed groundfish taken with salmon troll gear. The annual exvessel revenue from groundfish taken by salmon troll vessels during this period was $73 per vessel.

For Alternative 5B, the overfished species interactions in the fisheries using longline gears were identified under Alternative 2. The overfished species interactions in the fisheries using pot gears were identified under Alternative 3, except that the Dungeness crab pot vessels are excluded under Alternative 5B. This results in overfished species impacts for pot gear for Alternative 5B that are slightly more than Alternative 3.

Dungeness crab vessels will continue to fish within the RCAs for Dungeness crab; the ability to use the gear to target overfished shelf species within the RCAs is limited. Overfished species interactions in the fisheries using trawl gears were identified under Alternative 4A. The Overfished species interactions in the fisheries using line gears was identified under Alternative 5A, except that 10 HMS line vessels are excluded and 234 salmon troll vessels are included under ALternative 5B. Historically, groundfish catch has not been a significant component in salmon troll fisheries. However, the fishery does encounter groundfish and historical landings data include lingcod, POP, bocaccio, canary rockfish, widow rockfish, and yelloweye rockfish. Table 3.3.3.5 shows that the greatest overfished species effect of salmon trolling on groundfish is on canary rockfish. The inclusion of salmon troll vessels is expected to result in impacts similar to those projected in Table 3.3.3.5. Salmon troll vessels will continue to fish within the RCAs for salmon, but the incentive to keep or target overfished species taken in waters within the RCAs, where retention is prohibited, is reduced. Because HMS line vessels are projected to catch very few overfished groundfish, the overfished species impacts for HMS line gear is slightly more than those identified under Alternative 3.

Vessels using longline or pot gear would be required to operate their VMS units continuously from the point at which the vessel is used to fish in the OA fishery in federal waters. While, vessels using non-groundfish trawl gear would be required to operate their VMS units continuously from the point at which the vessel is used to fish in federal waters. The use of the term "fish" or "fishing" includes possessing federally managed groundfish in federal waters, even if the groundfish were taken and retained seaward of the EEZ or in state waters. Under this alternative, the available data would be the similar to 5A. HMS vessels are currently prohibited from using longline gear in the EEZ, HMS longline gear is currently prohibited gear in the EEZ, therefore no OA groundfish landings are expected to occur by these vessels. Excludes would be: approximately 10 vessels per year that landed groundfish taken with line gear while targeting HMS; and the estimated 21 vessels per year between that landed groundfish taken with pot gear while targeting Dungeness crab. However, data from the estimated 234 salmon troll vessels would be available under this alternative.

Alternative 6A: Any vessel engaged in a commercial fishery to which a RCA restriction applies. Require all vessels engaged in a commercial fishery to which an RCA restriction applies to carry and use VMS transceivers and provide declaration reports. Vessels using salmon, Dungeness crab, or HMS gear that do not take and retain groundfish are excluded. Vessels using Coastal Pelagic Species (CPS) netgear are excluded because it is not legal gear for harvesting groundfish. Pink shrimp vessels are also excluded. Because there is no link to federal authority at this time (federal nexus), vessels that fish exclusively in state waters are excluded. Prior to leaving port on a trip in which a vessel identified under this alternative is used to take and retain, possess, or land federally managed groundfish in federal waters, the vessel would be required to activate a VMS transceiver unit and to continuously operate the unit (24 hours a day) throughout the remainder of the calendar year. A declaration report would be required prior to leaving port on a trip in which the vessel is used to fish in a GCA in a manner that is consistent with the requirements of the conservation area. VMS requirements defined at 660.312 and prohibitions defined at 660.306 would apply to these vessels, as would the reporting requirements defined at 660.303 for vessels fishing in conservation areas.

Discussion: The vessels identified under this alternative are the same vessels as those identified under Alternative 5A, except that all vessels using longline gear to target Pacific halibut would be included rather than only those vessels that take and retain, possess or land groundfish. Also, under this alternative, vessels using salmon troll, California halibut net and HMS net gears used to fish pursuant to the harvest guidelines, quotas, and other management measures governing the OA fishery would be required to have and use VMS transceiver units and provide declaration reports. Between 2000 and 2004, an average of 65 vessels per year that are not registered to LE permits fished in the directed commercial fishery for Pacific halibut south of Point Chehalis. All of these vessels would be included under this alternative. This alternative also included all vessels using non-groundfish trawl gear. On average between 2000 and 2004 the number of vessels without LE groundfish permits was as follows: 40 vessels per year used non-groundfish trawl gear to fish for California halibut, 14 vessels per year used trawl gear to fish for sea cucumbers, and 23 vessels per year used trawl gear to fish for ridgeback prawn. Like Alternative 5B, vessels using salmon troll gear to fish pursuant to the harvest guidelines, quotas, and other management measures governing the OA fishery would also be required to carry and use VMS transceivers and provide declaration reports. Between 2000 and 2004, an average of 234 vessels per year landed groundfish taken with salmon troll gear. The annual exvessel revenue from groundfish taken by salmon troll vessels during this period was $73 per vessel. Bocaccio rockfish total catch mortality associated with CPS net gear was projected to be 0.3 mt, but would not be included under this alternative because it is not legal groundfish gear. However, 3 vessels per year between 2000 and 2004 landed groundfish with a per vessel exvessel revenue of $17. Between 2000 and 2004, an average of 47 vessels per year landed groundfish while fishing for California halibut nets would be included under this alternative. Between 2000 and 2004, an average of 25 vessels per year landed groundfish while fishing for HMS with nets south of 38° N. lat. (Point Reyes) would also be included under this alternative. XXXHowever, current California state law prohibits the landing of rockfish with setnet gearXXX. These vessels are not projected to take any overfished species in 2005.

Overfished species interactions in the fisheries using longline gears were identified under Alternative 2 Because this alternative would include all 65 Pacific halibut vessels, rather than just those that landed groundfish, the impacts for that fishery would be those projected in Table 3.3.3.5. Overfished species interactions in the fisheries using pot gears were identified under Alternative 3. Overfished species interactions in the fisheries using trawl gears were identified under Alternative 4A. Overfished species interactions in the fisheries using line gears were identified under Alternative 5B, except that 10 HMS line vessels are included. Because HMS line vessels are projected to catch very few overfished groundfish, the overfished species impacts for line gear is similar to Alternative 3. Overfished species impacts from HMS and California halibut net vessels are included under this alternative. When gill nets are fished for California halibut, fishermen attach suspenders to the nets to create slack in the net so the halibut entangle or roll up in the nets rather than being caught by their gills (CDFG 2000). Large mesh is used in halibut gill nets and the nets are fished in soft bottom areas were rockfish are less likely to be found, therefore they are not projected to take significant numbers of rockfish. The overfished species found in association with California halibut are bocaccio, canary rockfish and widow rockfish. HMS net gear will continue to fish within the RCAs. Historically, only small amounts of lingcod, bocaccio and widow rockfish have been landed with HMS net gear, which is required to be used in waters deeper than 60 fathoms. The stretch mesh has a diameter greater than 14", typically 18"-20", and hangs below the surface, where pelagic groundfish species and those that rise off the ocean floor are most vulnerable.

Vessels using longline or pot gear would be required to operate their VMS units continuously from the point at which the vessel is used to fish in the OA fishery in federal waters. While, vessels using non-groundfish trawl gear would be required to operate their VMS units continuously from the point at which the vessel is used to fish in federal waters. The use of the term “fish” or “fishing” includes possessing federally managed groundfish in federal waters, even if the groundfish were taken and retained seaward of the EEZ or in state waters.

Alternative 6B: Any vessel engaged in a commercial fishery to which a RCA restriction applies, except salmon troll vessels operating in waters north of 40°10' N. lat. that only retain yellowtail rockfish. Require all vessels engaged in a commercial fishery to which an RCA restriction applies to carry and use VMS transceivers and provide declaration reports. Vessels using salmon, Dungeness crab, CPS or HMS gear that do not take and retain groundfish are excluded. Salmon troll vessels operating in waters north of 40°10' N. lat. that only retain yellowtail rockfish are excluded. Pink shrimp vessels are excluded. If an RCA requirement is discontinued during the year, mandatory VMS coverage would be discontinued for the affected vessels. Because there is no link to federal authority at this time (federal nexus), vessels that fish exclusively in state waters are excluded. Prior to leaving port on a trip in which a vessel identified under this alternative is used to take and retain, possess, or land federally managed groundfish in federal waters, the vessel would be required to activate a VMS transceiver unit and to continuously operate the unit (24 hours a day) throughout the remainder of the calendar year. A declaration report would be required prior to leaving port on a trip in which the vessel is used to fish in a GCA in a manner that is consistent with the requirements of the conservation area. VMS requirements defined at 660.312 and prohibitions defined at 660.306 would apply to these vessels, as would the reporting requirements defined at 660.303 for vessels fishing in conservation areas.

Discussion: The vessels identified under this alternative are the same vessels as those identified under Alternative 6A except that 58 salmon troll vessels operating in waters north of 40°10' N. lat. that only retain yellowtail rockfish are excluded. Initially, Alternative 6B affects 1,478 vessels. In the long term, fewer vessels may be affected than under Alternative 6A, because Alternative 6B includes a provision to discontinued mandatory VMS coverage for OA gear groups when the RCA requirements are discontinued. Overfished species interactions under this alternative are similar to those under Alternative 6A, except for salmon troll vessels fishing north 40°10' N. lat. that land only yellowtail rockfish. Data on the overfished species impacts for salmon troll vessel are not available to more fully assess the changes in impacts between Alternatives 6A and 6B. Salmon troll vessels will continue to fish within the RCAs for salmon, but the incentive to keep or target overfished species taken in waters within the RCAs, where retention is prohibited, is increased over Alternative 6A for salmon troll vessels fishing north 40°10' N. lat.,

Vessels using longline or pot gear would be required to operate their VMS units continuously from the point at which the vessel is used to fish in the OA fishery in federal waters. While, vessels using non-groundfish trawl gear would be required to operate their VMS units continuously from the point at which the vessel is used to fish in federal waters. The use of the term “fish” or “fishing” includes possessing federally managed groundfish in federal waters, even if the groundfish were taken and retained seaward of the EEZ or in state waters.

Alternative 7: Any vessel engaged in a commercial fishery to which an RCA restriction applies, except vessels less than 12 feet in overall length. Require all vessels greater than 12 ft in length that are engaged in a commercial fishery to which an RCA restriction applies to carry and use VMS transceivers and provide declaration reports. Vessels using salmon, Dungeness crab, CPS or HMS gear that do not take and retain groundfish are excluded. Pink shrimp vessels are excluded. Vessels that fish exclusively in state waters are excluded. Prior to leaving port on a trip in which a vessel identified under this alternative is used to take and retain, possess, or land federally managed groundfish in federal waters, the vessel would be required to activate a VMS transceiver unit and to continuously operate the unit (24 hours a day) throughout the remainder of the calendar year. A declaration report would be required prior to leaving port on a trip in which the vessel is used to fish in a GCA in a manner that is consistent with the requirements of the conservation area. VMS requirements defined at 660.312 and prohibitions defined at 660.306 would apply to these vessels, as would the reporting requirements defined at 660.303 for vessels fishing in conservation areas.

<u>Discussion</u>: The vessels identified under this alternative are the same vessels as those identified under Alternative 6A, except that vessels less than 12 feet in length are excluded. An average of 22 vessels per year between 2000 and 2003 landed groundfish and were less than 12 feet in length. These vessels included 6 vessels that used longline gear, 2 vessels that used pot gear, and 14 vessels that used line gear.

Overfished species interactions under this alternative are similar to those under alternative 6A. Vessels using longline or pot gear would be required to operate their VMS units continuously from the point at which the vessel is used to fish in the OA fishery in federal waters. While, vessels using non-groundfish trawl gear would be required to operate their VMS units continuously from the point at which the vessel is used to fish in federal waters. The use of the term “fish” or “fishing” includes possessing federally managed groundfish in federal waters, even if the groundfish were taken and retained seaward of the EEZ or in state waters.

Alternative 8 - Low impact OA fisheries Require all vessels that fish in federal waters for which there is an RCA requirement, to carry and use VMS transceivers and to provide declaration reports except that vessels using pink shrimp trawl gear are excluded; vessels using gears where the best available data indicates that the incidental catch of overfished species is projected to be minimal would also be excluded. These low impact target fisheries and gear include: Dungeness crab pot, spot prawn pot, sea cucumber trawl, ridgeback prawn trawl, HMS line, and California sheephead pot.

Because there is no link to federal authority at this time (federal nexus), vessels that fish exclusively in state waters are excluded. Prior to leaving port on a trip in which a vessel identified under this alternative is used to take and retain, possess, or land federally managed groundfish in federal waters, the vessel would be required to activate a VMS transceiver unit and to continuously operate the unit (24 hours a day) throughout the remainder of the calendar year. A declaration report would be required prior to leaving port on a trip in which the vessel is used to fish in a GCA in a manner that is consistent with the requirements of the conservation area. VMS requirements defined at 660.312 and prohibitions defined at 660.306 would apply to these vessels, as would the reporting requirements defined at 660.303 for vessels fishing in conservation areas. A declaration report would be required prior to leaving port on a trip in which the vessel is used to fish in a GCA in a manner that is consistent with the requirements of the conservation area. VMS requirements defined at 660.312 and prohibitions defined at 660.306 would apply to these vessels, as would the reporting requirements defined at 660.303 for vessels fishing in conservation areas.

Discussion: The vessels identified under this alternative are 282 groundfish directed longline vessels per year, 65 Pacific halibut vessels per year, 142 groundfish directed pot vessels per year, 40 California halibut trawl vessels per year, 590 groundfish directed line vessels per year, 234 salmon troll vessels per year, and 58 California halibut vessels per year.

Overfished species interactions in the fisheries using longline gears were identified under Alternative 2 Because this alternative would include all 65 Pacific halibut vessels, the impacts for that fishery would be those projected in Table 3.3.3.5. Overfished species interactions in the fisheries using pot gears were identified under Alternative 3. Under this alternative the Dungeness crab, California sheephead and spot prawn pot vessels are excluded. This results in overfished species impacts for pot gear that are slightly more than Alternative 3. Dungeness crab and spot prawn pot vessels will continue to fish within the RCAs; the ability to use the gear to target overfished shelf species within the RCAs is limited. California sheephead are shallow nearshore finfish. Historically, lingcod has been the dominant overfished species landed by vessels targeting California sheephead. High lingcod survival is projected when released alive from nearshore pots (>50%). A 1993 study by Marine Resources Division Department of Fish and Game State of California showed that there is a potential for the live-fish trap fishery to negatively affect nontarget finfish populations which raises concern about the potential impacts of the gear if used in areas and at time where it is otherwise restricted.

Overfished species interactions in the fisheries using trawl gears were identified under Alternative 4A and 4B. This alternative includes only California halibut trawl. Gear specific estimates for the nongroundfish trawl vessels that where the primary target species was California halibut were not available. Lingcod, bocaccio, canary rockfish and widow rockfish were historically landed by all California halibut gears combined (Table 3.3.3.6 and Table 3.3.3.7). The projections for 2005 are similar in composition (Table 3.3.3.5). The interaction with overfished species for Pink shrimp vessels is neutral because they are allowed to fish within the trawl RCA providing a declaration report is sent prior to leaving port on a trip and BRDs are used. The interaction with overfished species for ridgeback prawn trawls that operate south of Point Conception depend on the use of BRDs to reduce the catch of finfish and the integrity of RCAs. The risk of vessels not adhering to RCA requirements is greater under this alternative than under Alternatives 4A-7. Prior to implementation of the RCAs and the requirement to used BRDs, lingcod, darkblotched rockfish, bocaccio, canary rockfish, cowcod, widow rockfish and yelloweye were landed in the prawn (trap and trawl for all prawn species) fisheries (Table 3.3.3.6 and Table 3.3.3.7) south of 40˚10' N. latitude. For nongroundfish trawl vessels where the primary target species was sea cucumber, no overfished species catch was projected for 2005. Prior to the implementation of RCAs, less than 0.5 mt of all overfished species combined were landed by sea cucumber vessels in a given year (Table 3.3.3.6 and Table 3.3.3.7). Overfished species interaction would be slightly greater than Alternatives 4A-7 for sea cucumber vessels.

Overfished species impacts from California Halibut net vessels would be included under this alternative. When gill nets are fished for California halibut, fishermen attach suspenders to the nets to create slack in the net so the halibut entangle or roll up in the nets rather than being caught by their gills (CDFG 2000). Large mesh is used in halibut gill nets and the nets are fished in soft bottom areas where rockfish are less likely to be found, therefore they are not projected to take significant numbers of rockfish. The overfished species found in association with California halibut are bocaccio, canary rockfish and widow rockfish.

When considering the impacts of an incidental fishery on overfished species, the HMS net and line fisheries, the California sheephead pot fishery, the sea cucumber trawl fishery and the spot prawn trap fishery have historically landed the lowest amounts of overfished species (Tables 3.3.3.6 and 3.3.3.7) before RCA management was adopted. These fisheries are also projected to have the lowest fishing mortality in 2005 with RCA management (Table 3.3.3.5). With the exception of sea cucumber trawl, fishing for the target species occurs within the RCAs, although only groundfish on trips were no fishing occurs in the RCA may be retained. The fisheries with slightly greater impacts on overfished species, those where small amounts by weight and proportion of the available OY (less than 0.05%), were taken included the ridgeback prawn trawl fishery and the Dungeness crab pot fishery. The Dungeness crab fishery occurs within the RCAs and has historically landed only small amounts of overfished species. While the ridgeback prawn trawl fishery has BRD requirements to reduce the catch of finfish, including overfished species, and has RCA restriction. In 1998, prior to the implementation of conservation areas and the BRD requirements, the prawn fisheries (all prawns) landed 0.7 mt of lingcod, 0.05 mt of darkbloched rockfish, 2.4 mt of bocaccio, 0.05 mt of canary rockfish, 1.2 mt of cowcod, and 0.05 mt of yelloweye rockfish (Table 3.3.3.7). Although the California gillnet fishery is projected to take a single overfished species, it is projected to have a greater impact with 0.5 mt of bocaccio by weight or 0.16% of the OY being taken.

Vessels using longline, line or pot gear would be required to operate their VMS units continuously from the point at which the vessel is used to fish in the OA fishery in federal waters. While, vessels using non-groundfish trawl gear would be required to operate their VMS units continuously from the point at which the vessel is used to fish in federal waters. The use of the term “fish” or “fishing” includes possessing federally managed groundfish in federal waters, even if the groundfish were taken and retained seaward of the EEZ or in state waters.

Table 2.0.2 Presence of overfished species in incidental nongroundfish fisheries (summarized from Tables 3.3.3.6 and 3.3.3.7)

	North of Mendocino				South of Mendocino		
Fishery (all gears)	1998	2000	2002		1998	2000	2002
California halibut	~	~	✢		✢✢✢	✢	✢✢✢
California gillnet	~	~	~		✢✢✢	✢	✢
California sheephead	~	~	~		✢	✢	✢
Dungeness crab	✢	✢	✢		✢	~	~
HMS	✢	✢	~		✢	✢	✢
Pacific halibut	✢✢✢	✢✢✢	✢✢✢		✢	~	~
Pink shrimp	✢✢✢	✢✢✢	✢✢✢		✢✢✢	✢	~
Prawn	~	~	~		✢✢✢	✢✢	✢
Salmon troll	✢✢✢	✢✢✢	✢✢✢		✢✢	✢✢	✢✢✢
Sea cucumber	~	~	~		✢	~	✢

✢✢✢ More than 0.5 mt of a single overfished species
✢✢ More than 0.5 mt of all overfished species combined
✢ Less than 0.5 mt of all overfished species combined
~ No overfished species landings data

Alternative 9 - Directed OA - Require all vessels that fish in federal waters for which there is an RCA requirement, to carry and use VMS transceivers and to provide declaration reports if they land more than 500 lb of groundfish in a calendar year. Because there is no link to federal authority at this time (federal nexus), vessels that fish exclusively in state waters are excluded. Prior to leaving port on a trip in which a vessel identified under this alternative is used to take and retain, possess, or land federally managed groundfish in federal waters, the vessel would be required to activate a VMS transceiver unit and to continuously operate the unit (24 hours a day) throughout the remainder of the calendar year. A declaration report would be required prior to leaving port on a trip in which the vessel is used to fish in a GCA in a manner that is consistent with the requirements of the conservation area. VMS requirements defined at 660.312 and prohibitions defined at 660.306 would apply to these vessels, as would the reporting requirements defined at 660.303 for vessels fishing in conservation areas. A declaration report would be required prior to leaving port on a trip in which the vessel is used to fish in a GCA in a manner that is consistent with the requirements of the conservation area. VMS requirements defined at 660.312 and prohibitions defined at 660.306 would apply to these vessels, as would the reporting requirements defined at 660.303 for vessels fishing in conservation areas

Discussion: The vessels identified under this alternative are 282 groundfish directed longline vessels per year, 6 Pacific halibut longline vessels per year (14 vessels if only 2003 & 2004 data used), 142 groundfish directed pot vessels per year, 1 Dungeness crab pot vessel per year, 2 prawn pot vessels per year, 2 California sheephead (CA nearshore.) vessels per year, 9 California halibut trawl vessels, 590 groundfish directed line vessels per year, no California halibut vessels, 1 HMS vessel, and 6 salmon troll vessels. The directed groundfish vessels that would be required to have and use VMS are the same as those identified in Alternatives 5-8. Incidental OA fishery vessels included under this alternative are only those vessels that landed more than 500 lb of groundfish in a calendar year.

Vessels using longline, line or pot gear would be required to operate their VMS units continuously from the point at which the vessel is used to fish in the OA fishery in federal waters. While, vessels using non-groundfish trawl gear would be required to operate their VMS units continuously from the point at which the vessel is used to fish in federal waters. The use of the term "fish" or "fishing" includes possessing federally managed groundfish in federal waters, even if the groundfish were taken and retained seaward of the EEZ or in state waters.

Overfished species interactions in the fisheries using longline gears were identified under Alternative 2 Because this alternative would include only 7 Pacific halibut vessels, may be incursions into the RCAs resulting in overfished species impacts greater than those identified in Table 3.3.3.5. for that fishery. However, given the short duration of the fishery and the permitting requirements, existing traditional enforcement resources may adequate to reduce the risk of incursions. Overfished species interactions in the fisheries using pot gears are similar to those identified under Alternative 8 because under this alternative only 1 Dungeness crab, 2 California sheephead and 2 spot prawn pot vessels are included. It is likely that these vessels would discard groundfish to avoid VMS requirements. Overfished species interactions in the fisheries using trawl gears are slightly more than those projected under Alternatives 1-3, because only 9 California halibut and 3 pink shrimp vessels would be required to have and use VMS. It is likely that these vessels would discard groundfish to avoid VMS requirements. Although 15 California halibut net gear vessels were identified, new state regulations prohibiting the landing of rockfish would likely result in no California halibut net gear vessels being required to have and use VMS; therefore, the interactions with overfished species would be similar to those under Alternatives 1-5B.

NOTE: If this alternative were defined as directed vessels only - "Require all vessels that fish in federal waters for which there is an RCA requirement, to carry and use VMS transceivers and to provide declaration reports if the sum of all groundfish in any landing exceeds 50% of the revenue on a fish ticket." The following vessels would be included: 282 groundfish directed longline vessels per year, 142 groundfish directed pot gear vessels per year, and 590 groundfish directed vessels per year.

Alternative 10 - No Action Alternative No VMS requirements for vessels in federal waters fishing pursuant to the harvest guidelines, quotas, and other management measures governing the OA fishery. Discontinue RCA management areas defined at 660.383 (c) and adjust trip limits and seasons accordingly. Require declaration reports from OA non-groundfish trawl vessels that are using trawl gear, allowed by regulation, to fish within a trawl RCA.

Discussion: Vessels without LE permits that fish pursuant to the harvest guidelines, quotas, and other management measures governing the OA fishery would not be required to carry and use VMS transceiver units. However, vessels could elect to voluntarily carry a VMS transceiver unit and provide position reports to NMFS if they choose. Vessels registered to LE permits that operate in both LE and OA fisheries (fishing conducted with OA gear, by a vessel that has a valid LE permit with an endorsement for another type of gear) would continue to be required to carry and use a VMS transceiver and to provide declaration reports. Declaration reports would continue to be required from vessels using non-groundfish trawl gear whether or not groundfish are retained by the vessel.

Unlike Alternative 1, the non-trawl and trawl RCA requirements for directed and incidental fisheries would be discontinued. Without the non-trawl and trawl RCAs, there is no need to have VMS to maintain the integrity of these RCAs. Non-trawl RCAs for the OA fisheries defined at 660.383(c)(3) and the trawl RCAs for the OA non-groundfish trawl fisheries defined at 660.383(c)(4) would be discontinued. The yelloweye RCA (a voluntary closure) defined at 660.383(c)(1) and cowcod conservation area defined at 660.383(c)(2) would be continued. State restrictions for states waters (0-3 nm) around the Farallon Islands and Cordell banks would remain in place. Traditional enforcement methods (such as aerial surveillance, boarding at sea via patrol boats, landing inspections and documentary investigation) would be the primary means to monitor compliance with the yellowtail rockfish and cowcod conservation areas as well as the Farallon Islands and Cordell banks areas.

Without non-trawl and trawl RCA restrictions for the OA vessels, the rate at which overfished species, particularly overfished shelf species, are encountered by OA vessels would be expected to increase. To prevent overfished species OYs from being exceeded, more restrictive trip limits would need to be adopted for all OA fisheries. The opportunity to harvest catch that may be found in the shelf areas would need to be greatly reduced. These more restrictive limits would be expected to not only constrain the effects of the OA fisheries on the overfished species OYs, but also to prevent excessive overfished species harvest in the OA fisheries from negatively affecting fishing opportunity in other sectors of the groundfish fishery. Only selective gears, those that have been proven to catch abundant species and that do not catch (or catch at extremely low rates) overfished species, would be allowed to continue on the shelf. The directed OA fisheries would be most affected by the limit reductions. Limits for the incidental OA fishers would accommodate low levels of incidental catch while not creating incentives to target groundfish.

Opportunities for some slope and nearshore species would be similar to those limits that have been in place for 2005. Deeper slope species, such as darkblotched rockfish and POP, are more vulnerable to LE trawl gear and historically have been taken in small proportions in the OA fishery. Nearshore fisheries, particularly with higher black rockfish limits, will likely result in higher lingcod catch. However, lingcod caught and discarded in nearshore areas are expected to have a relatively low mortality rate. Because lingcod are also distributed in shelf areas, where yelloweye and canary rockfish may be affected, it would be necessary to reduce lingcod limits to eliminate targeting opportunities.

If the cost of fuel remains high, as in 2005, fishers may choose to travel less distance to the fishing grounds and operate in the shelf areas rather than in slope areas when there is opportunity. Sablefish, though smaller in size, are also found shelf areas; therefore, the opportunity to harvest sablefish would be reduced. Similarly, flatfish opportunity would remain only for those OA vessels that use number 2 hooks with hook-and-line gear, because the selectivity of the gear. There would be no opportunities for shelf rockfish species. Example trip limit tables for the OA fisheries under Alternative 10 are shown below in Table 2.0.3 and Table 2.0.4.

Reduced trip limits are likely to result in lower gross revenues for some vessels, and this is likely to result in lower net revenues. Those vessels that are more actively engaged in the directed open access fishery by pursuing and achieving the open access cumulative limits are more likely to bear a higher proportion of lost revenues than vessels that are not actively engaged in the directed open access fishery. If vessels more actively engaged in the directed open access fishery are more reliant on revenues from those fisheries than vessels not actively pursuing existing cumulative limits, then the impact of reduced open access limits is likely to result in a lower standard of living for vessel operators actively engaged in directed open access fisheries.

If projections show that trip limits alone do not keep the total catch of overfished species within the specified OY, harvest guidelines or allocations, additional measures such as closed seasons would need to be used, or reductions in catch available to other sectors of the fishery (LE and recreational) may also need to be reduced. To keep the mortality of overfished species within their OYs, regulatory provisions at 50 CFR 660.370 (h)(7) concerning vessels that operate in both limited entry and open access fisheries would need to be revised to prevent vessels registered to LE groundfish permits from accessing the OA limits while operating within the RCAs.

Table 2.0.3. (North) to Part 660, Subpart G -- Alternative 10 Trip Limits for Open Access Gears North of 40°10' N. Lat.

Other Limits and Requirements Apply -- Read § 660.301 - § 660.390 before using this table 122004

		JAN-FEB	MAR-APR	MAY-JUN	JUL-AUG	SEP-OCT	NOV-DEC
		See § 660.370 and § 660.381 for Additional Gear, Trip Limit, and Restrictions.					
1	**Minor slope rockfish[1/] & Darkblotched rockfish**	Per trip, no more than 25% of weight of the sablefish landed					
2	**Pacific ocean perch**	100 lb/ month					
3	**Sablefish**	100 lb/ day, or 1 landing per week of up to 300 lb, not to exceed 1,200 lb/ 2 months					
4	**Thornyheads**	CLOSED					
5	**Dover sole**	3,000 lb/month, no more than 300 lb of which may be species other than Pacific sanddabs. May only be landed with by 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. Otherwise CLOSED					
6	**Arrowtooth flounder**						
7	**Petrale sole**						
8	**English sole**						
9	**Other flatfish[2/]**						
10	**Whiting**	CLOSED					
11	**Minor shelf rockfish[1/], Shortbelly, Widow, & Yellowtail rockfish**	CLOSED					
12	**Canary rockfish**	CLOSED					
13	**Yelloweye rockfish**	CLOSED					
14	**Minor nearshore rockfish & Black rockfish**	5,000 lb/ 2 months, no more than 1,200 lb of which may be species other than black or blue rockfish [3/]					
15	**Lingcod[4/]**	CLOSED		100 lb/ month			CLOSED
16	**Other Fish[5/] & Pacific cod**	Not limited					
17	**PINK SHRIMP NON-GROUNDFISH TRAWL**						
18	North	**Effective April 1 - October 31:** 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. This limit is within the 200 lb per month combined limit for all grounfish and is not in addition to that limit. All groundfish species are subject to the limits, seasons, restrictions listed above in this table.					

North

1/ Bocaccio, chilipepper and cowcod rockfishes are included in the trip limits for minor shelf rockfish.
Splitnose rockfish is included in the trip limits for minor slope rockfish.

2/ "Other flatfish" are defined at § 660.302 and include butter sole, curlfin sole, flathead sole, Pacific sanddab, rex sole, rock sole, sand sole, and starry flounder.

3/ For black rockfish north of Cape Alava (48°09.50' N. lat.), and between Destruction Is. (47°40' N. lat.) and Leadbetter Pnt. (46°38.17' 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.

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

5/ "Other fish" are defined at § 660.302 and include sharks, skates, ratfish, morids, grenadiers, and kelp greenling.
Cabezon is included in the trip limits for "other fish."

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

Table 2.0.4. (South) to Part 660, Subpart G -- Alternative 10 Trip Limits for Open Access Gears South of 40°10' N. Lat.

Other Limits and Requirements Apply -- Read § 660.301 - § 660.390 before using this table 122004

		JAN-FEB	MAR-APR	MAY-JUN	JUL-AUG	SEP-OCT	NOV-DEC
	See § 660.370 and § 660.381 for Additional Gear, Trip Limit, and Restrictions.						
1	**Minor slope rockfish[1/] & Darkblotched rockfish**						
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**	CLOSED					
5	**Sablefish**						
6	40°10' - 36° N. lat.	100 lb/ day, or 1 landing per week of up to 300 lb, not to exceed 1,200 lb/ 2 months					
7	South of 36° N. lat.	150 lb/ day, or 1 landing per week of up to 350 lb					
8	**Thornyheads**						
9	40°10' - 34°27' N. lat.	CLOSED					
10	South of 34°27' N. lat.	50 lb/ day, no more than 300 lb/ 2 months					
11	**Dover sole**	3,000 lb/month, no more than 300 lb of which may be species other than Pacific sanddabs. May only be landed with by 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. Otherwise CLOSED					
12	**Arrowtooth flounder**						
13	**Petrale sole**						
14	**English sole**						
15	**Other flatfish[2/]**						
16	**Whiting**	CLOSED					
17	**Minor shelf rockfish[1/], Shortbelly, Widow & Chilipepper rockfish**	CLOSED					
20	**Canary rockfish**	CLOSED					
21	**Yelloweye rockfish**	CLOSED					
22	**Cowcod**	CLOSED					
23	**Bocaccio**	CLOSED					
26	**Minor nearshore rockfish & Black rockfish**						
27	Shallow nearshore	300 lb/ 2 months	CLOSED	500 lb/ 2 months	600 lb/ 2 months	500 lb/ 2 months	300 lb/ 2 months
28	Deeper nearshore						
29	40°10' - 34°27' N. lat.	500 lb/ 2 months	CLOSED	500 lb/ 2 months		400 lb/ 2 months	500 lb/ 2 months
30	South of 34°27' N. lat.			600 lb/ 2 months			400 lb/ 2 months
31	California scorpionfish	300 lb/ 2 months	CLOSED	300 lb/ 2 months	400 lb/ 2 months		300 lb/ 2 months
32	**Lingcod[3/]**	CLOSED		100 lb/ month, when nearshore open			CLOSED
33	**Other Fish[4/] & Cabezon**	Other fish CLOSED, Cabazon and Kelp Greenling unlimited					

South

Table 2.0.4. (South) Continued

34	**PINK SHRIMP NON-GROUNDFISH TRAWL GEAR**		South con't
35	South	**Effective April 1 - October 31:** 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.	
36	**RIDGEBACK PRAWN AND, SOUTH OF 38°57.50' N. LAT., CA HALIBUT AND SEA CUCUMBER NON-GROUNDFISH TRAWL**		
45		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 31).	

1/ Yellowtail rockfish is included in the trip limits for minor shelf rockfish and POP is included in the trip limits for minor slope rockfish.
2/ "Other flatfish" are defined at § 660.302 and include butter sole, curlfin sole, flathead sole, Pacific sanddab, rex sole, rock sole, sand sole, and starry flounder.
3/ The size limit for lingcod is 24 inches (61 cm) total length.
4/ "Other fish" are defined at § 660.302 and include sharks, skates, ratfish, morids, grenadiers, and kelp greenling. Pacific cod is included in the trip limits for "other fish."
To convert pounds to kilograms, divide by 2.20462, the number of pounds in one kilogram.

2.3 Alternatives rejected from further analysis

VMS coverage of the recreational fisheries is not being considered at this time. At its October 2003 meeting, the ad hoc VMS Committee considered expansion of the VMS program, including expansion into the charter and private sectors of the recreational fishery. After considerable discussion, the committee recommended that an area-by-area evaluation of the groundfish impacts by these participants was necessary before a final recommendation could be made.

The pink shrimp fisheries were originally not included in the alternatives for VMS coverage. Pink shrimp vessels are allowed to fish within the trawl RCA providing a declaration report has been sent prior to leaving port on a trip in which the vessel is used to fish within a GCA or RCA. Pink shrimp trawl vessels were excluded in the coverage alternatives, because they are required to use finfish excluders, which dramatically reduce their catch of overfished species, primarily canary rockfish. At the Council's June 2005 meeting, the Council considered management alternatives to reduce the impacts of fishing on Pacific coast groundfish EFH, as mandated by the Magnuson-Stevens Act. The focus on protecting habitat from bottom trawl impacts resulted in the Council recommending that NMFS adopt many new closed areas for bottom trawl gear. For monitoring the integrity of these habitat protection measures, vessels using trawl gear to target pink shrimp that do not already have a LE permit registered to the vessel, were recommended for inclusion into the OA VMS alternatives.

The salmon troll fisheries are allowed to fish within the non-trawl RCA and are allowed to retain some groundfish. Because VMS cannot be used to determine where a particular species was caught on individual fishing trips where activities occur both inside and outside RCAs, it was not originally considered to be an effective enforcement tool for monitoring OA trip limit compliance by salmon troll vessels.

State and federal fisheries in which groundfish are incidentally taken, but not landed were not included in the analysis because fisheries where groundfish catch is not landed are not considered to be OA fishery. These vessels include: the those targeting CPS squid, CPS wetfish, or HMS with purse seine gear.

3.0 AFFECTED ENVIRONMENT

The purpose of this EA is to analyze a range of alternatives for expanding the VMS program into the OA groundfish fisheries off the coasts of Washington, Oregon, and California. The affected environment includes: the geographical location in which these fisheries occur; the groundfish and other species these vessels harvest and interact with; the fish buyers and processors that are dependent on the fishery; the suppliers and services; and ultimately, and the fishing-dependent communities where vessels dock and fishing families live. The following section of this document, Section 3, describes the physical, biological, and socio-economic characteristics of the affected environment.

3.1 Physical Environment

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. When these EFHs for all groundfish species 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 seaward to the boundary of the U.S. EEZ.

This is a tiered EA that expands on information presented in the original July 2003 VMS EA titled, The Program to Monitor Time-Area Closures in the Pacific Coast Groundfish Fishery. Section 3.1, Physical Environment, of the original EA contained detailed information on the marine ecosystem. In addition, Section 3.2 of the February 2005 Draft EFH EIS titled: The Pacific Coast Groundfish Fishery Management Plan, EFH Designation and Minimization of Adverse Impacts, contains further information on the physical environment. Readers who are interested in more detailed information on the physical environment than is provided in this EA are referred to the EFH EIS. A copy of the EFH EIS can be obtained by contacting the Sustainable Fisheries Division, Northwest Region, NMFS, by writing to 7600 Sand Point Way, NE, Seattle, WA 98115–0070; or calling 206-526-6187 or 206-526-4490; or viewing the internet posting at http://www.nwr.noaa.gov/.

3.1.1 Current Habitat Protection Areas

There are many areas off the West Coast where marine habitat is afforded some level of protection through existing regulations. These are areas that have been established by federal, state, and local agencies or other organizations. Areas may have been established to regulate navigation, restrict access (e.g., for security or fishing purposes), protect certain natural resources, regulate use, or for other purposes. These areas are known generally as marine managed areas, but are more specifically called National Wildlife Refuges, National Marine Sanctuaries, fishery closure areas, State Parks, oil platform navigation safety zones, national security zones, marine protected areas, or marine reserves. Of the 321 distinct marine management areas, fifty nine may be considered marine reserves where all fishing is prohibited due either to specific fishing regulations or to access restrictions. Some sites may, for example, prohibit commercial fishing but allow recreational fishing; others allow fishing for some, but not all species of fish or invertebrates. Still others may only regulate fishing for one type of organism. A description of the existing marine managed areas is contained in Section 3.6 of the Pacific Coast Groundfish Fishery Management Plan, EFH Designation and Minimization of Adverse Impacts, Draft EFH EIS.

At the Council's June 2005 meeting, it adopted a preferred alternative for the "Essential Fish Habitat Designation and Minimization of Adverse Impacts Draft EIS." The Council's preferred alternative included a recommendations for designating: Habitat Areas of Particular Concern (HAPC); areas where gear restrictions will to protect habitat; and ecologically important areas that are to be closed to specified gear types. Amendment 19 to the groundfish FMP is being developed to authorizes these new groundfish habitat protection closures. The Council's final recommendations on Amendments 19 are scheduled for their November 2005 meeting. Background information and supporting documentation for the Council's recommendation can be found within that EFH EIS.

3.2 Biological Environment

3.2.1 Groundfish Resources

The Pacific Coast groundfish FMP manages over 90+ species, which are divided into the following groups: roundfish, flatfish, rockfish, sharks, skates, ratfish, morids, and grenadiers. These species occur throughout the EEZ and occupy diverse habitats at all stages in their life history. Information on the interactions between the various 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.

Each fishing year, the Council uses the best available stock assessment data to evaluate the biological condition of the Pacific Coast groundfish fishery and to develop estimates of allowable biological catch (ABC) levels for major groundfish stocks. The ABCs are biologically based estimates of the amount of fish that may be harvested from the fishery each year without jeopardizing the stability of the resource. The ABC may be modified to incorporate biological safety factors and risk assessment due to uncertainty.

Harvest levels or optimum yields (OYs) are established for the species or species groups that the Council proposes to manage. In 2005, OYs are defined for the following groundfish species and species groups: bocaccio, black rockfish, cabezon, canary rockfish, chilipepper rockfish, cowcod, darkblotched rockfish, Dover sole, lingcod, longspine thornyhead, the minor rockfish complexes (the unassessed northern and southern nearshore, continental shelf, and continental slope rockfish species,) Pacific cod, POP, Pacific whiting, sablefish, shortbelly rockfish, shortspine thornyhead, splitnose rockfish, widow rockfish, yelloweye rockfish, and yellowtail rockfish. Numerical OYs are not set for every stock.

The Magnuson-Stevens Act requires an FMP to prevent overfishing. Overfishing is defined in the National Standards Guidelines (63 FR 24212, May 1, 1998) as exceeding the fishing mortality rate needed to produce maximum sustainable yield. The OY harvest levels are set at levels that are expected to prevent overfishing, equal to or less than the ABCs. The term “overfished” describes a stock whose abundance is below its overfished/rebuilding threshold. Overfished/rebuilding thresholds are generally linked to the same productivity assumptions that determine the ABC levels. The default value of this threshold for the groundfish FMP is 25% of the estimated unfished biomass level. In 2005, eight groundfish species continue to be designated as overfished: bocaccio (south of Monterey), canary rockfish, cowcod (south of Point Conception), darkblotched rockfish, lingcod, Pacific ocean perch, widow rockfish, and yelloweye rockfish.

This is a tiered EA that expands on information presented in the July 2003 EA titled, The Program to Monitor Time-Area Closures in the Pacific Coast Groundfish Fishery. Section 3.2, Biological Environment, of the original EA, contained detailed biological information on the groundfish resources. Therefore this EA contains a summary of information provided in the original EA. Readers who are interested in further information on the status of the groundfish resources, including the status of overfished species, are referred to Section 4.0 of the EIS, prepared by the Pacific Fishery Management Council, for the Proposed Acceptable Biological Catch and Optimum Yield Specifications and Management Measures for the 2005-2006 Pacific Coast Groundfish Fishery. Copies of the EIS can be obtained from the Pacific Fishery Management Council, by writing to 7700 NE Ambassador Place, Suite 200, Portland, OR 97220-1384; or calling 503 820-2280; or viewing the internet posting at http://www.pcouncil.org.

3.2.2 Endangered Species

West Coast marine species listed as endangered or threatened under the ESA include marine mammals, seabirds, sea turtles, and salmon. 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. Table 3.2.2.1 lists the species are subject to the conservation and management requirements of the ESA because they are listed as threatened or endangered.

Table 3.2.2.1. West Coast Endangered Species

Marine Mammals	Seabirds
Threatened: • Steller sea lion (*Eumetopias jubatus*) Eastern Stock • Guadalupe fur seal (*Arctocephalus townsendi*) • Southern sea otter (*Enhydra lutris*) California Stock	Endangered: • Short-tail albatross (*Phoebastria (=Diomedea) albatrus*) • California brown pelican (*Pelecanus occidentalis*) • California least tern (*Sterna antillarum browni*) Threatened: • Marbled murrelet (*Brachyramphs marmoratus*)
Sea Turtles	**Salmon**
Endangered: • Green turtle (*Chelonia mydas*) • Leatherback turtle (*Dermochelys coriacea*) • Olive ridly turtle (*Lepidochelys olivacea*) Threatened: • Loggerhead turtle (*Caretta caretta*)	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 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, Northern California

Marine Mammals: Table 3.2.3.1 of the original VMS EA identified marine mammal communities by depth categories (nearshore, shelf and slope depth) that approximate those defined by the RCAs for three coastal regions, which included southern California, central to northern California, and Oregon to British Columbia.

Seabirds: Over sixty species of seabirds occur in waters off the West Coast within the EEZ, including: loons, grebes, albatross, fulmars, petrels, shearwaters, storm-petrels, pelicans, cormorants, frigate birds, phalaropes, skuas, jaegers, gulls, kittiwakes, skimmers, terns, guillemots, murrelets, auklets, and puffins. The migratory range of these species includes areas where OA commercial fishing occurs; commercial fishing also occurs near the breeding colonies of many of these species. Besides entanglement in fishing gear, seabirds may be indirectly affected by commercial fisheries in various ways. Change in prey availability may be linked to 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. Under the Magnuson-Stevens Act, NMFS is required to ensure fishery management actions comply with other laws designed to protect seabirds.

Sea Turtles: Sea turtles are highly migratory; four of the six species found in U.S. waters have been sighted off the West Coast. Little is known about the interactions between sea turtles and West Coast commercial fisheries. The directed fishing for sea turtles in West Coast groundfish fisheries is prohibited, because of their ESA listings. Sea turtles have been known to be taken incidentally by the California-based pelagic longline fleet and the California halibut gillnet fishery. Because of differences in gear and fishing strategies between those fisheries and the directed groundfish fisheries, the expected take of sea turtles is minimal in the directed OA groundfish fisheries.

Salmon: salmon caught in the U.S. West Coast fishery have life cycle ranges that include coastal streams and river systems from central California to Alaska and oceanic 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. The OA groundfish fishery includes vessels that take and retain groundfish while using troll gear to target salmon.

This is a tiered EA that expands on information presented in the original July 2003 EA titled, “The Program to Monitor Time-Area Closures in the Pacific Coast Groundfish Fishery” Section 3.2.2 of the original EA, “Endangered Species” contains more detailed information on these resources.

3.2.3 Non-groundfish Species Interactions

Dungeness Crab: Dungeness crab (*Cancer magister*) are 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 (98 fm). Although Dungeness crab are found on mud and gravel, it is most abundant on sandy bottoms and in eelgrass. Dungeness crab, are typically harvested using traps (crab pots), ring nets, by hand (scuba divers) or dip nets, and may be incidentally taken or harmed unintentionally by groundfish gears.

Highly Migratory Species: Highly migratory species (HMS) include five tuna species, five shark species, striped marlin, swordfish, and dorado or dolphinfish. tunas, billfish, dorado, and sharks. HMS species 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 (PFMC 2003) 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. Appendix A of the HMS FMP contains detailed information on life history and essential fish habitat for these species. Copies of the HMS FMP can be obtained from the Pacific Fishery Management Council, by writing to 7700 NE Ambassador Place, Suite 200, Portland, OR 97220-1384; or calling 503 820-2280; or viewing the internet posting at http://www.pcouncil.org.

Pacific Pink Shrimp: Pacific pink shrimp (*Pandalus jordani*) are found from Unalaska in the Aleutian Islands to San Diego, California, at depths of 25 to 200 fm (46 to 366 m). Off the U.S. West Coast, these shrimp are harvested with trawl gear from northern Washington to central California between 60 and 100 fm (110 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 bottom.

Ridgeback prawn: Ridgeback prawns (*Sicyonia ingentis*) are found south of Monterey, California to Baja, California in depths of 145 feet (73 fm) to 525 feet (263 fm) (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 they are 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.

Pacific Halibut:. Pacific halibut (*Hippoglossus stenolepis*), in the family Pleuronectidae, range along the continental shelf in the North Pacific and Bering Sea in waters of 22 to 366 fm (40 to 200 m). They have flat, diamond-shaped bodies and may migrate long distances. Juvenile halibut, mostly shorter than the legal size limit, tend to migrate from north to south until they reach maturity. Adult halibut migrate from shallow summer feeding grounds to deeper winter spawning grounds. Most adult fish return to the same feeding grounds each summer where most commercial and recreational fishing occurs.

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 (Eschmeyer et al. 1983), but are most common south of Oregon. The center of distribution occurs south of Oregon. They predominantly associate 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. They are an important sport and commercial species, especially in California where they are targeted using hook-and-line and trawl gear.

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 in the Gulf of California, but are uncommon north of Point Conception. They can live to 50 years of age and attain 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.

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 (*Loligo opalescens*). These species are managed under the Coastal Pelagic Species Fishery Management Plan. 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 to southeastern Alaska. When abundance is low, Pacific sardine do not occur in large quantities north of Point Conception, California. Pacific (chub) mackerel 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 and Monterey Bay, Central California.

Stock assessments for Pacific sardine and Pacific mackerel from December 1999 and July 1999, respectively, indicate increasing relative abundance for both species. 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, near-record landings of 70,799 mt of Pacific mackerel occurred for the combined directed fisheries off California and Baja California.

Population dynamics for market squid are poorly understood, and annual commercial catch varies from less than 10,000 mt to 90,000 mt. 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. Amendment 10 to the CPS FMP (January 27, 2003; 68 FR 3819- Available online at http://www.gpoaccess.gov/fr/index.html) describes and analyzes several approaches for estimating an MSY proxy for market squid.

Sea Cucumber: Two sea cucumber species are targeted commercially: the California sea cucumber *(Parastichopus californicus*) 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. 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. Sea stars, crabs, various fishes, and sea otters prey upon them. 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, which is not unexpected since a commercial fishery for these species began in the late 1970s and expanded substantially after 1990.

Spot prawn: Spot prawn (*Pandalus platyceros*) are the largest of the pandalid shrimp and range from Baja, California 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 prawns 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 prawns are taken by both traps and trawls on the West Coast with the fishery taking predominantly older females. Further information on the biological environment can be found in Section 3 of the Pacific Coast Groundfish Fishery Management Plan, EFH Designation and Minimization of Adverse Impacts, Draft EIS, prepared in February 2005.

3.3 SOCIO-ECONOMIC ENVIRONMENT

3.3.1 Conservation Areas and Depth-Based Management.

Since 1998, groundfish management measures have been shaped by the need to rebuild overfished groundfish stocks. The 90+ species in the West Coast groundfish complex mix with each other to varying degrees throughout the year and in different portions of the water column. Some species, like Pacific whiting, are strongly aggregated, making them easier to target with relatively little bycatch of other species. Conversely, other species like canary rockfish may occur in species-specific clusters, but are also found co-occurring with a wide variety of other groundfish species.

Over the past several years, groundfish management measures have been carefully crafted to recognize the tendencies of overfished species to co-occur with healthy stocks in certain times and areas. Management measures have been specifically designed to reduce incidental interception of overfished species taken in fisheries targeting more abundant stocks. To reduce the incidental catch of overfished species, trip limits for target species that co-occurrence with overfished species have been reduced and large geographically defined conservation areas (GCAs and RCAs) have been used to restrict or prohibit fishing activity.

The Council and NMFS began using conservation areas to reduce fisheries impacts on overfished groundfish species in 2001. NMFS initially defined two Cowcod Conservation Areas (CCAs) in the Southern California Bight. These areas were closed to recreational and commercial fishing for groundfish. These closures were located in areas of known cowcod abundance and were intended to prevent fishing vessels from taking cowcod either directly or incidentally in fisheries targeting other species. The CCAs have remained in place since 2001 and continue to be a central part of the Council's long-term rebuilding strategy for cowcod.

In September 2002, NMFS introduced its first large-scale conservation area, known as the Darkblotched Rockfish Conservation Area (DBCA). The DBCA extended from the U.S/Canada border to Cape Mendocino, California and had seaward and shoreward boundary lines approximating the 100 fm (183 m) and 250 fm (457 m) depth contours. Trawling was prohibited within the DBCA. The closure of this area to trawling was intended to reduce incidental darkblotched rockfish interception by fisheries targeting more abundant (continental) slope species.

Beginning in 2003, the Council recommended a greater suite of area closures intended to protect different overfished species, particularly overfished shelf species, from incidental harvest by vessels targeting other more abundant species. Similar to Council efforts to craft landings limits and seasons to protect overfished species, the 2003 conservation areas were intended to protect overfished species at depths where they are most often encountered and from gear that is most likely to catch those species. For example, POP has historically been taken almost exclusively by trawl gear, while yelloweye rockfish is more susceptible to hook-and-line gear used in commercial and recreational fisheries.

The suite of GCAs areas that affect the open access fisheries currently includes the two CCAs; the Yelloweye RCA off the Washington coast, the groundfish trawl, non-groundfish trawl and the nontrawl RCAs. The trawl and nontrawl RCAs extended along the entire length of the West Coast and are based on ocean bottom depths. The non-groundfish trawl RCAs are found in waters off southern California. The RCAs can vary seasonally depending on when and where the overfished species targeted for protection were taken by historic fisheries. RCA boundary lines were designated by a series of latitude/longitude coordinates intended to approximate ocean bottom depth contours delineating overfished species habitats. A more in-depth discussion of the introduction of depth-based management to West Coast groundfish fisheries management is provided in the proposed rule to implement the 2003 and 2004 specifications and management measures (January 7, 2003, 68 FR 936 and January 8, 2004, 68 FR 1380 -- Available online at http://www.gpoaccess.gov/fr/index.html).

3.3.2 Commercial fisheries

Commercial fisheries land a larger portion, by weight, of West Coast fish than any other group. CPS, followed by groundfish, crab, and HMS have made up the largest landings by weight since 2000. Crab, followed by groundfish, CPS, and HMS were the highest-valued fisheries between 2000 and 2003 (Table 3.3.2.1). During this same period, the gear groups with the largest amount of landings, by weight, were gill net, trammel net, trawl, trap/pot, and troll gear (Table 3.3.2.2)

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 LE permits that were created specified the type of gear that a permitted vessel could use in the LE fishery. Each LE permit also had an associated vessel length. Most of the Pacific Coast non-tribal commercial groundfish harvest is taken by vessels registered to LE permits that use trawl, longline, and trap (or pot) gears.

There are also several OA fisheries that take groundfish incidentally to their intended target species or who directly target groundfish. 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 may hold various state issue licences and permits, yet they do not hold a federal groundfish LE permit. Though the overall OA groundfish landings are much smaller than LE landings, they are part of the economic make-up of West Coast groundfish vessels.

As of August 2004, there were 406 vessels with Pacific Coast groundfish LE permits, of which approximately 43% were trawl only vessels, 48% were longline only vessels, 7% were trap vessels, and the remaining 2% were combinations of 2 or more gears. The number of vessels registered for use with LE permits has decreased since the implementation of the permit stacking program for sablefish-endorsed LE fixed gear permits in 2001 and the LE trawl vessel buyback program in late 2003.

Table 3.3.2.1. Shoreside Landings and Exvessel Revenue by Species Category and Year

		Year			
Species Group	Data type	2000	2001	2002	2003
CPS	Landed weight (lbs)	498,232,740	431,544,771	403,146,744	266,368,388
	Exvessel Revenue ($)	42,069,760	32,494,118	32,732,787	33,824,432
Crab	Landed weight (lbs)	30,562,479	26,645,343	37,156,344	75,126,504
	Exvessel Revenue ($)	64,575,735	54,017,788	62,570,332	118,393,209
Groundfish	Landed weight (lbs)	268,754,713	226,402,046	164,010,829	180,765,829
	Exvessel Revenue ($)	62,689,248	52,034,893	43,438,224	48,945,438
HMS	Landed weight (lbs)	23,217,661	27,365,996	23,269,259	38,071,415
	Exvessel Revenue ($)	22,790,849	24,253,397	17,256,645	28,126,563
Other	Landed weight (lbs)	21,579,099	19,705,423	20,890,419	16,868,699
	Exvessel Revenue ($)	27,123,067	23,982,459	23,098,380	20,616,940
Salmon	Landed weight (lbs)	7,122,757	6,458,681	9,790,983	11,493,417
	Exvessel Revenue ($)	13,962,096	10,605,885	14,345,088	20,959,564
Shellfish	Landed weight (lbs)	18,101,109	18,552,442	27,117,595	26,746,585
	Exvessel Revenue ($)	45,577,879	44,101,002	61,294,480	69,678,867
Shrimp	Landed weight (lbs)	35,906,296	40,960,953	57,818,606	32,160,356
	Exvessel Revenue ($)	20,543,414	16,753,777	21,407,954	11,479,887
Total Landed weight (lbs)		903,476,854	797,635,655	743,200,779	647,601,193
Total Exvessel Revenue ($)		299,332,048	258,243,320	276,143,890	352,024,899

Source: PacFIN ftl table. August 2004
Note: Data shown is for PFMC management areas and does not include inside waters such as Puget Sound and Columbia River.

Table 3.3.2.2. Shoreside Landings and Revenue by Gear Type and Year

		Year			
Gear	Data type	2000	2001	2002	2003
Dredge	Landed weight (lbs)			C	
	Exvessel Revenue ($)			C	
Hook and Line	Landed weight (lbs)	11,802,585	11,020,956	12,614,636	10,825,355
	Exvessel Revenue ($)	20,935,838	19,225,187	17,679,231	19,776,877
Misc	Landed weight (lbs)	35,380,715	33,635,105	42,904,188	38,561,396
	Exvessel Revenue ($)	62,944,925	58,034,808	74,019,410	79,445,478
Net	Landed weight (lbs)	502,470,237	435,111,623	406,345,771	268,877,740
	Exvessel Revenue ($)	48,226,898	36,665,962	36,382,949	36,919,258
Pot	Landed weight (lbs)	33,746,129	29,263,663	39,942,815	78,765,977
	Exvessel Revenue ($)	75,724,736	64,286,487	71,891,553	129,824,380
Troll	Landed weight (lbs)	25,541,566	28,789,324	27,054,341	45,832,676
	Exvessel Revenue ($)	29,247,312	29,245,055	25,667,562	43,931,473
Trawl	Landed weight (lbs)	259,658,663	220,003,436	157,474,652	173,261,044
	Exvessel Revenue ($)	43,868,230	36,547,531	31,428,967	33,034,613
Shrimp Trawl	Landed weight (lbs)	34,876,959	39,811,548	56,862,974	31,477,005
	Exvessel Revenue ($)	18,384,109	14,238,290	19,072,882	9,092,821
Total Landed weight (lbs)		903,476,854	797,635,655	743,199,377*	647,601,193
Total Exvessel Revenue ($)		299,332,048	258,243,320	276,142,553*	352,024,899

Source: PacFIN ftl table. August 2004. Note: Data is for PFMC management areas only and doesn't include Puget Sound and Columbia River
C means data was restricted due to confidentiality

3.3.3 Open Access Groundfish Fisheries

Unlike the LE sector, the OA fishery has unrestricted participation and is comprised of vessels targeting or incidentally catching groundfish with a large variety of gears. OA vessels must comply with cumulative trip limits established for the OA sector and are subject to the other operational restrictions imposed in the regulations, including the GCA and RCA restrictions. While the OA groundfish fishery is under federal management and does not have participation restrictions, some state and federally managed fisheries that land groundfish in the OA fishery have implemented their own restricted access (limited entry) programs or enacted management restrictions that have affected participation in groundfish fisheries. In addition, the individual states may impose landing restrictions and limits that are more restrictive than federal restrictions or limits. XXX(Appendix A to this EA contains additional information on state regulations and licensing restrictions that affect the open access fishery participants.)XXX

The OA 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 commercial OA groundfish fishery consists of vessels that do not necessarily depend on revenue from the sale of groundfish as their a major source of income. The fishery is split between vessels targeting groundfish (*directed OA fishery vessels*) and vessels targeting other species but landing groundfish that was caught incidentally while targeting a nongroundfish species (*incidental OA fishery vessels*). However, it's difficult to segregate vessels into these two categories because the choice depends on the intention of the fisher. Over the course of a year or during a single trip, a fisher may engage in different strategies and may switch between directed and incidental fishing categories. Such changes in strategy are likely the result of a variety of factors, including the potential economic return from landing a particular mix of species.

The incidental catch of groundfish occurs in the Pacific halibut, California halibut, Dungeness crab, prawn, sheephead, sea cucumber, pink shrimp, salmon, HMS, and CPS fisheries. The majority of incidental fishery 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 has the lowest groundfish landings, by weight (Hastie 2001). When considering both the directed and incidental OA fisheries, the variety of gears and the number of participating vessels is very large. Table 3.3.3.1. shows the number of directed and incidental OA vessels by fishery, the weight of groundfish landed, and the exvessel value of that catch for the years 2000-2004. The total number of vessels in each incidental fishery (those landing groundfish plus those that do not) are also shown.

Table 3.3.3.1. Open Access groundfish landings by fishery and gear group, 2000-2004 (PacFin)

Open access gear group	Number of vessels landing groundfish (total number of vessels)	Landed weight of groundfish (mt)	Exvessel revenue from groundfish ($)	Average per vessels exvessel revenue from groundfish ($)
Longline -groundfish directed a/				
2000	305	410	1,818,898	6,003
2001	324	398	1,690,165	5,217
2002	263	352	1,370,175	5,210
2003	296	479	1,730,461	5,846
2004	222	444	1,411,191	6,357
5-year average	*282*	*417*	*1,604,178*	*5,726*
Longline - Pacific Halibut directed				
2000	39 (61)	2.2	8,915	229
2001	35 (70)	1.9	5,956	170
2002	42 (73)	2.5	7,288	174
2003	38 (63)	4.9	21,694	571
2004	34 (59)	9.2	28,920	851
5-year average	*38 (65)*	*4.1*	*14,555*	399
Longline - CA Halibut directed				
2000	5 (10)	0.2	501	100
2001	1 (8)	c	c	0
2002	2 (14)	c	c	0
2003	2 (6)	c	c	0
2004	2 (7)	c	c	0
5-year average	2 (9)	c	c	20
Pot - groundfish directed a/				
2000	154	183	987,706	6,414
2001	140	182	986,069	7,043
2002	139	183	984,756	7,085
2003	149	186	997,578	6,695
2004	143	183	987,646	6,907
5-year average	*145*	*183*	*988,751*	*6,829*
Pot - Dungeness crab directed				
2000	33 (792)	0.6	2,112	64
2001	25 (781)	0.2	744	30
2002	23 (783)	0.3	1,143	50
2003	17 (816)	0.3	868	51
2004	6 (835)	0.2	652	109
5-year average	*21 (801)*	*0.3*	*1,104*	*61*
Pot - prawn directed				
2000	9 (36)	c	225	25
2001	7 (37)	0.3	1,408	201
2002	4 (27)	0.3	2,435	609
2003	6 (20)	0.1	677	113
2004	3 (21)	c	c	0
5-year average	*6 (28)*	*0.1*	*949*	*190*
Pot - sheephead directed				
2000	21 (103)	2.0	20,676	985
2001	26 (81)	3.8	37,496	1,442
2002	28 (74)	0.7	5,747	205
2003	14 (50)	0.3	1,784	127
2004	16 (32)	0.8	7,088	443
5-year average	*21 (68)*	*1.5*	*14,558*	*640*

Table 3.3.3.1. Continued

Open access gear group	Number of vessels landing groundfish (total number of vessels)	Landed weight of groundfish (mt)	Exvessel Revenue from groundfish ($)	Average per vessels exvessel revenue from groundfish ($)
Trawl - sea cucumber directed				
2000	0 (16)	c	c	c
2001	2 (13)	c	c	c
2002	2 (14)	c	c	c
2003	1 (14)	c	c	c
2004	1 (13)	c	c	c
5-year average	*2 (14)*	*c*	*c*	*c*
Trawl - CA halibut directed				
2000	22 (42)	2.4	5,449	248
2001	33 (46)	5.9	10,505	318
2002	29 (49)	6.0	13,018	449
2003	17 (42)	1.0	1,886	111
2004	13 (19)	12.3	35,637	2,741
5-year average	*23 (40)*	*5.5*	*13,299*	*773*
Trawl - spot prawn directed				
2000	10 (25)	0.6	1,065	107
2001	9 (24)	0.5	1,038	115
2002	9 (25)	0.6	1,198	133
2003	1 (6)	c	48	48
2004	0 (4)	0.0	0	0
5-year average	*7 (17)*	0.4	837	*81*
Trawl -Ridgeback Prawn				
directed	22 (35)	5.1	8,939	406
2000	16 (23)	3.9	6,182	386
2001	12 (25)	0.8	767	64
2002	12 (23)	1.6	2,072	173
2003	5 (11)	0.4	564	113
2004				
	13 (23)	*2.4*	*3,705*	*228*
5-year average				
Trawl -Pink Shrimp directed				
2000	62 (67)	142	203,664	3,285
2001	51 (62	89	129,326	2,536
2002	44 (53)	45	61,359	1,395
2003	6 (44)	1	817	136
2004	4 (43)	0	74	19
5-year average	*33 (54)*	*55*	*79,048*	*1,474*
Line gear - all groundfish a/				
2000	760	462	2,461,956	3,239
2001	635	501	2,545,790	4,009
2002	576	522	2,735,646	4,749
2003	501	404	1,963,033	3,918
2004	476	457	2,503,500	5,259
5-year average	*590*	*469*	*2,441,985*	*4,235*
Line gear - CA halibut				
2000	69 (230)	1.4	4,716	68
2001	69 (237)	1.4	5,985	87
2002	58 (231)	1.1	3,674	63
2003	47 (259)	1.5	6,254	133
2004	45 (240)	2.0	7,742	172
5-year average	*58 (239)*	1.5	*5,674*	*105*

Table 3.3.3.1. Continued

Open access gear group	Number of vessels landing groundfish (total number of vessels)	Landed weight of groundfish (mt)	Exvessel Revenue from groundfish ($)	Average per vessels exvessel revenue from groundfish ($)
Line gear - Salmon troll (coastwide)				
2000	281 (1,076)	15	26,073	93
2001	243 (1,058)	11	17,960	74
2002	207 (1,085)	7	12,707	61
2003	202 (1,043)	6	11,053	55
2004	237 (1,234)	11	19,816	84
5-year average	*234 (1,099)*	*10*	*17,522*	*73*
Line gear - Salmon troll (north only)				
2000	212	14	23,654	112
2001	228	9	15,158	66
2002	148	8	12,374	84
2003	134	4	7,574	57
2004	157	7	13,046	83
5-year average	*176*	*8*	*14,361*	*82*
Line gear - HMS				
2000	18 (220)	0.4	1,319	73
2001	12 (238	0.3	1,102	92
2002	7 (211)	0.3	652	93
2003	5 (187)	0.1	396	79
2004	6 (145)	0.1	236	39
5-year average	*10 (200)*	*0.2*	*741*	*75*
Net gear - HMS				
2000	33 (193)	1.5	2,099	64
2001	27 (167)	1.3	2,329	86
2002	26 (129)	1.6	3,200	123
2003	20 (123)	--	22	1
2004	19 (103)	1.1	2,577	136
5-year average	*25 (143)*	*1.1*	*2,045*	*82*
Net gear - CA halibut				
2000	64 (84)	20	28,902	452
2001	54 (63)	16	25,862	479
2002	43 (61)	11	19,137	445
2003	38 (51)	6	9,743	256
2004	35 (51)	4	7,450	213
5-year average	*47 (62)*	*11*	*18,219*	*389*

a/ Directed groundfish vessels are those vessels with any landing exceeding 50% of the revenue on a fish ticket

Table 3.3.3.2. Historical harvests for the open access fishery, 2000-2004 (PacFin)

Year	Groundfish round weight (mt)	Groundfish exvessel value ($)	Non-groundfish round weight (mt)	Non-groundfish exvessel value ($)	Total round weight (mt)	Total exvessel value ($)
2000	1,226	5,552,214	22,217	71,515,893	23,443	77,068,107
2001	1,200	5,439,726	24,297	61,777,567	25,497	67,217,293
2002	1,122	5,200,565	31,177	70,224,642	32,298	75,425,207
2003	1,086	4,738,621	40,900	114,672,760	41,986	119,411,381
2004	1,120	5,003,066	32,841	107,797,057	33,961	112,800,123

Many OA vessels predominately fish for non-groundfish species and inadvertently catch and land groundfish. In times and areas when fisheries for other species are not as profitable, some vessels will transition into the groundfish OA fishery for short periods. When landings and revenue are measured, the OA fishery is more expansive south of 40˚ 10' N lat. OA fishers in the south earned more per pound for their landed groundfish catch, reflecting the more lucrative live fish markets, among other things, in that region. Table 3.3.3.2 shows the historical harvests (landings) of groundfish and non-groundfish by OA vessels. In 2003, the first complete year in which coastwide RCAs were implemented, the round weight of nongroundfish landed increased over previous years while landings of groundfish species decreased slightly.

Because incidental vessels do not necessarily depend on their revenue from the groundfish fishery as their major source of income, understanding the level of dependency that such participants have on the OA groundfish fishery must be considered in light of their overall fisheries revenues. Table 3.3.3.3 shows the number of OA vessels by vessel length and level of dependency on the groundfish fishery (proportion of annual revenue that is from groundfish). Table 3.3.3.4 shows the number of OA vessels by level of dependency based on gross income for all West Coast landings. Between November 2000 and October 2001, 1,287 vessels landed groundfish in the OA sector of the groundfish fishery. Of these vessels, 771 vessels (60%) had a greater than 5% dependency on the groundfish fishery with 345 of these vessels having a 95-100% level of dependency of groundfish. The OA fishery is dominated by vessels under 40 feet in length. About 78 percent of the vessels that landed OA groundfish between November 2000 and October 2001 were less than 40 feet on length. It is assumed that a portion of these smaller vessels fish exclusively in state waters, and thus would be excluded from the VMS alternatives presented in this EA. However, the data are not available to identify the proportion of vessels that fish only in state waters. Approximately 36 percent of the OA vessels had a greater than 65 percent dependency on groundfish, with 56 percent of the most dependent vessels having less than $5,000 in gross fishing income. A greater proportion of vessels with lower levels of dependency on groundfish fell within income categories greater than $5,000. However, increases in higher valued groundfish catch in 2003 may reduce the proportion of OA vessels in the lowest (<$5,000) income category.

Table 3.3.3.3 Number of open access vessels by level of dependency and vessel length (based on data from November 2000 - October 2001) a/

	<40'	40'-50'	50'-60'	60'-70'	70'-150'	Unspecified	Total
<5%	324	109	29	28	25	1	516
>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

Extracted from table 6-18a DEIS, Proposed Acceptable Biological Catch and Optimum Yield Specifications and Management Measures for the 2005-2006 Pacific Coast Groundfish fishery
a/ OA vessels with more than half of their total landings value coming from groundfish are considered to be in the directed fishery

Table 3.3.3.4 Number of open access vessels by gross income levels of dependency for all West Coast landings (based on data from November 2000 - October 2001) a/

	Exvessel revenue from West Coast landings				
	<5,000	$5,000-$50,000	$50,000-$200,000	>$200,000	Total
<5%	45	268	169	34	516
>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

Extracted from table 6-17a DEIS, Proposed Acceptable Biological Catch and Optimum Yield Specifications and Management Measures for the 2005-2006 Pacific Coast Groundfish fishery
a/ open access vessels with more than half of their total landings value coming from groundfish are considered to be in the directed fishery

Historically, most of the OA fishing activity has occurred in the nearshore and shelf areas. As a result, bocaccio, canary rockfish, lingcod, yelloweye rockfish, and cowcod have been encountered more frequently than the other overfished species. Deeper slope species such as darkblotched rockfish and POP, and pelagic shelf species such as widow rockfish, are more vulnerable to trawl gear, and have been taken in smaller proportions in the OA fishery. With the exception of the pink shrimp trawl fishery, the OA trawl fisheries using nongroundfish trawl gear have historically landed few slope species.

Since 2003, total catch (retained plus discard) of overfished species taken in the OA sectors of the groundfish fishery has been projected before the start of each fishing year. The overfished species catch projections are used to determine if the proposed management measures are adequate to keep the total catch of overfished species within the sector harvest guidelines and allocations and within the OY specified for rebuilding. As the fishing year progresses, the Council reviews and revises management measures. The projected catch values for the open access sectors of the 2005 groundfish fishery are presented in Table 3.3.3.5.

When the total catch of overfished species projected to be taken by the OA groundfish fishery is considered in relation to the available OY for each overfished species, only canary rockfish is projected to exceed 10% of the available OY(10.26%). Less than 5% of the available OY is projected to be taken of the remaining overfished species: 4.32% of the lingcod OY, 2.31% of the yelloweye rockfish OY, 3.88% of the bocaccio OY, 2.38% of the cowcod OY, 0.18% of the widow rockfish OY, 0.07% of the darkblotched OY, and 0.02% of the POP OY. With the exception of widow and yelloweye rockfish, the majority of the overfished species projected to be taken in 2005 will be taken in the directed OA fisheries.

When considering the impacts of an incidental fishery on overfished species, the HMS net and line fisheries, the California sheephead pot fishery, the sea cucumber trawl fishery and the spot prawn trap fishery have historically landed the lowest amounts of overfished species (Tables 3.3.3.6 and 3.3.3.7) before RCA management was adopted. These fisheries are also projected to have the lowest fishing mortality in 2005 with RCA management (Table 3.3.3.5). With the exception of sea cucumber trawl, fishing for the target species occurs within the RCAs, although only groundfish on trips where no fishing occurs in the RCA may be retained. The fisheries with slightly greater impacts on overfished species, those where small amounts by weight and proportion of the available OY (less than 0.05%), were taken included the ridgeback prawn trawl fishery and the Dungeness crab pot fishery. The Dungeness crab fishery occurs within the RCAs and has historically landed only small amounts of overfished species. While the ridgeback prawn trawl fishery has BRD requirements to reduce the catch of finfish, including overfished species, and has RCA restrictions. In 1998, prior to the implementation of conservation areas and the BRD requirements, the prawn fisheries (all prawns) landed 0.7 mt of lingcod, 0.05 mt of darkbloched rockfish, 2.4 mt of bocaccio, 0.05 mt of canary rockfish, 1.2 mt of cowcod, and 0.05 mt of yelloweye rockfish (Table 3.3.3.7). Although the California gillnet fishery is projected to take a single overfished species, it is projected to have a greater impact with 0.5 mt of bocaccio by weight or 0.16% of the OY being taken.

Those incidental fisheries with the greatest impacts on overfished species are salmon troll, pink shrimp trawl, Pacific halibut longline and California halibut (overfished species impacts not provided by gear type). The salmon troll fishery is projected to take 0.7% of the bocaccio OY, 3.43% of the canary rockfish OY, 0.01% of the lingcod OY, 0.11% of the widow rockfish OY, and 0.77% of the yelloweye rockfish OY. The salmon troll fishery, which occurs primarily on the shelf and within the RCA, has been allowed small incidental catches of Pacific halibut and groundfish, including yellowtail rockfish. Historical data show that salmon troll trips that did not land halibut had a higher range of groundfish landings (11-149 mt) than troll trips that landed halibut (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 (Amendment 16-3, July 2004).

The overfished species impacts from the pink shrimp fishery, which is allowed to occur within the RCA because finfish excluders are required, are 0.03% of the bocaccio OY, 0.21% of the canary rockfish OY, 0.02% of the lingcod OY, 0.04% of the widow rockfish OY, and 0.38% of the yelloweye rockfish OY. The overfished species impacts projected for the Pacific halibut fishery are 0.04% of the lingcod OY. The overfished species impacts projected for the California halibut fishery are 0.03% of the bocaccio OY, 0.21% of the canary rockfish OY, and 0.08% of the lingcod OY.

Table 3.3.3.5 Total catch projections of overfished species in the 2005 open access fisheries. (9/1/2005 GMT's best estimates of total mortality)

	2005 bycatch projections (mt)							
	Bocaccio	Canary Rockfish	Cowcod	Darkblotched Rockfish	Lingcod	Pop	Widow	Yelloweye
Groundfish directed	10.6	3.0	0.1	0.2	100.0	0.1	0.1	0.3
California Halibut	0.1	0.1		0.0	2.0	0.0		
California Gillnet a/	0.5			0.0		0.0	0.0	
California Sheephead a/				0.0	0.0	0.0	0.0	0.0
CPS wetfish a/	0.3							
CPS squid b/								
Dungeness crab	0.0		0.0	0.0	0.5	0.0		
HMS		0.0	0.0	0.0				
Pacific Halibut	0.0	0.0	0.0	0.0	1.0	0.0	0.0	0.0
Pink Shrimp	0.1	0.1	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	0.3	0.2
Sea cucumber	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
Spot prawn (trap)								
Total 2005 Projected catch	11.9	4.8	0.1	0.2	104.3	0.1	0.5	0.6
2005 total catch OY	307	46.8	4.2	269	2,414	447	285	26
Proportion of total catch OY	3.88%	10.26%	2.38%	0.07%	4.32%	0.02%	0.18%	2.31%

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

b/ 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.

Tables 3.3.3.6 Round weight by species and target fishery 1998 -2002, North of Cape Mendocino (mt) (Amendment 16-2, December 2004)

1998								
	Lingcod	Darkblotched Rockfish	POP	Bocaccio	Canary Rockfish	Cowcod	Widow Rockfish	Yelloweye Rockfish
Pacific Halibut	1.4	--	0	--	0.3	--	0	--
CA Halibut	0	--	--	--	0	--	--	--
Salmon	3.1	0	0.1	--	2.2	--	0.3	--
Gillnet complex	--	--	--	--	--	--	--	--
HMS	0	--	--	--	--	--	--	--
Pink shrimp	6.4	--	5.9	0	10.5	--	4.4	--
Dungeness	0.1	--	--	--	--	--	--	--
Prawns	--	--	--	--	--	--	--	--
2000								
Pacific Halibut	2.6	--	--	--	0.2	--	0	--
Salmon	8.4	--	--	--	1.6	--	0.1	0.05
Gillnet complex	--	--	--	--	--	--	--	--
HMS	--	--	--	--	--	--	0.05	--
Pink shrimp	15.1	--	0.3	--	11.3	--	2.4	--
Dungeness	0.05	--	--	--	0.05	--	--	--
Sea cucumber	--	--	--	--	--	--	--	--
Prawns	--	--	--	--	--	--	--	--
2002								
Pacific Halibut	3.9	--	0	--	0.1	--	--	0.2
CA Halibut	0	--	--	--	--	--	--	--
Salmon	3.9	--	--	--	0.5	--	0	--
Gillnet complex	--	--	--	--	--	--	--	--
HMS	--	--	--	--	--	--	--	--
Pink shrimp	6.2	0.6	0.05	--	1.2	--	--	--
Dungeness	0	--	--	--	--	--	--	--
Prawns	--	--	--	--	--	--	--	--
all vessel LE and OA permitted are included - tables show potential of gear to take if fishing occurs in the RCAs								

Table 3.3.3.7 Round weight by species and target fishery 1998 - 2002, South of Cape Mendocino (mt) (Amendment 16-2, December 2004)

	Lingcod	Darkblotched Rockfish	POP	Bocaccio	Canary Rockfish	Cowcod	Widow Rockfish	Yelloweye Rockfish
1998								
Pacific halibut	0.05	--	--	--	--	--	--	--
CA halibut	1.6	--	--	0.05	0	--	0.2	--
Salmon	0.3	--	--	0.1	0.05	--	0	0
Gillnet complex	0.5	--	--	0.3	--	0	0	--
HMS	0	--	--	0	--	--	--	--
Pink shrimp	0	--	--	0	0.1	--	0.9	--
Dungeness	0.2	--	--	--	0	--	--	--
Sea cucumber	--	--	--	0	--	--	--	--
Prawns	0.7	0.05	--	2.4	0.05	1.2	--	0.05
CA Sheephead	0.3	--	--	0	--	0	--	--
2000								
CA halibut	0.1	0	--	0.05	0	--	--	--
Salmon	0.4	--	--	0.2	0.1	--	0	--
Gillnet complex	--	--	--	--	--	--	--	--
HMS	--	--	--	0.05	0	--	--	0
Pink shrimp	0	--	--	--	0	--	0	--
Dungeness	--	--	--	--	--	--	--	--
Sea cucumber	--	--	--	--	--	--	--	--
Prawns	0.3	--	--	0.1	0.05	0.1	0.05	--
CA sheephead	0.05	--	--	0	0	--	0	0
2002								
CA Halibut	0.8	--	--	0.05	--	--	0.1	--
Salmon	0.5	--	--	0	--	--	--	--
Gillnet complex	0.5	--	--	0.3	--	0	0	--
HMS	0.1	--	--	--	--	--	--	--
Pink shrimp	--	--	--	--	--	--	--	--
Dungeness	--	--	--	--	--	--	--	--
Sea cucumber	0	--	--	--	--	--	--	--
Prawns	0	--	--	0.05	0.05	--	--	--
CA sheephead	0.1	--	--	0	--	--	--	--

a/ all vessel LE and OA permitted are included
b/ includes all prawn trawl

Open Access Directed Fisheries Participation in the directed OA fishery segment varies between years. Participants may move into other, more profitable fisheries, or they may take time off from fishing, or they may quit fishing altogether. Directed OA fishers use various non-trawl gears to target particular groundfish species or species groups. Longline and hook-and-line gear are the most common OA gear types and are generally used to target sablefish, rockfish, and lingcod. Pot gear is used for targeting sablefish, thornyheads and rockfish. Though largely restricted from use in recent year and prohibited 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. Table 3.3.3.1. above identified the number of OA directed vessels that landed groundfish and the total landed weight and exvessel revenue of the groundfish by gear group, for 2000-2004.

Within the directed OA fishery, fishers are further grouped into the “dead” and/or “live” fish fisheries. The terms dead and live fish fisheries refers to the state of the fish when it is landed. The dead fish fishery has historically been the most common way to land fish. In 2001, the dead fish fishery made up 80% of the directed OA landings. However, more recently, the high market value for live fish has encouraged increased landings in the live fish fishery. In 2001, 20% of fish landed (by weight, coastwide) by directed OA fishers was landed alive as compared to only 6% in 1996 (PFMC 2004).

In the live-fish fishery, groundfish are primarily caught with hook and line gear (rod-n-reel), with LE longline gear and with LE pot gear, and a variety of other hook gears (e.g. stick gear). The fish are kept alive in a seawater tank on board the vessel. California halibut and rockfish taken in gill and trammel nets have increasingly appeared in the live fish fishery (CDFG 2001). Live fish are sold at a premium price to food fish markets and restaurants, primarily in Asian communities in California. Only limited information exists on the distribution of effort by OA vessels. Because the OA sector has an increasingly large live-fish fishery component with nearshore species making up most of the live fish landings, effort located near shore likely accounts for most live fish landings.

In California, since 1995, hook and line gear for the live-fish fishery has been limited to a maximum of 150 hooks per vessel and 15 hooks per line within one mile of the mainline shore (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 primary target of the live fish fishery. Sablefish and rockfish are also landed alive in Oregon. The Oregon live fish fishery occurs in waters of ten fathoms or less (18 m). Only legal gears are allowed to be used to catch nearshore live fish. In early 2002, an Oregon Developing 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). However, commercial fishing for food fish is prohibited in Oregon bays and estuaries and within 600 feet (183 m) seaward of any jetty.

The VMS actions proposed in this EA would not apply to vessels that only fish in state waters. Because data were not available to specifically identify vessels that only fish in state waters, the number of vessels shown in Table 3.3.3.1 include all vessels: those that operated only in state waters (0-3 nm from shore), those that operate only in federal waters (>3 nm from shore) and those that operate in both state and federal waters.

Table 3.3.3.8 shows the weight of OA landings by depth group (nearshore, shelf, pelagic, and slope), for each of the directed fisheries for the years 2000-2004. Although data were not available to specifically identify vessels that fish only in state waters, many of the vessels that land nearshore species, are assumed to fish only in state waters. The landings data in Table 3.3.3.8 shows that the majority (72%) of groundfish landings by directed OA line gear was from the nearshore group, followed by the shelf group (18%) between 2000 and 2004. Given the large proportion of nearshore landings, it could be assumed that many of the directed OA line gear vessels identified in table 3.3.3.1 do not fish in federal waters and would not trigger the VMS requirements.

The directed OA fisheries may also account for substantial amounts of bycatch (incidental catch which is not landed), especially for overfished groundfish species. As a result of the large proportion of nearshore landings by line gear vessels, bocaccio, canary rockfish, lingcod, yelloweye rockfish, and cowcod would likely be encountered more frequently than the other overfished species. Because the majority of longline and pot directed OA groundfish fisheries land deeper slope species, they are more likely to interact with overfished species such as darkblotched rockfish and POP. However, because these deeper dwelling overfished species are more vulnerable to trawl gear, they have been taken in smaller proportions in the OA fishery.

Open Access Incidental Fisheries Groundfish species co-occur with other nongroundfish species. When fishing gear is used to target nongroundfish species it may also encounter groundfish. Fisheries targeting Pacific halibut, California halibut, Dungeness crab, spot prawn, ridgeback prawn, California Sheephead, sea cucumber, pink shrimp, salmon and HMS are allowed to land incidentally caught groundfish and are a component of the OA fishery referred to as the incidental OA fisheries. The mortality of groundfish, especially for overfished groundfish species ,varies substantially between the incidental fisheries. The interaction between the nongroundfish target species and overfished groundfish species depend on many variables, including: the geographical areas fished (nearshore, shelf, slope, pelagic); the level at which the target species co-occur with overfished species; the vulnerability of the overfished species to the type of gear that is used, and the selectivity of the gear. In addition, fishing mortality rates resulting from the fishing activity may vary considerably between the gears and fisheries. Historical state and federal landing allowances also affect the perception of what species are taken incidentially. The number of OA incidental vessels that landed groundfish and the total landed weight and exvessel revenue of the groundfish by gear group, for 2000-2004 were identified above in Table 3.3.3.1.

Yelloweye rockfish prefer rocky reef habitat on the continental shelf, and are most vulnerable to fixed gear fisheries that traditionally occurred on the shelf including the commercial line fisheries targeting sablefish, Pacific halibut, and dogfish. Groundfish are also caught in the Pacific halibut fishery. Rockfish and sablefish are commonly intercepted, as they are found in similar habitat to Pacific halibut and are easily caught with longline gear. There is a strong correlation between directed line fisheries that target Pacific halibut (both commercial and recreational) and bycatch of yelloweye rockfish. Therefore, for 2003 management, the Council used the depth-based results of the IPHC halibut survey data to infer the depth-based yelloweye bycatch implications in this fishery. Approximately 99.1% of the yelloweye rockfish catch and 7.7% of the commercial-sized Pacific halibut catch in the IPHC survey occurred in waters shallower than 100 fm. Therefore, the Council recommended restricting the commercial halibut fishery to waters deeper than 100 fm, which is the regulation formally adopted by the IPHC.

Pots or traps are used in the incidental OA fisheries that target Dungeness crab, prawns, and California sheephead. Pots can be designed to be selective in the pursuit of various species. They can be rigged to be size selective, and in some cases, species selective. Fish pots can also be size selective through various means including mesh size, circular escape rings or rectangular escape vents. There is a low mortality for bycatch of unwanted species and juvenile fish in a pot fishery. Bycatch species are generally kept alive in the pot until it is hauled and then can be released alive. Despite the selectivity of pot gear small amounts of overfished species are taken incidentially. Prior to RCA management, small amounts of lingcod and canary rockfish were landed in the Dungeness crab pot fishery, while small amounts of lingcod, darkblotched rockfish, bocaccio, canary rockfish, cowcod, widow rockfish and yelloweye rockfish were landed in the prawn fisheries (Table 3.3.3.6 and 3.3.3.7). In the Dungeness crab fishery black rockfish may also be pulled up in the pot. Although, groundfish are caught incidentally in Dungeness crab pots off Washington, Oregon, and California, but can only be landed in XXOregonXX and California ports.

California sheephead are shallow nearshore finfish found in the coastal waters of southern California and Mexico and are managed as part of the California nearshore fishery along with many nearshore rockfish species. Different species of nearshore fishes often occur in mixed groups, making it difficult to target individual species. A 1993 study by Marine Resources Division Department of Fish and Game State of California, found that 66% of the finfish captured during the day time trap sets were nontarget species. At night, 81% of the finfish captured were nontarget and 33% of all finfish were either injured or killed. Because of these significant findings, the potential for the live-fish trap fishery to negatively affect nontarget finfish populations may be greater than projected. When compared to the nontarget finfish landings, (which did not include the incidental catch thrown directly overboard during trapping operations) by live-fish trappers who were primarily targeting California Sheephead, they made up 9% of the landed nontarget catch. (XXXMarine Resources Division Department of Fish and Game State of California September 1993, Live-Fish Trap Fishery in Southern California 1989- 1992 and Recommendations for Management, M. Palmer- Zwahlen, J. O´Brien, and L. Laughlin)

Lingcod, canary rockfish, and widow rockfish were the overfished species were encountered on the greatest number of open access trawl trips in which groundfish was the dominant catch in the northern OA fisheries (Table 3.3.3.6). In southern OA fisheries, lingcod and bocaccio were the overfished species most frequently encountered (Table 3.3.3.7). Deeper slope species, such as darkblotched rockfish and POP, are more vulnerable to LE trawl gear and have been taken in small proportions in the OA fishery.
The non-groundfish trawl fisheries (pink shrimp trawl, ridgeback prawn, sea cucumber, and California halibut directed) primarily operate and land nearshore and shelf groundfish species and are therefore less likely to interact with overfished slope species.

BRDs or Finfish Excluders in pink shrimp trawls are used to reduce mortality of overfished species in that fishery. In some years, prior to finfish excluder requirements, the pink shrimp trawl fishery has accounted for a significant share of canary rockfish incidental catch (Table 3.3.3.6 and Table 3.3.3.7). The pink shrimp trawl fishery is exempted from RCA boundaries because state-required bycatch excluders are believed to effectively reduce bycatch of overfished species. Ridgeback prawn trawls that operate south of Point Conception have used BRDs to avoid bocaccio, cowcod, canary rockfish, and yelloweye rockfish without overly compromising catch efficiency of ridgeback prawns. The ridgeback prawn fishery operates primarily between 35 fm and 90 fm, with an average fishing depth of 75 fm. Trawl logbook data show that 99% of ridgeback prawns are caught in depths of 101 fm or less. With traditional fishing grounds being in sandy habitats, the impact to the overfished rockfish stocks are reduced.

Most sea cucumber trawl effort is concentrated in southern California, and collection is by hand using scuba in northern California. Until 1997 about 75% of the annual catch was from the southern California sea cucumber trawl fishery. The dive fishery has increased substantially,and now accounts for 80% of the total harvest. For nongroundfish trawl vessels where the primary target species was sea cucumber, no overfished species catch was projected for 2005. Prior to the implementation of RCAs, less than 0.5 mt of all overfished species combined were landed by sea cucumber vessels in a given year (Table 3.3.3.6 and Table 3.3.3.7). California halibut, a state-managed species, is targeted with hook-and-line, setnets and trawl gear, all of which intercept groundfish. Gear specific estimates for the nongroundfish trawl vessels where the primary target species was California halibut were not available. Lingcod, bocaccio, canary rockfish and widow rockfish were historically landed by all California halibut gears combined (Table 3.3.3.6 and Table 3.3.3.7). The projections for 2005 are similar in composition (Table 3.3.3.5).

Hook-and-line gear refers to both stationary longlines (setlines) and mobile or trolled hook-and-line gear. The gear may extend vertically or horizontally, and be on-bottom or off-bottom. Fish harvested with hook-and-line gear typically have minimal physical damage from the gear itself. Hook and line gear can have substantially different applications and selectivity. Hook size and type can affect selectivity. The use of small hooks can increase selectivity for small-mouth fish (such as sand-dabs, a type of flatfish) and avoid larger-mouth rockfish. Also, barbless hooks are required in some (nongroundfish fisheries) to improve survival of fish that must be released.

Historically, groundfish catch has not been a significant component in salmon troll fisheries. However the fishery does encounter groundfish and historical landings data include lingcod, POP, bocaccio, canary rockfish, widow rockfish, and yelloweye rockfish. Table 3.3.3.5 shows that the greatest overfished species effect of salmon trolling on groundfish is on canary rockfish. Management measures aimed at protecting canary rockfish, which is often caught in association with yellowtail rockfish, include reduced catch opportunity for yellowtail rockfish. A 2001analysis indicated that the amount of canary rockfish taken with salmon troll gear was not highly correlated to the amount of yellowtail rockfish taken with salmon troll gear. Following these findings NMFS implemented a yellowtail incidental catch limit specific to the salmon troll fishery north of 40˚10' N. latitude. The intent of this small trip limit was to help reduce discard of yellowtail rockfish in the salmon troll fishery, without providing an incentive to target yellowtail rockfish or to exacerbate the incidental catch of canary rockfish. In addition to the incidental catch of groundfish, there is an incidental catch of Pacific halibut in the salmon troll fishery. Historical data show that trips where no halibut are landed have a higher range of groundfish landings in comparison to trips where halibut was landed. However, looking at groundfish catch frequency, either by vessel or trips, reveals that groundfish are caught more often by vessels on trips catching halibut (Amendment 16-3 EIS, July 2004).

Albacore is an important HMS species caught with line gear, in terms of west coast landings, and is commonly caught with troll gear. The albacore troll fishery has little groundfish bycatch. Albacore are very sensitive to water temperature, and the low bycatch may be because few other species are found in the warmer surface waters.

Central California was an important area for the California halibut set gill net fishery during the 1980s. In the early 1990s, California's set gillnet fishery was subject to increasingly restrictive state regulations that 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 nearshore live-fish fishery. (Amendment 16-2 EIS, December 2003) Gill nets are single-walled nets made of nylon or monofilament which are hung without slack to catch species such as white croaker and rockfish that gill in the nets. When gill nets are fished for California halibut, fishermen attach suspenders to the nets to create slack in the net so the halibut entangle or roll up in the nets, rather than being caught by their gills (XXXCalifornia Department of Fish and Game Marine Region Biological Opinion prepared for Director Robert C. Hight Assessment of Management Alternatives for Protecting Marine Mammals and Birds in the Central Coast Set Gill Net Fishery Compiled by Paul N. Reilly, Senior Marine Biologist September 8, 2000XXX). Because of the large mesh (8.5 inch) used in halibut gill nets and because the nets are fished in soft bottom areas, they are not projected to take significant numbers of rockfish. Overfished species found in association with California halibut are bocaccio, canary rockfish and widow rockfish. HMS Drift gillnet observer data shows that pelagic groundfish species such as whiting, spiny dogfish, and yellowtail rockfish are most frequently caught.

The weight of OA landings by depth group (nearshore, shelf, pelagic, and slope) are shown in Table 3.3.3.8 for each of the incidental groundfish fisheries for the years 2000-2004. The weight of groundfish landed in the incidental OA fisheries varies both between vessels within a target fishery and between fisheries. Table 3.3.3.9 groups vessels into weight categories (less than 100 lb per year, 101-500 lb per year, 500-1000 lb per year, and more than 1000 lbs per year) based on the annual weight of groundfish landed between 2000-2004. This information identifies the number of vessels that are landing the smallest amounts of groundfish. The vessels in the smallest groups (less than 100 lb, 101-500) likely represent trips in which groundfish is being avoided when harvesting the nongroundfish target species, or trips for nongroundfish targets that have a lower co-occurrence rate with groundfish. The incidental fisheries where the vast majority of vessels land less that 500 lb of groundfish per year are: Pacific halibut prior to 2004, California halibut longline, Dungeness crab pot, sheephead pot, sea cucumber trawl, ridgeback prawn trawl in 2004, pink shrimp trawl in 2003 and 2004, California halibut line gear, salmon troll, and HMS line gear. The fisheries where a substantial proportion of vessels land more than 500 lb of groundfish per year include: spot prawn pot, California halibut trawl, Pacific halibut longline in 2004, and ridgeback prawn trawl prior to 2004. Table 3.3.3.10**.** presents similar information, however, in this table vessels are grouped by month and the unique number of vessel that exceed the threshold for the monthly weight category is also presented. The weight categories for landed groundfish in table 3.3.3.10 are: less than 100lb per month, 101-200 lb per month, and greater than 200 lb per month.

Table 3.3.3.8. Open access directed and incidental fisheries, weight of groundfish landings by depth group 2000-2004 (PacFin)

OA gear group & weight of groundfish landed	Weight of landed catch by all vessels mt a/			
	Nearshore	Pelagic	Shelf	Slope
Longline -groundfish directed				
2000	88	1	23	294
2001	84	6	27	279
2002	55	0	21	276
2003	33	0	55	390
2004	27	1	96	319
5-year average	57	*1*	*44*	*312*
Longline - Pacific Halibut directed				
2000	--	--	0.7	1.8
2001	--	--	3.1	2.3
2002	--	--	0.9	2.0
2003	--	--	0.9	5.4
2004	--	--	1.5	8.8
5-year average	--	--	*1.4*	*4.0*
Longline -CA halibut directed b/				
2000	0.1	--	0.1	--
2001	--	--	c	--
2002	--	--	c	--
2003	--	--	c	--
2004	--	--	c	--
5-year average	--	--	--	--
Pot -groundfish directed				
2000	57	c	1	124
2001	39	--	2	113
2002	29	--	2	104
2003	27	c	4	179
2004	19	--	3	179
5-year average	*34*	--	*3*	*140*
Pot - Dungeness crab directed				
2000	0.5	c	0.1	0.1
2001	0.2	c	c	0.1
2002	0.4	--	c	0.1
2003	0.1	--	c	0.6
2004	0.3	--	c	0.2
5-year average	*0.3*	--	--	*0.2*

Table 3.3.3.8. Continued

OA gear group & weight of groundfish landed	Weight of landed catch by all vessels mt a/			
	Nearshore	Pelagic	Shelf	Slope
Pot - spot prawn directed				
2000	0.3	--	c	c
2001	0.3	--	c	1.3
2002	c	1.0	2.0	3.0
2003	0.2	--	c	1.0
2004	0.2	--	c	c
5-year average	*0.2*	*0.2*	*0.4*	*1.1*
Pot - sheephead directed				
2000	2.1	--	c	c
2001	3.5	--	0.5	0.2
2002	0.7	--	0.2	0.1
2003	0.5	--	0.2	c
2004	1.2	--	0.3	c
5-year average	*1.6*	--	*0.2*	*0.1*
Trawl - sea cucumber directed				
2000	c	--	--	--
2001	--	--	--	--
2002	--	--	c	--
2003	--	--	c	c
2004	--	--	c	--
5-year average	--	--	--	--
Trawl - CA halibut directed				
2000	0	--	10	--
2001	1	--	8	--
2002	1	--	7	--
2003	c	--	2	--
2004	c	--	13	--
5-year average	--	--	*8*	--
Trawl - spot prawn directed				
2000	--	--	0.9	--
2001	c	--	0.6	0.1
2002	c	--	0.4	--
2003	--	--	--	--
2004	--	--	--	--
5-year average	--	--	*0.5*	–

Table 3.3.3.8. Continued

OA gear group & weight of groundfish landed	Weight of landed catch by all vessels mt a/			
	Nearshore	Pelagic	Shelf	Slope
Trawl -Ridgeback Prawn directed				
2000	0.7	c	4.8	0.1
2001	0.3	c	7.0	c
2002	0.3	--	2.8	c
2003	c	0.1	2.8	--
2004	0.1	--	0.7	--
5-year average	*0.3*	--	*3.6*	--
Trawl -Pink Shrimp directed				
2000	c	58	51	36
2001	c	47	24	19
2002	--	21	16	9
2003	--	c	1	c
2004	--	c	2	c
5-year average	--	*25*	*19*	*13*
Line gear - groundfish directed b/				
2000	312	14	96	24
2001	384	3	88	24
2002	392	3	81	46
2003	266	2	66	69
2004	320	3	91	41
5-year average	*337*	*5*	*84*	*41*
Line gear - CA halibut				
2000	0.7	c	0.6	c
2001	0.6	c	0.7	c
2002	0.2	c	0.8	c
2003	0.3	--	1.5	--
2004	0.4	c	1.7	c
5-year average	*0.4*	--	*1.1*	--
Line gear - Salmon troll (coastwide)				
2000	2.0	2.3	9.2	0.1
2001	0.8	3.7	6.5	0.2
2002	0.9	2.3	2.9	0.6
2003	0.4	3.3	2.4	0.2
2004	0.7	6.9	3.6	0.1
5-year average	*1.0*	*3.7*	*4.9*	*0.2*

Table 3.3.3.8. Continued

OA gear group & weight of groundfish landed	Weight of landed catch by all vessels mt a/			
	Nearshore	Pelagic	Shelf	Slope
Line gear - HMS b/				
2000	c	0.1	0.2	--
2001	0.1	c	0.2	c
2002	c	--	0.1	--
2003	0.1	--	0.1	0.4
2004	c	--	0.1	0.2
5-year average	--	--	*0.1*	*0.1*
Net gear - HMS b/				
2000	--	--	--	--
2001	--	--	0.1	--
2002	--	--	0.1	--
2003	--	--	0.1	--
2004	--	--	0.1	--
5-year average	--	--	0.1	--
Net gear - CA halibut b/				
2000	1.3	0	7.6	0.1
2001	1.2	c	5.5	0
2002	0.6	0	3.6	c
2003	0.1	0	1.8	c
2004	0.3	c	1.3	0
5-year average	*0.7*	–	*4.0*	--

a/ very small amounts landed
b/ unknown species of groundfish appeared for longline CA halibut, hook and line groundfish directed and hook and line HMS directed. These values are not included in this table.

Table 3.3.3.9. OA groundfish vessels by annual weigh of groundfish landed, 2000-2004 (PacFin)

Open access gear group & weight of groundfish landed	Number of Vessels (weight of landed catch by all vessels lb)				
	2000	2001	2002	2003	2004
Longline - Pacific Halibut directed					
<100 lb	20 (931)	17 (563)	24 (1,212)	14 (561)	2 (89)
101-500 lb	19 (4,641)	14 (3,293)	15 (3,293)	14 (3,401)	15 (4,457)
501-1,000	--	3 (2,115)	3 (1,920	6 (4,349)	10 (7,538)
>1,000	--	1 (8,629)	--	4 (5,522)	7 (10,701)
Longline -CA halibut directed					
<100 lb	4 (168)	1 (61)	2 (70)	2 (63)	2 (11)
101-500 lb	1 (352)	0	0	0	0
Pot - Dungeness crab directed					
<100 lb	30 (822)	23 (313)	21 (440)	15 (368)	4 (50)
101-500 lb	3 (719)	2 (455)	1 (201)	1 (348)	1 (322)
501 -1,000 lb			1 (606)	1 (944)	1 (669)
Pot - spot prawn directed					
<100 lb	7 (100)	2 (111)	--	2 (29)	2 (103)
101-500 lb	1 (481)	4 (1,093)	3 (579)	3 (392)	--
501-1,000 lb	1 (520)	--	--	--	1 (650)
>1,000 lb		4 (2,585)	1 (1,253)	1 (2,289)	–
Pot - sheephead directed					
<100 lb	15 (494)	17 (457)	21 (568)	11 (461)	8 (244)
101-500 lb	4 (588)	5 (1,147)	6 (1,285)	2 (540)	7 (1,544)
501-1,000 lb	--	1 (522)	1 (582)	1 (504)	--
>1,000 lb	2 (3,820)	3 (7478)	--	--	1 (1,694)
Trawl - sea cucumber directed					
<100 lb	--	2	2	1	1
Trawl - CA halibut directed					
<100 lb	7 (209)	13 (471)	11 (333)	11 (586)	2 (11)
101-500 lb	6 (1,559)	6 (1,876)	8 (1,743)	4 (1,000)	4 (923)
501-1,000 lb	4 (2,250)	6 (4,807)	6 (4,807)	1 (604)	1 (783)
>1,000 lb	6 (19,718)	8 (16,904)	4 (12,895)	1 (2,393)	6 (27,955)
Trawl - spot prawn directed					
<100 lb	4 (170)	5 (212)	5 (284)	1 (48)	--
101-500 lb	5 (1,164)	2 (402)	4 (965)	--	--
501-1,000 lb	--	--	--	--	--
>1,000 lb	1 (1,244)	2 (1,207)	--	--	–

Table 3.3.3.9. Continued

Open access gear group & weight of groundfish landed	Number of Vessels (weight of landed catch by all vessels lb)				
	2000	2001	2002	2003	2004
Trawl -Ridgeback Prawn directed					
<100 lb	7 (315)	3 (99)	5 (160)	3 (169)	2 (55)
101-500 lb	4 (654)	3 (615)	3 (610)	4 (1,018)	1 (104)
501-1,000 lb	4 (2,839)	5 (3,834)	2 (1,851)	3 (2,269)	2 (1,557)
>1,000 lb	7 (10,443)	5 (11,995)	2 (4,330)	2 (3,013)	
Trawl -Pink Shrimp directed					
<100 lb	6 (276)	7 (347)	3 (164)	2 (74)	2 (21)
101-500 lb	7 (1,871)	3 (867)	6 (1,545)	2 (512)	1 (120)
501-1,000 lb	3 (2,241)	1 (894)	9 (6,767)	1 (706)	--
>1,000 lb	46 (317,748)	40 (195,835)	26 (91,796)	1 (1,643)	1 (3,728)
Line gear - CA halibut					
<100 lb	63 (2,299)	61 (1,500)	52 (1,170)	33 (777)	29 (796)
101-500 lb	6 (1,121)	8 (1,661)	6 (1,221)	13 (2,619)	16 (3,951)
501-1000 lb	--	--	--	1 (681)	–
Line gear - Salmon troll (coastwide)					
<100 lb	187 (6,232)	177 (5,808)	168 (5,504)	162 (4,758)	159 (5,866)
101-500 lb	83 (18,905)	55 (11,398)	36 (6,714)	36 (6,818)	75 (17,196)
501-1,000 lb	11 (6,854)	10 (6,486)	2 (1,514)	4 (2,448)	3 (1,942)
>1,000 lb	--	1 (1,221)	1 (1,115)	--	--
Line gear - Pacific Halibut					
<100 lb	--	--	--	1 (8)	1 (97)
Line gear - HMS					
<100 lb	17 (739)	9 (275)	6 (216)	2 (73)	4 (106)
101-500 lb	1 (120)	3 (389)	1 (366)	2 (293)	1 (143)
501-1,000 lb				1 (924)1	1 (536)

a/ multiple records exist for landings with HKL gear that do not have an associated vessel id. The vessel count in this case is an estimate
b/ annual revenue of $2,500 is used as a proxy for vessels that had efforts directed at groundfish
c\ if ≥20% of revenue was from groundfish, a vessel was assumed to have target groundfish at some point during the year

Table 3.3.3.10. Number of incidental OA vessels landing category and month, 2000 - 2004 (PacFin)

OA gear group & weight of groundfish landed	Number of Vessels (weight of landed catch by all vessels lb)												Unique vessels
	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Longline - Pac. Halibut													
2000													
<100 lb	--	--	--	--	--	--	29	--	--	--	--	--	29
101-200 lb	--	--	--	--	--	--	11	1	--	--	--	--	12
>200 lb	--	--	--	--	--	--	8	--	--	--	--	--	8
2001													
<100 lb	--	--	--	--	--	1	21	--	4	--	--	--	24
101-200 lb	--	--	--	--	--	2	8	--	1	--	--	--	10
>200 lb	--	--	--	--	--	--	10	--	3	--	--	--	10
2002													
<100 lb	--	--	--	--	--	20	20	--	--	--	--	--	34
101-200 lb	--	--	--	--	--	3	5	--	--	--	--	--	8
>200 lb	--	--	--	--	--	7	3	--	--	--	--	--	10
2003													
<100 lb	--	--	--	--	--	16	8	2	--	--	--	--	25
101-200 lb	--	--	--	--	--	4	9	3	--	--	--	--	13
>200 lb	--	--	--	--	--	2	8	10	--	--	--	--	14
2004													
<100 lb	--	--	--	--	--	11	8	1	--	--	--	--	17
101-200 lb	--	--	--	--	--	5	7	--	--	--	--	--	11
>200 lb	--	--	--	--	--	19	17	2	--	--	--	--	27
Longline -CA halibut													
2000													
<100 lb	1	2	1	2	1	1	1	1	--	1	--	--	5
101-200 lb	--	--	--	--	1	--	--	--	--	--	--	--	1
>200 lb	--	--	--	--	--	--	--	--	--	--	--	--	--
2001													
<100 lb	--	--	--	--	--	--	1	--	--	--	--	1	1
101-200 lb	--	--	--	--	--	--	--	--	--	--	--	--	--
>200 lb	--	--	--	--	--	--	--	--	--	--	--	--	--
2002													
<100 lb	--	1	--	1	--	--	1	--	--	--	--	--	2
101-200 lb	--	--	--	--	--	--	--	--	--	--	--	--	--
>200 lb	--	--	--	--	--	--	--	--	--	--	--	--	--
2003													
<100 lb	--	1	--	--	--	1	--	--	--	--	--	--	2
101-200 lb	--	--	--	--	--	--	--	--	--	--	--	--	--
>200 lb	--	--	--	--	--	--	--	--	--	--	--	--	--
2004													
<100 lb	--	--	--	--	--	1	--	--	--	--	--	--	1
101-200 lb	--	--	--	--	--	--	--	--	--	--	--	--	--
>200 lb	--	--	--	--	--	--	--	--	--	--	--	--	--
Pot - Dungeness crab													
2000													
<100 lb	3	1	5	15	9	8	5	1	--	--	1	7	32
101-200 lb	--	--	--	--	1	--	--	--	--	--	--	--	1
>200 lb	--	--	--	1	--	--	--	--	--	--	--	--	1
2001													
<100 lb	5	6	4	6	3	3	1	2	--	--	--	1	24
101-200 lb	--	--	1	--	--	--	--	--	--	--	--	--	1
>200 lb	--	--	--	1	--	--	--	--	--	--	--	--	1
2002													
<100 lb	10	4	8	3	6	3	1	--	--	--	--	2	21
101-200 lb	--	--	--	1	--	--	--	--	--	--	--	--	1
>200 lb	--	--	--	--	--	1	--	--	--	--	--	--	1
2003													
<100 lb	6	5	3	4	4	2	1	--	--	--	--	1	15
101-200 lb	--	1	--	--	--	--	--	--	--	--	--	1	1
>200 lb	2	--	--	--	--	--	--	--	--	--	--	--	2
2004													
<100 lb	--	1	1	1	2	--	--	--	--	--	--	--	5
101-200 lb	--	1	1	--	--	--	--	--	--	--	--	--	2
>200 lb	1	--	--	--	--	--	--	--	--	--	--	--	1

Table 3.3.3.10. Continued

OA gear group & weight of groundfish landed	Number of Vessels (weight of landed catch by all vessels lb)												Unique vessels
	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Pot - spot prawn													
2000													
<100 lb	4	1	1	1	1	2	1	2	2	2	1	--	9
101-200 lb	--	--	--	--	--	1	--	1	1	--	--	1	2
>200 lb	--	--	--	--	--	--	--	--	--	--	--	--	--
2001													
<100 lb	--	1	3	--	3	3	3	2	3	2	1	1	7
101-200 lb	1	1	--	2	--	1	--	1	--	--	--	--	5
>200 lb	1	1	1	--	--	--	--	1	--	1	1	--	1
2002													
<100 lb	--	1	1	4	--	1	1	2	1	2	1	--	4
101-200 lb	--	--	--	--	--	1	--	1	1	--	--	--	3
>200 lb	1	1	--	--	--	--	--	--	1	--	--	--	1
2003													
<100 lb	--	1	--	--	2	--	--	1	1	--	--	--	4
101-200 lb	--	--	--	--	--	1	--	--	2	--	--	--	3
>200 lb	2	1	--	--	--	--	--	--	--	--	--	--	1
2004													
<100 lb	--	--	--	1	--	--	1	1	--	--	--	--	3
101-200 lb	--	--	--	--	--	--	--	--	2	--	--	--	1
>200 lb	--	--	--	--	–	1	–	–	–	–	–	–	1
Pot - sheephead													
2000													
<100 lb	2	2	7	7	7	11	6	4	7	2	1	2	21
101-200 lb	--	--	--	--	1	2	1	--	1	--	1	1	3
>200 lb	--	--	--	2	1	2	--	--	2	--	1	--	2
2001													
<100 lb	4	3	6	6	8	7	8	4	3	2	2	--	26
101-200 lb	--	--	1	--	1	2	2	5	1	1	--	--	3
>200 lb	--	--	--	3	3	1	3	1	3	--	--	--	10
2002													
<100 lb	--	--	8	6	8	8	5	8	--	--	--	--	26
101-200 lb	--	--	1	3	--	1	1	--	--	--	--	--	5
>200 lb	--	--	--	1	--	--	1	--	--	--	--	--	2
2003													
<100 lb	2	6	2	--	4	4	3	--	1	--	--	--	14
101-200 lb	--	--	--	--	3	1	1	--	--	--	--	--	2
>200 lb	--	--	--	--	1	--	--	--	--	--	--	--	1
2004													
<100 lb	--	1	8	6	6	9	7	8	2	1	--	--	16
101-200 lb	--	--	--	--	1	3	1	1	1	--	--	--	2
>200 lb	--	--	--	--	1	--	--	2	1	--	--	--	2
Trawl - CA halibut													
2000													
<100 lb	4	5	3	4	4	3	3	3	7	4	4	1	21
101-200 lb	2	--	2	5	2	2	3	3	2	1	--	--	9
>200 lb	6	2	3	8	3	10	6	4	1	2	--	1	13
2001													
<100 lb	3	8	7	4	9	7	1	3	6	5	12	7	29
101-200 lb	3	2	3	--	4	3	4	3	5	1	3	4	16
>200 lb	1	1	8	3	4	2	3	5	2	6	2	4	18
2002													
<100 lb	9	11	9	6	3	4	5	3	--	1	3	5	27
101-200 lb	6	10	2	4	2	6	2	--	1	--	--	2	14
>200 lb	3	6	9	8	8	4	--	--	--	--	--	1	9
2003													
<100 lb	8	2	4	5	8	3	2	3	1	3	1	--	17
101-200 lb	1	1	2	2	1	--	--	1	1	1	--	--	3
>200 lb	1	1	--	--	--	--	--	1	--	--	1	--	3
2004													
<100 lb	3	1	1	2	1	2	1	3	3	2	4	2	11
101-200 lb	1	1	2	--	--	--	3	4	2	--	1	5	9
>200 lb	2	--	1	1	2	5	9	4	3	2	3	5	8

Table 3.3.3.10. Continued

OA gear group & weight of groundfish landed	Number of Vessels (weight of landed catch by all vessels lb)												Unique vessels a/
	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Trawl - spot prawn													
2000													
<100 lb	1	1	2	--	--	3	1	2	-	--	--	--	7
101-200 lb	--	2	--	1	1	2	1	2	1	--	--	--	4
>200 lb	--	--	--	--	1	1	--	--	1	--	--	--	3
2001													
<100 lb	--	1	3	2	3	2	1	1	1	--	--	--	7
101-200 lb	--	1	1	1	1	1	1	--	--	--	--	--	4
>200 lb	--	--	--	--	1	--	--	--	--	--	--	--	1
2002													
<100 lb	--	--	2	4	4	1	1	1	--	--	--	--	8
101-200 lb	--	--	--	2	--	1	--	--	--	--	--	--	3
>200 lb	--	--	--	1	--	--	--	--	--	--	--	--	1
2003													
<100 lb	--	--	--	1	--	--	--	--	--	--	--	--	1
101-200 lb	--	--	--	--	--	--	--	--	--	--	--	--	--
>200 lb	--	--	--	--	--	--	--	--	--	--	--	--	--
2004													
<100 lb	--	--	--	--	--	--	--	--	--	--	--	--	--
101-200 lb	--	--	--	--	--	--	--	--	--	--	--	--	--
>200 lb	--	--	--	--	--	--	--	--	--	--	--	--	--
Trawl -Ridgeback Prawn													
2000													
<100 lb	2	5	4	3	3	--	1	--	1	7	3	4	19
101-200 lb	3	1	1	4	5	--	--	--	--	2	3	5	11
>200 lb	--	--	5	7	3	--	--	--	--	--	7	5	7
2001													
<100 lb	3	3	4	4	2	--	1	1	--	3	1	1	13
101-200 lb	7	7	7	5	3	--	--	--	--	--	1	--	11
>200 lb	8	5	5	2	--	--	--	--	--	2	3	5	10
2002													
<100 lb	4	1	2	2	4	--	2	--	--	1	1	1	11
101-200 lb	2	4	1	1	1	--	--	--	--	--	--	--	6
>200 lb	3	1	5	3	3	--	--	--	--	--	--	--	5
2003													
<100 lb	3	3	2	5	2	--	--	--	--	7	5	--	11
101-200 lb	--	2	1	3	3	--	--	--	--	4	2	--	8
>200 lb	1	--	2	2	5	--	--	--	--	--	--	--	6
2004													
<100 lb	3	--	1	1	--	--	--	--	--	2	--	--	4
101-200 lb	1	1	--	--	--	--	--	--	--	1	1	--	2
>200 lb	--	--	--	--	--	--	--	--	--	1	1	1	2
Trawl -Pink Shrimp													
2000													
<100 lb	--	--	--	--	5	5	3	6	1	--	--	--	18
101-200 lb	--	--	--	--	3	3	3	2	--	2	--	--	11
>200 lb	--	--	--	2	8	43	49	37	37	27	--	--	54
2001													
<100 lb	--	--	--	4	4	5	2	5	4	8	--	--	26
101-200 lb	--	--	--	3	2	2	3	3	4	4	--	--	15
>200 lb	--	--	--	25	29	37	31	18	11	2	--	--	42
2002													
<100 lb	--	--	--	6	5	4	8	4	5	2	--	--	21
101-200 lb	--	--	--	4	1	2	2	2	1	2	--	--	10
>200 lb	--	--	--	13	35	28	4	4	2	1	--	--	38
2003													
<100 lb	--	--	--	2	2	1	1	1	--	1	--	--	4
101-200 lb	--	--	--	1	--	--	--	--	--	--	--	--	1
>200 lb	--	--	--	–	2	1	–	–	1	1	--	--	3
2004													
<100 lb	--	--	--	–	--	1	–	1	--	--	--	--	2
101-200 lb	--	--	--	–	1	--	–	--	--	--	--	--	1
>200 lb	--	--	--	–	1	1	1	1	–	–	--	--	1

Table 3.3.3.10. Continued

OA gear group & weight of groundfish landed	Number of Vessels (weight of landed catch by all vessels lb)												Unique vessels a/
	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Line gear - CA halibut													
2000													
<100 lb	--	1	4	11	8	19	25	18	16	11	8	7	69
101-200 lb	--	--	--	--	--	--	–	2	--	--	--	--	2
>200 lb	--	--	--	--	--	--	1	--	--	--	--	--	1
2001													
<100 lb	5	3	3	5	10	10	14	27	12	16	4	3	67
101-200 lb	--	--	--	--	1	--	2	1	1	--	--	--	4
>200 lb	--	--	--	--	--	--	1	--	--	--	--	--	1
2002													
<100 lb	3	1	7	6	8	10	14	18	10	9	4	2	58
101-200 lb	--	--	--	--	--	--	1	1	2	--	--	--	3
>200 lb	--	--	--	--	--	--	--	--	--	--	--	--	--
2003													
<100 lb	--	3	2	--	5	13	14	18	11	5	5	2	45
101-200 lb	--	--	--	--	--	--	1	4	2	1	--	--	1
>200 lb	--	--	--	--	--	--	--	2	--	--	--	--	2
2004													
<100 lb	--	--	3	6	6	10	16	17	15	9	--	--	44
101-200 lb	--	1	--	--	--	--	3	2	2	--	--	--	8
>200 lb	--	--	--	--	--	--	1	2	1	--	--	--	4
Line gear - Salmon troll (coastwide)													
2000													
<100 lb	--	--	--	21	74	95	114	61	54	26	6	2	253
101-200 lb	--	--	--	--	12	14	8	2	6	--	--	--	40
>200 lb	--	--	--	--	26	9	4	--	4	--	--	--	40
2001													
<100 lb	--	--	--	48	84	100	66	72	56	15	3	--	230
101-200 lb	--	--	--	2	12	11	3	11	2	--	--	--	34
>200 lb	--	--	--	1	9	7	--	5	2	--	--	--	19
2002													
<100 lb	--	--	18	43	85	48	42	39	28	14	6	1	191
101-200 lb	--	--	1	2	11	1	2	4	1	--	--	--	21
>200 lb	--	--	--	1	6	1	1	6	1	--	--	--	13
2003													
<100 lb	--	--	8	24	57	27	33	54	44	33	--	--	184
101-200 lb	--	--	--	3	6	2	4	4	6	4	--	--	24
>200 lb	--	--	--	--	2	2	4	5	5	--	--	--	12
2004													
<100 lb	--	--	22	37	83	72	41	52	35	12	--	--	209
101-200 lb	--	--	--	3	27	14	13	8	2	--	--	--	51
>200 lb	--	--	--	--	11	5	1	--	2	1	--	--	18
Line gear - HMS													
2000													
<100 lb	--	1	--	--	--	3	1	5	6	1	1	--	18
101-200 lb	--	--	--	--	--	--	--	--	--	1	1	--	1
>200 lb	--	--	--	--	--	--	--	--	--	--	--	--	--
2001													
<100 lb	--	--	--	--	--	4	2	5	1	1	1	--	10
101-200 lb	--	--	--	--	--	--	--	1	--	1	1	--	2
>200 lb	--	--	--	--	--	--	--	--	--	--	--	--	--
2002													
<100 lb	--	--	--	--	--	--	2	2	2	--	--	--	6
101-200 lb	--	--	--	--	--	--	--	--	--	--	--	--	1
>200 lb	--	--	--	--	--	--	--	--	--	--	--	--	--
2003													
<100 lb	--	--	--	--	--	1	1	1	1	--	--	--	3
101-200 lb	--	--	--	--	--	3	2	1	--	--	--	--	3
>200 lb	--	--	--	--	--	1	1	--	--	--	--	--	1
2004													
<100 lb	--	--	--	--	--	1	3	1	1	1	1	--	5
101-200 lb	--	--	--	--	--	1	1	1	--	--	--	--	2
>200 lb	--	--	--	--	--	--	--	--	1	--	--	--	1

a/ Values for unique vessels cannot be summed between weight categories

Dungeness Crab Fishery

The states of Oregon and California, and Washington in cooperation with the Washington Coast treaty tribes manage the Dungeness crab fishery. The Pacific States Marine Fisheries Commission (PSMFC) provides inter-state coordination. 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. The commercial fishery may retain only male crabs (thus protecting the reproductive potential of the populations); the fishery has open and closed seasons; and the commercial fishery must comply with a minimum size limit on male crabs.

Washington manages the Dungeness fishery with a LE system with two tiers of pot limits and a season from December 1 through September 15. In Oregon, 306 vessels made landings in 1999. The Oregon season 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 LE program in 1995, and as of March 2000 about 600 California residents and 70 non-residents hold LE permits. Nonetheless, effort has increased with the entry of larger multipurpose vessels from other fisheries. Landings have not declined. The effort increase has resulted in a "race for fish" with more than 80% of total landings made during the month of December.

Both personal use fishers and commercial fishers target Dungeness crab. At the commercial level, the Dungeness crab fishery generated $67 to $130 million in exvessel revenue (Table 3.3.3.11); in recent years (2002 and 2003) the amount of exvessel revenue generated by the fishery has been increasing due in part to increases in stock biomass. For many vessels, the Dungeness crab fishery has been the fishery with the largest exvessel revenues.

The majority of Dungeness crab fishing effort and catch occurs during the months of December and January. Many types of vessels participate in this fishery including vessels that may otherwise be LE groundfish trawlers and fixed gear vessels, as well as other types of vessels. The Dungeness crab fishery tends to occur in areas nearer to shore than the LE trawl and fixed gear fisheries. To avoid gear interactions with the Dungeness crab fishery, a conscious effort has been made to allow groundfish trawl vessels access to waters deeper than 60 fathoms during winter months.

All three states are comparable in terms of landed weight and revenue in coastal management areas, and Washington has an additional component in Puget Sound that is substantial. Washington had the highest landings recent years for coastal Dungeness crab, followed closely by Oregon and California. The ports with highest landings are distributed among the three states (Table 3.3.3.12).

Table 3.3.3.11. Landings and Exvessel Revenue of Dungeness Crab by Area, State, and Year (2000-2003)

			YEAR			
Area	State	Data type	2000	2001	2002	2003
Coastal Management Areas	CA	Landed weight (lbs)	6,482,913	3,546,106	7,297,676	22,196,754
		Exvessel revenue ($)	13,751,700	9,009,756	13,458,089	35,270,665
	OR	Landed weight (lbs)	11,180,845	9,689,804	12,442,612	23,480,735
		Exvessel revenue ($)	23,710,261	19,291,484	20,759,342	36,399,904
	WA	Landed weight (lbs)	11,700,416	12,049,827	16,101,625	28,191,992
		Exvessel revenue ($)	25,609,842	24,003,463	26,707,196	45,129,820
Other Management Areas	CA	Landed weight (lbs)				C
		Exvessel revenue ($)				C
	WA	Landed weight (lbs)	6,732,220	7,522,403	6,944,948	6,941,032
		Exvessel revenue ($)	14,084,886	14,752,254	13,548,402	13,259,518
Total Landed weight (lbs)			36,096,394	32,808,140	42,786,861	80,810,513*
Total Exvessel revenue ($)			77,156,690	67,056,957	130,059,907	130,071,468*

Source: PacFIN ftl table. August 2004

Note: C represents data restricted due to confidentiality

"Other management areas" includes inside waters such as Puget Sound and Columbia River

* totals do not include confidential data

Table 3.3.3.12. Top 15 Ports for Dungeness Crab Landings and Revenue (2000 - 2003)

Rank	Top Ports for Dungeness Crab by Weight	Top Ports for Dungeness Crab by Value
1	WESTPORT	WESTPORT
2	ASTORIA	ASTORIA
3	CRESCENT CITY	CRESCENT CITY
4	NEWPORT	NEWPORT
5	BELLINGHAM BAY	BELLINGHAM BAY
6	CHARLESTON (COOS BAY)	CHARLESTON (COOS BAY)
7	EUREKA	EUREKA
8	BROOKINGS	BLAINE
9	BLAINE	BROOKINGS
10	ILWACO	SAN FRANCISCO
11	SAN FRANCISCO	LACONNER
12	CHINOOK	ILWACO
13	LACONNER	CHINOOK
14	TAHOLAH	TAHOLAH
15	ANACORTES	PRINCETON / HALF MOON BAY

Source: PacFIN FTL table. July 2004

Highly Migratory Species Fisheries The HMS fishery management unit includes five tuna species, five shark species, striped marlin, swordfish, and dorado. Complex management of HMS fisheries results from the multiple management jurisdictions, users, and gear types targeting these species, and from the 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.

Albacore tuna account for a large majority of the landed weight and value (Table 3.3.3.13). NMFS monitors the numerous species caught by the HMS fishery, but which are not part of the fishery management unit. Commercial fishers use five distinctive gear types to harvest HMS: hook-and-line, driftnet, pelagic longline, purse seine, and harpoon (Table 3.3.3.14). By gear, approximately 27 purse seine, 887 surface hook-and-Line, 121 drift gillnet, 20 longline, and 32 harpoon permits have been issued for the HMS fisheries. While hook-and-line gear catches many HMS species, traditionally it has been used to harvest tunas. The principal target species for hook-and-line fisheries include albacore and other tunas, swordfish and other billfish, several shark species, and dorado. Albacore make up the highest hook and line landings, with the majority taken by troll and jig-and-bait gear (92% in 1999). Gillnet, drift longline, and other gear take a small portion of fish. These gear types vary in the incidence of groundfish interception depending on the area fished and time of year. Overall, nearly half of the total coastwide landings of albacore, by weight, were landed in California.

Fishers use pelagic longline to target swordfish, shark and tunas; drift gillnet gear to target swordfish, tunas, and sharks off California and Oregon; purse seine gear to target tuna off California and Oregon; and harpoon to target swordfish off California and Oregon. Some vessels, especially longliners and purse seiners, fish outside of the EEZ, but may deliver to West Coast ports. Drift gillnets intercept most groundfish, including whiting, spiny dogfish, and yellowtail rockfish. Most landings occur in Washington and Oregon (Table 3.3.3.14), and the top several ports occur in these states (Table 3.3.3.15).

Table 3.3.3.13 Landings and Revenue of HMS by Species and Year

		Year			
Species Type	Data Type	2000	2001	2002	2003
Albacore	Landed weight (lbs)	19,848,814	24,495,425	22,063,692	36,485,624
	Exvessel revenue ($)	17,103,010	20,577,991	14,272,304	24,305,367
Shark	Landed weight (lbs)	547,195	567,274	517,745	491,807
	Exvessel revenue ($)	720,450	670,249	629,727	588,697
Other Tuna	Landed weight (lbs)	1,559,831	1,644,104	78,491	113,077
	Exvessel revenue ($)	900,461	833,464	90,157	100,998
Dorado and Marlin	Landed weight (lbs)	8,946	18,394	C	C
	Exvessel revenue ($)	12,633	13,501	C	C
Swordfish	Landed weight (lbs)	1,252,875	640,799	609,248	980,229
	Exvessel revenue ($)	4,054,296	2,158,192	2,264,288	3,131,158
Total Landed Weight (lbs)		23,217,661	27,365,996	23,269,176*	38,070,737*
Total Exvessel Revenue ($):		22,790,849	24,253,397	17,256,476*	28,126,220*

Source: PacFIN FTL table. July 2004
Note: C represents data restricted due to confidentiality
* totals do not include confidential data

Table 3.3.3.14 HMS Landings and Exvessel Revenue by State, Year, and Major Gear Group

			YEAR			
State	Gear Group	Data Type	2000	2001	2002	2003
CA	Hook and Line	Landed weight (lbs)	2,323,968	2,402,114	4,534,829	2,697,411
		Exvessel revenue ($)	2,741,226	2,334,606	2,945,594	2,741,955
	Net	Landed weight (lbs)	2,902,991	2,802,769	1,090,415	930,255
		Exvessel revenue ($)	3,975,012	2,850,343	2,225,363	1,741,480
	Troll	Landed weight (lbs)	1,964,550	3,907,886	1,364,167	1,360,872
		Exvessel revenue ($)	1,872,012	3,063,523	1,024,421	988,564
OR	Hook and Line	Landed weight (lbs)	C	76,513	323,497	C
		Exvessel revenue ($)	C	41,340	198,261	C
	Net	Landed weight (lbs)	C		C	86,604
		Exvessel revenue ($)	C		C	13,720
	Troll	Landed weight (lbs)	8,755,933	8,948,222	4,036,735	9,039,680
		Exvessel revenue ($)	7,488,326	7,545,405	2,752,640	6,115,181
WA	Hook and Line	Landed weight (lbs)	C	C	C	
		Exvessel revenue ($)	C	C	C	
	Net	Landed weight (lbs)	C			
		Exvessel revenue ($)	C			
	Troll	Landed weight (lbs)	7,020,617	9,145,451	11,776,387	23,792,124
		Exvessel revenue ($)	5,836,813	7,947,279	7,418,555	15,706,940

Source: PacFIN FTL table. July 2004.
Note: C represents data restricted due to confidentiality

Table 3.3.3.15. Top Ports for HMS Landings and Exvessel Revenue (2000 - 2003)

Rank	Top 15 Ports by Weight	Top 15 Ports by Exvessel Revenue
1	ILWACO	ILWACO
2	NEWPORT	NEWPORT
3	WESTPORT	WESTPORT
4	ASTORIA	ASTORIA
5	CHARLESTON (COOS BAY)	SAN DIEGO
6	TERMINAL ISLAND	MORRO BAY
7	EUREKA	SAN PEDRO
8	MORRO BAY	CHARLESTON (COOS BAY)
9	MOSS LANDING	TERMINAL ISLAND
10	BELLINGHAM BAY	EUREKA
11	SAN PEDRO	MOSS LANDING
12	SAN DIEGO	BELLINGHAM BAY
13	OCEANSIDE	SAN FRANCISCO
14	FIELDS LANDING	OCEANSIDE
15	CRESCENT CITY	CRESCENT CITY

Source: PacFIN FTL table. July 2004

Pacific Pink Shrimp Fishery

The Council has no direct management authority over pink shrimp. In 1981, the three coastal states established uniform coastwide regulations for the pink shrimp fishery. The season runs from April 1 through October 31. Regulations authorize pink shrimp commercial harvest only by trawl nets or pots. Trawl gear harvests most of these shrimp off the West Coast from Northern Washington to Central California at depths from 60 fm and 100 fm (110 m to 180 m), with the majority taken off Oregon (Table 3.3.3.16). The ports with highest landings also occur in Oregon, followed by Washington and Oregon ports (Table 3.3.3.17).

Shrimp trawl nets are usually constructed with net mesh sizes smaller than the net mesh sizes for legal groundfish trawl gear. Most shrimp trawl gear has a mesh size of one inch to three-eights inches between knots. Thus, shrimp trawlers commonly catch groundfish, while groundfish trawlers catch little shrimp. 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). 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.

Many vessels that participate in the shrimp trawl fishery also have groundfish LE permits. Vessels participating in the pink shrimp fishery must abide by the same rules as vessels that do not have groundfish LE permits. However, all groundfish landed by vessels with LE permits are included in the LE total.

Table 3.3.3.16 Pink Shrimp Landings and Exvessel Revenue by Year and State (LBS and USD)

		YEAR			
State	Data Type	2000	2001	2002	2003
CA	Landed weight (lbs)	2,459,095	3,612,205	4,116,213	2,147,685
	Exvessel revenue ($)	1,049,119	992,644	1,275,023	657,159
OR	Landed weight (lbs)	25,462,479	28,482,140	41,583,534	20,545,976
	Exvessel revenue ($)	10,192,294	7,560,473	11,352,588	5,051,246
WA	Landed weight (lbs)	4,360,914	6,590,344	10,105,043	7,893,802
	Exvessel revenue ($)	1,700,410	1,713,687	2,745,707	1,959,662
Total Landed Weight (lbs)		32,282,488	38,684,689	55,804,790	30,587,463
Total Exvessel Revenue ($)		12,941,823	10,266,804	15,373,317	7,668,068

Source: PacFIN FTL table. July 2004

Table 3.3.3.17 Top 15 Ports for Pink Shrimp Landings and Exvessel Revenue (2000–2003)

Rank	Top Ports by Weight	Top Ports by Exvessel Revenue
1	ASTORIA	ASTORIA
2	NEWPORT	NEWPORT
3	CHARLESTON (COOS BAY)	CHARLESTON (COOS BAY)
4	WESTPORT	WESTPORT
5	GARIBALDI (TILLAMOOK)	GARIBALDI (TILLAMOOK)
6	EUREKA	EUREKA
7	CRESCENT CITY	CRESCENT CITY
8	BROOKINGS	BROOKINGS
9	ILWACO	ILWACO
10	SOUTH BEND	SOUTH BEND
11	TOKELAND	MORRO BAY
12	MORRO BAY	TOKELAND
13	AVILA	AVILA
14	FIELDS LANDING	FIELDS LANDING
15	MONTEREY	MONTEREY

Source: PacFIN FTL table. July 2004

Ridgeback Prawn Fisheries

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. Shrimp gear accounts for nearly all prawn landings, although groundfish trawl and other gears take minor amounts (Table 3.3.3.18). The top ports for landed weight and exvessel value occur in the Santa Barbara Channel-Santa Monica Bay region (Table 3.3.3.19). The State of California manages the ridgeback prawn fishery. Similar to spot prawn and pink shrimp fisheries, prawns are an "non-groundfish" fishery in the federal OA groundfish fishery, entitling 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. Regulations allow an incidental take of 50 pounds of prawns or 15% by weight during the closed period. During the open prawn season, federal regulations limit finfish landings per trip to a maximum of 1,000 pounds, with no more than 300 pounds of groundfish. A vessel operator may land any amount of sea cucumbers with ridgeback prawns as long as the 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 cod ends or 3 inches for double-walled cod ends and maintaining a logbook (required since 1986).

Table 3.3.3.18. Ridgeback Prawn Landings and Exvessel Revenue by Year (LBS and USD)

		YEAR			
Gear Group	Data Type	2000	2001	2002	2003
Trawl	Landed weight (lbs)	141,160	16,920	19,735	12,454
	Exvessel revenue ($)	165,345	26,976	31,599	14,641
Shrimp Trawl	Landed weight (lbs)	1,414,844	340,024	422,240	486,890
	Exvessel revenue ($)	1,633,636	508,853	606,064	669,274
Other Gears	Landed weight (lbs)	10,172			237
	Exvessel revenue ($)	13,201			641
Total Landed Weight (lbs)		1,566,176	356,944	441,975	499,581
Total Exvessel Revenue ($)		1,812,182	535,829	637,663	684,557

Source: PacFIN FTL table. July 2004

Table 3.3.3.19. Rank of All Ports with Ridgeback Prawn Landings and Exvessel Revenue (2000–2003)

Rank	Rank of Ports by Weight	Rank of Ports by Exvessel Revenue
1	SANTA BARBARA	SANTA BARBARA
2	VENTURA	VENTURA
3	OXNARD	OXNARD
4	TERMINAL ISLAND	TERMINAL ISLAND
5	LONG BEACH	LONG BEACH
6	PLAYA DEL REY	PLAYA DEL REY
7	PORT HUENEME	PORT HUENEME
8	SAN PEDRO	SAN PEDRO
9	MORRO BAY	MORRO BAY
10	AVILA	AVILA
11	SAN SIMEON	SAN SIMEON
12	POINT ARENA	POINT ARENA
13	PRINCETON / HALF MOON BAY	PRINCETON / HALF MOON BAY

Source: PacFIN ftl table. August 2004

Salmon

The ocean commercial salmon fishery, non-treaty and treaty, is managed by both the states and the federal government. The Council manages fisheries in the EEZ while the states manage fisheries in their waters. All ocean commercial salmon fisheries off the West Coast states use troll gear, and primarily target chinook and coho. Limited pink salmon landings occur in odd-years. A gillnet/tangle net fishery that does not technically occur in Council-managed waters may have some impact on groundfish that migrate through state waters. Commercial coho landings fell precipitously in the early 1990s and remain very low. In response to the listing of many wild salmon stocks 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 avoiding depressed natural stocks. 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.

California accounts for most landings and revenues of salmon caught in the coastal management areas, followed by Oregon and Washington (Table 3.3.3.20). However, Washington landings in Puget Sound and other non-coastal areas substantially exceed the total coastal landings. Most of the top 10 ports for quantity of landings occur in Washington (Table 3.3.3.21), but the top ports in terms of revenues occur more evenly distributed by state.

The salmon troll fishery has a small incidental catch of Pacific halibut and groundfish, including yellowtail rockfish. The historical data show that salmon troll trips that did not land halibut had a higher range of groundfish landings (11-149 mt) than troll trips that landed halibut (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. To account for yellowtail rockfish landed incidentally while not promoting targeting on the species, federal managers have allowed salmon trollers to land up to one pound of yellowtail per two pounds of salmon in 2001, not to exceed 300 pounds per month (north of Cape Mendocino).

Table 3.3.3.20 Salmon Landings and Exvessel Revenue by Area, State, and Year (LBS and USD)

			YEAR			
Area	State	Data type	2000	2001	2002	2003
Coastal Management Areas	CA	Landed weight (lbs)	5,143,030	2,407,615	4,941,537	6,382,942
		Exvessel revenue ($)	10,325,395	4,772,551	7,643,076	12,166,622
	OR	Landed weight (lbs)	1,563,697	2,960,716	3,501,154	3,667,155
		Exvessel revenue ($)	3,069,828	4,736,557	5,388,352	7,198,494
	WA	Landed weight (lbs)	416,030	1,090,350	1,348,292	1,443,320
		Exvessel revenue ($)	566,873	1,096,778	1,313,661	1,594,448
Other Management Areas	OR	Landed weight (lbs)	1,340,819	1,855,600	2,089,757	2,438,378
		Exvessel revenue ($)	961,419	1,125,372	1,543,793	1,586,972
	WA	Landed weight (lbs)	12,750,614	28,791,819	32,904,386	31,122,453
		Exvessel revenue ($)	9,772,895	11,298,116	12,013,803	11,100,583
Total Landed weight (lbs)			21,214,190	37,106,100	44,785,126	45,054,248
Total Exvessel revenue ($)			24,696,410	23,029,373	27,902,685	33,647,119

Source: PacFIN ftl table. August 2004
Note: "Other management areas" includes inside waters such as Puget Sound and Columbia River

Table 3.3.3.21 Top 15 Ports for Salmon Landings and Exvessel Revenue (2000–2003)

Rank	Top 15 Ports by Weight	Top 15 Ports by Exvessel Revenue
1	BELLINGHAM BAY	NEWPORT
2	SEATTLE	FORT BRAGG
3	SHELTON	BELLINGHAM BAY
4	COLUMBIA RIVER PORTS - OREGON	CHARLESTON (COOS BAY)
5	TAHOLAH	BODEGA BAY
6	LACONNER	SAN FRANCISCO
7	NEWPORT	COLUMBIA RIVER PORTS - OREGON
8	EVERETT	SHELTON
9	FORT BRAGG	PRINCETON / HALF MOON BAY
10	TACOMA	SEATTLE
11	BLAINE	MOSS LANDING
12	COPALIS BEACH	TACOMA
13	PORT ANGELES	TAHOLAH
14	BODEGA BAY	PORT ANGELES
15	CHARLESTON (COOS BAY)	BLAINE

Source: PacFIN ftl tables. August 2004

Pacific Halibut

The bilateral (U.S./Canada) IPHC recommends conservation regulations for Pacific halibut, and the governments of Canada and the U.S. implement the regulations in their own waters. The IPHC requires a license to participate in the commercial Pacific halibut fishery in waters off Washington, Oregon, and California (Area 2A). Area 2A licenses, issued for the directed commercial fishery, have decreased from 428 in 1997 to 215 in 2004.The Pacific and North Pacific Fishery Management Councils have responsibility for allocation in Council waters within the IPHC management regime. The Pacific Halibut Catch Sharing Plan (CSP) for Area 2A specifies allocation agreements of the Council, the states of Washington, Oregon, and California, and the Pacific halibut treaty tribes. The CSP specifies recreational and commercial fisheries for Area 2A. The commercial sector has both a treaty and non-treaty components. Regulations limit the directed non-treaty commercial fishery in Area 2A to south of Point Chehalis, Washington, Oregon, and California. Commercial landings have ranged from about 0.5 to 1.0 million pounds (head on dressed weight) and $1.5 to $2.3 million (Table 3.3.3.22). Washington accounts for the majority of the highest-producing ports for landed weight and revenue (Table 3.3.3.23). In the non-treaty commercial sector, the directed halibut fishery receives an allocation of 85% of the harvest and the salmon troll fishery receives 15% to cover incidental catch. The LE primary sablefish fishery north of Point Chehalis, Washington (46º 53' 18" N latitude) may retain halibut when the Area 2A total allowable halibut catch (TAC) is above 900,000 pounds. 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.

Table 3.3.3.22 Pacific Halibut Commercial Landings and Exvessel Revenue by Year and Gear (LBS and USD)

		YEAR			
Gear Group	Data Type	2000	2001	2002	2003
Hook and Line	Landed weight (lbs)	519,645	745,500	949,274	807,131
	Exvessel revenue ($)	1,358,462	1,578,914	1,941,603	2,226,318
Troll	Landed weight (lbs)	25,574	37,639	42,811	48,416
	Exvessel revenue ($)	62,210	78,409	81,505	107,640
Total Landed weight (lbs)		545,219	783,139	992,085	855,547
Total Exvessel Revenue ($)		1,420,671	1,657,323	2,023,108	2,333,98

Source: PacFIN ftl table. August 2004

Table 3.3.3.23 Top 15 Ports for Pacific Halibut Landings and Exvessel Revenue (2000–2003)

Rank	Top 15 Ports by Weight	Top 15 Ports by Exvessel Revenue
1	NEAH BAY	NEAH BAY
2	NEWPORT	NEWPORT
3	PORT ANGELES	PORT ANGELES
4	TAHOLAH	BELLINGHAM BAY
5	BELLINGHAM BAY	TAHOLAH
6	LAPUSH	LAPUSH
7	ASTORIA	ASTORIA
8	WESTPORT	WESTPORT
9	CHARLESTON (COOS BAY)	CHARLESTON (COOS BAY)
10	EVERETT	BLAINE
11	BLAINE	EVERETT
12	FLORENCE	FLORENCE
13	PORT ORFORD	GARIBALDI (TILLAMOOK)
14	GARIBALDI (TILLAMOOK)	CHINOOK
15	CHINOOK	PORT ORFORD

Source: PacFIN ftl table. August 2004

<u>California Halibut</u>

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. Federal regulations allow fishing with 4.5-inch minimum mesh size trawl in federal waters, but California regulations prohibit trawling within state waters, except in the designated “California halibut trawl grounds,” where a 7.5-inch minimum mesh size must be used during open seasons. Historically, California commercial halibut fishers have preferred setnets because of these restrictions, and predominantly use 8.5-inch mesh and maximum length of 9,000. These nets take most of the landings (Table 3.3.3.24) 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). Overall, the ports with highest California halibut landings occur in central and southern California (Table 3.3.3.25).

Table 3.3.3.24. California Halibut Landings and Exvessel Revenue by Year and Gear (LBS and USD)

		YEAR			
Gear Group	Data type	2000	2001	2002	2003
Hook and Line	Landed weight (lbs)	118,519	124,241	166,307	208,887
	Exvessel revenue ($)	366,478	398,222	523,217	654,537
Misc.	Landed weight (lbs)	C	C	C	C
	Exvessel revenue ($)	C	C	C	C
Net	Landed weight (lbs)	380,105	319,235	255,720	181,439
	Exvessel revenue ($)	1,122,396	981,323	820,973	601,822
Pot	Landed weight (lbs)	463	170	1,501	592
	Exvessel revenue ($)	1,225	531	3,594	2,419
Troll	Landed weight (lbs)	9,163	10,382	8,259	13,735
	Exvessel revenue ($)	21,241	24,687	18,784	29,589
Trawl	Landed weight (lbs)	277,878	377,094	451,186	342,609
	Exvessel revenue ($)	728,537	1,076,334	1,276,334	912,487
Shrimp Trawl	Landed weight (lbs)	63,947	66,634	55,534	77,324
	Exvessel revenue ($)	214,903	226,478	203,011	326,085
Total Landed weight (lbs)		850,075	897,756	938,507	824,586
Total Exvessel revenue ($)		2,454,780	2,707,575	2,845,913	2,526,939

Source: PacFIN ftl table. August 2004:
Note: totals exclude confidential data

Table 3.3.3.25 Top 15 Ports for California Halibut Landings and Exvessel Revenue (2000–2003)

Rank	Top 15 Ports by Weight	Top 15 Ports by Exvessel Revenue
1	SAN FRANCISCO	SAN FRANCISCO
2	PRINCETON / HALF MOON BAY	VENTURA
3	VENTURA	PRINCETON / HALF MOON BAY
4	SANTA BARBARA	SANTA BARBARA
5	SAN PEDRO	TERMINAL ISLAND
6	TERMINAL ISLAND	SAN PEDRO
7	OXNARD	OXNARD
8	MOSS LANDING	PORT HUENEME
9	SANTA CRUZ	OCEANSIDE
10	AVILA	SANTA CRUZ
11	PORT HUENEME	AVILA
12	OCEANSIDE	MOSS LANDING
13	MONTEREY	SAN DIEGO
14	SAN DIEGO	MONTEREY
15	MORRO BAY	MORRO BAY

Source: PacFIN ftl table. August 2004

California Sheephead
Pot fishermen account for well over half of the total catch and revenues of Sheephead (Table 3.3.3.26), followed by hook and line gear. Nets and other gears take minimal amounts of Sheephead. The top 15 ports in California have a similar order of landed weight and revenue (Table 3.3.3.27)

Table 3.3.3.26 Landings and Exvessel Revenue of California Sheephead by State, Gear, and Year (LBS and USD)

			YEAR			
State	Gear	Data type	2000	2001	2002	2003
California	Hook and Line	Landed weight (lbs)	33,211	23,928	22,698	24,587
		Exvessel revenue ($)	93,186	73,996	66,304	82,449
	Other Gears	Landed weight (lbs)	1,506	1,268	1,199	2,677
		Exvessel revenue ($)	4,663	2,860	4,100	10,131
	Net	Landed weight (lbs)	3,067	3,097	1,432	474
		Exvessel revenue ($)	5,897	3,401	1,388	1,317
	Pot	Landed weight (lbs)	136,161	121,941	95,719	79,618
		Exvessel revenue ($)	490,773	437,409	339,741	292,673
Total Landed weight (lbs)			173,945	150,234	121,048	107,356
Total Exvessel revenue ($)			594,519	517,666	411,532	386,570

Source: PacFIN ftl table. August 2004

Table. 3.3.3.27 Ports for Sheephead Landings and Exvessel Revenue (2000–2003)

Rank	Top 15 Ports by Weight	Top 15 Ports by Exvessel Revenue
1	OXNARD	OXNARD
2	SAN DIEGO	SAN DIEGO
3	SANTA BARBARA	TERMINAL ISLAND
4	TERMINAL ISLAND	SANTA BARBARA
5	NEWPORT BEACH	NEWPORT BEACH
6	VENTURA	MISSION BAY
7	MISSION BAY	VENTURA
8	OCEANSIDE	OCEANSIDE
9	DANA POINT	DANA POINT
10	SAN PEDRO	SAN PEDRO
11	POINT LOMA	POINT LOMA
12	LONG BEACH	LONG BEACH
13	MORRO BAY	PLAYA DEL REY
14	PLAYA DEL REY	REDONDO BEACH
15	REDONDO BEACH	MORRO BAY

Source: PacFIN ftl table. August 2004

Coastal Pelagic Species
The CPS fisheries are concentrated in California (Table 3.3.3.28), but CPS fishing also occurs in Washington and Oregon. Vessels using round haul gear (purse seines and lampara nets) account for 99% of total CPS landings and revenues per year (Table 3.3.3.29). In Washington, the Emerging Commercial Fishery regulations provides for the sardine fishery as a trial commercial fishery. The trial fishery targets sardines, but also lands anchovy, mackerel, and squid. Regulations limit the fishery to vessels using purse seine gear; prohibits fishing inside of three miles, and requires logbooks. 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. Oregon manages the sardine fishery 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 Southern California round haul fleet is the most important sector of the CPS fishery in terms of landings, and most of the highest production ports occur in this area (Table 3.3.3.30). 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 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 35E40' N latitude) and two-thirds is allocated to Southern California (south of 35E40' N latitude). An OA CPS fishery is in place north of 39˚N latitude and a LE 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).

Table 3.3.3.28 CPS Landings and Exvessel Revenue by Area, State, and Year (LBS and USD)

			YEAR			
Area	State	Data type	2000	2001	2002	2003
Coastal Management Areas	CA	Landed weight (lbs)	465,666,430	376,633,573	316,754,663	182,994,919
		Exvessel revenue ($)	40,179,911	29,373,729	27,852,840	29,261,203
	OR	Landed weight (lbs)	21,629,154	29,337,380	50,396,664	56,500,887
		Exvessel revenue ($)	1,173,218	1,726,387	2,835,693	3,016,660
	WA	Landed weight (lbs)	10,937,156	25,573,818	35,995,417	26,872,582
		Exvessel revenue ($)	716,632	1,394,002	2,044,254	1,546,569
Other Management Areas	OR	Landed weight (lbs)	C	C	C	C
		Exvessel revenue ($)	C	C	C	C
	WA	Landed weight (lbs)	530,364	813,484	1,196,872	1,070,620
		Exvessel revenue ($)	208,419	297,702	529,434	510,373
Total Landed weight (lbs)			498,763,104	432,358,255	404,343,616	267,439,00
Total Exvessel revenue ($)			42,278,180	32,791,820	33,262,222	34,334,805

Source: PacFIN ftl table. August 2004
Note: C represents data restricted due to confidentiality
Totals do not include confidential data
"Other management areas" includes inside waters such as Puget Sound and Columbia River

Table 3.3.3.29 CPS Landings and Exvessel Revenue by Year and Gear(LBS and USD)

		YEAR			
Gear Group	Data type	2000	2001	2002	2003
Hook and Line	Landed weight (lbs)	447,269	132,292	46,697	135,851
	Exvessel revenue ($)	64,810	63,396	30,017	53,557
Misc	Landed weight (lbs)	238,310	53,720	90,661	141,291
	Exvessel revenue ($)	82,093	390,882	621,647	463,864
Net	Landed weight (lbs)	496,714,839	430,478,604	404,186,770	266,878,952
	Exvessel revenue ($)	42,035,766	32,142,853	32,605,922	33,761,365
Pot	Landed weight (lbs)	100,375	1,240	347	57,592
	Exvessel revenue ($)	10,194	398	126	15,534
Troll	Landed weight (lbs)	645,533	307,434	558	43,777
	Exvessel revenue ($)	57,140	11,811	666	15,701
Trawl	Landed weight (lbs)	626,541	1,384,594	21,999	181,009
	Exvessel revenue ($)	28,150	182,129	2,734	24,105
Shrimp Trawl	Landed weight (lbs)	1,086	371	1,255	536
	Exvessel revenue ($)	569	351	1,577	678
Total Landed weight (lbs)		498,773,953	432,358,255	404,348,287	267,439,008
Total Exvessel revenue ($)		42,278,722	32,791,820	33,262,689	34,334,805

Source: PacFIN ftl table. August 2004

Table. 3.3.3.30 Top 15 Ports for CPS Landings and Exvessel Revenue (2000–2003)

Rank	Top 15 Ports by Weight	Top 15 Ports by Exvessel Revenue
1	SAN PEDRO	SAN PEDRO
2	PORT HUENEME	PORT HUENEME
3	TERMINAL ISLAND	MOSS LANDING
4	MOSS LANDING	TERMINAL ISLAND
5	ASTORIA	VENTURA
6	VENTURA	ASTORIA
7	ILWACO	SAN FRANCISCO
8	MONTEREY	MONTEREY
9	SAN FRANCISCO	ILWACO
10	WESTPORT	SAUSALITO
11	SAUSALITO	PRINCETON / HALF MOON BAY
12	PRINCETON / HALF MOON BAY	WESTPORT
13	SANTA BARBARA	TACOMA
14	LONG BEACH	MARSHALL
15	MARSHALL	SANTA BARBARA

Source: PacFIN ftl table. August 2004

Sea Cucumber

California implemented a permit program for sea cucumber in 1992. In 1997 the state established separate, LE permits for the dive and trawl sectors. Permit rules encourage permit transfer to the dive sector which has lead to growth in this sector. The dive sector currently accounts for 80% of landings. There are currently 113 sea cucumber dive permits and 36 sea cucumber trawl permits. 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. California fishers account for the majority of sea cucumbers by weight and value, followed by Washington fishers (Table 3.3.3.31); Oregon has too few participants for public release of data.

Sea cucumbers are managed by the states. Along the West Coast, sea cucumbers are harvested by diving or trawling (Table 3.3.3.32). Only the trawl fishery for sea cucumbers lands an incidental catch of groundfish. 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.

The top ports for landed weight and ex-vessel revenue occur roughly equally in California and Washington (Table 3.3.3.33).

Sea cucumber fisheries have expanded worldwide. On the West Coast, a dive fishery for warty sea cucumbers occurs in Baja California, Mexico, and dive fisheries for California sea cucumbers occur 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.

Table 3.3.3.31 Sea Cucumber Landings and Exvessel Revenue by Area, State, and Year (LBS and USD)

			YEAR			
Area	State	Data type	2000	2001	2002	2003
Coastal Management Areas	CA	Landed weight (lbs)	643,310	717,695	946,810	758,569
		Exvessel revenue ($)	606,578	584,970	801,276	687,854
	OR	Landed weight (lbs)	C	C	C	C
		Exvessel revenue ($)	C	C	C	C
Other Management Areas	WA	Landed weight (lbs)	605,755	661,657	549,127	438,707
		Exvessel revenue ($)	836,720	903,570	598,820	560,533
Total Landed weight (lbs)			1,249,065	1,379,352	1,495,937	1,197,276
Total Exvessel revenue ($)			1,443,297	1,488,540	1,400,096	1,248,387

Source: PacFIN ftl table. August 2004
Note: C represents data restricted due to confidentiality
“Other management areas” includes inside waters such as Puget Sound and Columbia River

Table 3.3.3.32 Sea Cucumber Landings and Exvessel Revenue by Year and Gear (LBS and USD)

		YEAR			
Gear aggregation	Data type	2000	2001	2002	2003
Misc. (including dive gear)	Landed weight (lbs)	574,689	465,804	660,598	466,855
	Exvessel revenue ($)	558,029	419,318	610,742	475,262
Other Gears	Landed weight (lbs)	674,667	913,583	835,339	731,109
	Exvessel revenue ($)	885,777	1,069,291	789,354	774,084
Total Landed weight (lbs)		1,249,065	1,379,352	1,495,937	1,197,276
Total Exvessel revenue ($)		1,443,297	1,488,540	1,400,096	1,248,387

Source: PacFIN ftl table. August 2004
Note: C represents data restricted due to confidentiality
“Other management areas” includes inside waters such as Puget Sound and Columbia River
totals are equivalent to previous table to protect confidentiality

Table 3.3.3.33 Top 15 Ports for Sea Cucumber Landings and Exvessel Revenue (2000–2003)

Rank	Top 15 Ports by Weight	Top 15 Ports by Exvessel Revenue
1	OXNARD	OXNARD
2	SANTA BARBARA	BLAINE
3	BLAINE	ANACORTES
4	ANACORTES	SANTA BARBARA
5	TERMINAL ISLAND	TERMINAL ISLAND
6	POULSBO	BELLINGHAM BAY
7	BELLINGHAM BAY	POULSBO
8	SEATTLE	SEATTLE
9	TACOMA	TACOMA
10	VENTURA	LACONNER
11	LACONNER	VENTURA
12	PUGET ISLAND	PUGET ISLAND
13	FRIDAY HARBOR	FRIDAY HARBOR
14	SAN PEDRO	SAN PEDRO
15	MISSION BAY	PORT TOWNSEND

Source: PacFIN ftl table. August 2004

Spot Prawn

Spot prawn which are managed by the states have historically been targeted with both trawl and pot gear (Table 3.3.3.34). For the purposes of managing incidentally-caught groundfish, the trawl fishery has been categorized as non-groundfish trawl in the OA sector of the groundfish fishery. However, the landing of spot prawn taken with trawl gear is currently prohibited in all three states. Washington State prohibited the use of trawl nets for harvesting spot prawns after 2003. On February 18, 2003, the California Fish and Game Commission adopted regulations prohibiting the use of trawl nets to take spot prawn. The regulations went into effect on April 1, 2003. Oregon prohibited the use of trawl nets for harvesting spot prawns after 2003. Before 2003, California had the largest and oldest trawl fishery with about 54 vessels operating from Bodega Bay south to the U.S./Mexico border.

The trap fishery began in 1985 with a live prawn segment. The fleet operates from Monterey Bay, where six boats are based, to Southern California, where a 30 to 40 boat fleet results in higher production. Fishers in both fishing areas set traps 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 LE 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. California has the top 15 ports for landed weight and ex-vessel revenue (Table 3.3.3.35). (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.)

Table 3.3.3.34 Spot Prawn Landings and Exvessel Revenue by Year and Gear in California (LBS and USD)

		Year			
Gear	Data type	2000	2001	2002	2003
Pot	Landed weight (lbs)	180,339	218,813	175,497	159,168
	Exvessel revenue ($)	1,646,474	1,993,004	1,607,681	1,505,684
Trawl (all trawl types)	Landed weight (lbs)	266,682	203,346	218,067	6,841
	Exvessel revenue ($)	2,188,968	1,709,452	1,759,197	61,364
Total Landed weight (lbs)		447,021	422,159	393,564	166,009
Total Exvessel Revenue ($)		3,835,442	3,702,456	3,366,877	1,567,049

Source: PacFIN ftl table. August 2004

Note: Spot prawn landings do not show up specifically in landed catch data for WA and OR

Table 3.3.3.35 Top 15 Ports for Spot Prawn Landings and Exvessel Revenue in California (2000–2003)

Rank	Top 15 Ports by Weight	Top 15 Ports by Exvessel Revenue
1	MORRO BAY	MORRO BAY
2	MONTEREY	MONTEREY
3	OXNARD	OXNARD
4	VENTURA	VENTURA
5	DANA POINT	DANA POINT
6	TERMINAL ISLAND	TERMINAL ISLAND
7	SANTA BARBARA	OCEANSIDE
8	OCEANSIDE	SANTA BARBARA
9	SAN DIEGO	MOSS LANDING
10	RICHMOND	SAN DIEGO
11	MOSS LANDING	RICHMOND
12	SAN FRANCISCO	SAN FRANCISCO
13	FORT BRAGG	FORT BRAGG
14	BODEGA BAY	BODEGA BAY
15	HUNTINGTON BEACH	MISSION BAY

Source: PacFIN ftl table. August 2004

Buyers and Processors

Excluding Pacific whiting delivered to at-sea processors, vessels participating in Pacific groundfish fisheries deliver to shore-based processors within Washington, Oregon, and California. Buyers are located along the entire coast; however, processing capacity has been consolidating in recent years. Several companies have left the West Coast or have chosen to quit the business entirely, have been consoloidated or are inactive. This has led to trucking groundfish from certain ports to another community for processing. Therefore, landings do not necessarily indicate processing activity in those communities. However, examination of the species composition of landed catch by state can lead to inferences of some processor characteristics.

According to PacFIN data, in 2002 Oregon had the largest amount of groundfish landings (56%), followed by Washington (28%), and California (16%). In contrast, Oregon has the largest amount of exvessel revenue (40%), followed by California (32%) and Washington (22%), respectively. Oregon accounts for the majority of Pacific whiting landings, which creates a large difference between the percentage of landed catch and exvessel revenue because Pacific whiting has a relatively low price per pound. The relatively high amount of Pacific whiting being landed in Oregon may create a case where many processors must generate capacity to handle large quantities at a time. Groundfish processors in Washington may receive landings from Alaska fisheries. Depending on the amount of catch Washington processors can draw from Alaska fisheries, some groundfish processors may require the capacity to process large amounts of product. California processors concentrating on West Coast fisheries may focus on relatively smaller throughput of 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) also occurs offshore on factory ships. Several thousand entities have permits to buy fish on the West Coast (Table 3.3.3.36). 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 (PFMC 2004).[1]

According to PacFIN data, the number of unique companies buying groundfish along the West Coast has

[1]/ A "buyer" was defined here by a unique combination of 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.

declined in recent years. This trend coincides with recent regulatory restrictions and diminished landings of higher valued species such as rockfish. The number of buyers purchasing other species such as crab and salmon has been stable or increasing in recent years.

Table 3.3.3.36 Count of Fish Buyers by Year, Species Type, and State (not unique records)

		Year			
State	Species Group	2000	2001	2002	2003
CA	Coastal Pelagic	174	126	118	112
	All Crab	298	306	291	351
	Groundfish	412	385	324	310
	HMS	233	241	222	199
	Other species	558	515	510	505
	All Salmon	277	225	269	273
	All Shell fish	6	10	2	2
	All Shrimp & Prawns	154	126	129	107
OR	Coastal Pelagic	14	15	16	16
	All Crab	67	77	81	83
	Groundfish	84	74	79	81
	HMS	96	112	125	138
	Other species	90	91	103	94
	All Salmon	104	134	143	150
	All Shell fish	19	14	46	27
	All Shrimp & Prawns	36	36	30	26
WA	Coastal Pelagic	12	17	16	15
	All Crab	125	125	158	168
	Groundfish	43	42	40	45
	HMS	37	39	55	53
	Other species	109	102	98	106
	All Salmon	189	218	219	213
	All Shell fish	167	178	177	171
	All Shrimp & Prawns	75	72	72	80

Source: PacFIN ftl and ft tables. July 2004
Note: records are not unique buyers and should not be summed

Fishing Communities

Fishing communities, as defined in the MSA, include not only the people who catch the fish, but also those who share a common dependency on directly related fisheries-dependent services and industries. Commercial fishing communities 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 makes 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. 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. Although unique, communities share many similarities. For example, all face danger, safety issues, dwindling resources, and a multitude of state and federal regulations. Individuals in unique communities have 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 U.S. communities with an interest in the groundfish fisheries are also considered. In spite of a variety of ethnic backgrounds, fishers in many areas come together to form fishing communities, drawn together by their common interests in economic and physical survival in an uncertain and changing ocean and regulatory environment. The top 15 ports for OA groundfish and revenue are found in Table 3.3.3.37.

Table 3.3.3.37 Top Ports for Open Access Groundfish Landings and Revenue (2000 - 2003)

Rank	Top 15 Ports for Landed Revenue	Top 15 Ports for Landed Weight
1	Morro Bay	Moss Landing
2	Port Orford	Neah Bay
3	Moss Landing	Fort Bragg
4	Fort Bragg	Port Orford
5	Gold Beach	Port Angeles
6	Avila	Morro Bay
7	Santa Barbara	Gold Beach
8	Port Angeles	Westport
9	Crescent City	Eureka
10	Neah Bay	Crescent City
11	San Francisco	Astoria
12	Monterey	San Francisco
13	Astoria	Avila
14	Eureka	Charleston (Coos Bay)
15	Westport	Brookings

Source: PacFIN VSMRFD files. July 2004

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 can be found in the The Pacific Coast Groundfish Fishery Management Plan, EFH Designation and Minimization of Adverse Impacts, Draft EIS, prepared in February 2005.

<u>Enforcement</u>
Scarce state and federal resources also limit the use of traditional enforcement methods. Traditional fishery monitoring techniques include air and surface craft surveillance, declaration requirements, landing inspections, and analysis of catch records and logbooks. Current assets for patrolling offshore areas include helicopter and fixed wing aircraft deployed by the U.S. Coast Guard and state enforcement entities, 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 offshore closed areas. The availability of Coast Guard assets may be challenged by other missions such as Homeland Security and search and rescue.

Shoreside enforcement activities complement at-sea monitoring and declaration requirements by inspecting recreational and commercial vessels for compliance with landing limits, gear restrictions, and seasonal fishery closures. State agencies are increasingly using dockside sampling as a means of assessing groundfish catch in recreational fisheries, which when combined with state and federal enforcement patrols at boat launches and marinas, provides a means of ensuring compliance with bag limits and fishery closures. Commercial landings are routinely investigated upon landing or delivering to buying stations or processing plants and can be tracked through fish ticket and logbook records.

4.0 IMPACTS OF THE ALTERNATIVES

The terms "effect" and "impact" are used synonymously under NEPA. Impacts includes ecological, aesthetic, historic, cultural, economic, social, or health, whether direct, indirect, or cumulative. Direct effects are caused by the action itself and occur at the same time and place. Indirect effects are caused by the action and are later in time or farther removed in distance, but are still reasonably foreseeable. Indirect effects may include growth-inducing effects and other effects related to induced changes in the pattern of land use, population density or growth rate, and related effects on air and water and other natural systems, including ecosystems. Cumulative impacts are those impacts on the environment that result from the incremental impact 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.

Sections 4.1 through 4.3 of this document discusses the direct and indirect impacts on the physical, biological, and socio-economic environment that are likely to occur under each of the proposed alternatives, including the status quo alternative. Section 4.4 presents the reasonably foreseeable cumulative effects of the environment from the proposed alternatives.

4.1 Physical Impacts

PHYSICAL ENVIRONMENT - COMPARISON OF THE ALTERNATIVES	
PHYSICAL STRUCTURE	Changes to the physical environment as a result of VMS regulations
<u>Alternative 1</u> Status quo	<u>Direct impact</u> No direct impacts beyond what has been considered in previous NEPA documents. <u>Indirect impact</u> Little data available to assess OA fishing location and intensity.
<u>Alternative 2</u> Vessels using longline gear	<u>Direct impact</u> Data from approximately vessels 322 vessels that use longline gear to take and retain, possess or land OA groundfish (282 directed groundfish, 38 Pacific halibut, and 2 CA halibut) could be used to maintain the integrity of habitat protection areas. Unforeseen effects from longline gear on the physical environment resulting from illegal fishing in the habitat protection areas will likely be reduced as a result of the deterrent effect. Longline gear primarily affects benthic environment when it slides on the bottom during setting and retrieval. <u>Indirect impact</u> VMS data from approximately 322 vessels using longline gear can be combined with data on fishing gear impacts and habitat to better understand how effort shifts affect the physical environment.
Alternative 3 Vessels using longline or pot gear	In **addition** to impacts identified for the 322 vessels under Alt. 2 <u>Direct impact</u> Data from approximately 193 vessels that use pot gear to take and retain, possess or land OA groundfish (145 directed groundfish, 21 Dungeness crab, 6 prawn, and 21 CA sheephead) could be used to maintain the integrity of habitat protection areas. Unforeseen effects from pot gear on the physical environment resulting from illegal fishing in the habitat protection areas will likely be reduced as a result of the deterrent effect. Pots affect benthic habitat where individual pots contact seabed and when gear is dragged along the bottom during retrieval. <u>Indirect impact</u> VMS position data from approximately 193 vessels using pot gear can be combined with data on fishing gear impacts and habitat to better understand how pot vessel effort shifts affect the physical environment.
<u>Alternative 4A</u> Vessels using longline, pot or trawl gear, except: pink shrimp trawl	In **addition** to impacts identified the 515 vessels under Alt. 2 and 3 <u>Direct impact</u> Data from approximately 77 vessels using nongroundfish trawl gear, excluding pink shrimp trawl, (23 ridgeback prawn, 14 sea cucumber, and 40 CA halibut vessels) could be used to maintain the integrity of habitat protection areas. Unforeseen effects from trawl gear on the physical environment resulting from illegal fishing in the habitat protection areas will likely be reduced as a result of the deterrent effect. Deterring illegal trawling in habitat protection areas is most important because trawl gear is believed to have a greater negative effect on benthic organisms and structure than other OA fishing gears. Includes approximately 59% of the OA nongroundfish trawl vessels that currently do not have VMS requirements. <u>Indirect impact</u> VMS position data from approximately 77 vessels using trawl gear can be combined with data on fishing gear impacts and habitat to better understand how trawl gear effort shifts affect the physical environment. Understanding where 59% of the nongroundfish bottom trawl vessel's effort is distributed is most important because trawl gear is believed to have greater impact on physical habitat than OA fixed gears.

PHYSICAL ENVIRONMENT - Continued	
PHYSICAL STRUCTURE	Changes to the physical environment as a result of VMS regulations
Alternative 4B Vessels using longline, pot or trawl gear	In **addition** to impacts identified for the 515 vessels under Alt. 2 and 3 Direct impact Data from approximately 131 vessels using nongroundfish trawl gear, including pink shrimp trawl (54 pink shrimp vessels. 23 ridgeback prawn, 14 sea cucumber, and 40 CA halibut vessels) could be used to maintain the integrity of habitat protection areas. Proposed habitat protection areas are most restrictive to bottom trawl gears. Unforeseen effects from nongroundfish trawl gear on the physical environment resulting from illegal fishing in the habitat protection areas will likely be reduced as a result of the deterrent effect. Deterring illegal trawling in habitat protection areas is most important because trawl gear is believed to have a greater negative effect on benthic organisms and structure than other gears used in the OA fisheries. All OA nongroundfish trawl vessels that do not currently have VMS requirements would be included. Indirect impact VMS position data from approximately 131 vessels (100% of the OA nongroundfish trawl vessels) using trawl gear can be combined with data on fishing gear impacts and habitat to better understand effort shifts and potential effects on the physical environment. Understanding where nongroundfish bottom trawl effort is distributed is important because trawl gear is believed to have a greater impact on physical habitat than other OA fishing gears.
Alternative 5A Vessels using longline, pot, trawl or line gear, except: pink shrimp trawl and salmon troll	In **addition** to impacts identified for the 592 vessels under Alt. 2, 3 and 4A Direct impact Data from approximately 658 vessels using line gear (590 groundfish directed, 58 CA halibut, and 10 HMS vessels) could be used to maintain the integrity of habitat protection areas. Unforeseen effects from line gear on the physical environment resulting from illegal fishing in the habitat protection areas will likely be reduced as a result of the deterrent effect. Of the OA gears, line gear is believed to have the least contact with the seabed and bottom dwelling organisms, and therefore the lowest risk to benthic habitat if incursions into habitat protection areas occur. Indirect impact VMS position data from approximately 658 vessels using line gear can be combined with data on fishing gear impacts and habitat to better understand effort shifts and the potential effects on the physical environment.
Alternative 5B Vessels using longline, pot, trawl or line gear, except: pink shrimp trawl, HMS longline and line, and Dungeness crab pot gear	Direct impact Data from approximately 1,453 vessels: 322 vessels using longline gear (282 directed groundfish, 38 Pacific halibut, and 2 CA halibut); 172 vessels using pot gear (145 directed groundfish, 6 prawn, and 21 CA sheephead); 77 vessels using nongroundfish trawl gear (23 ridgeback prawn, 14 sea cucumber, and 40 CA halibut vessels), and 882 vessels using line gear (590 groundfish directed, 58 CA halibut, 10 HMS vessels, and 234 salmon troll vessels) could be used to maintain the integrity of habitat protection areas. Unforeseen effects from longline, pot, line, and nongroundfish trawl gear (excluding pink shrimp trawl) on the physical environment resulting from illegal fishing in the habitat protection areas will likely be reduced as a result of the deterrent effect. Proposed habitat protection areas are most restrictive to bottom trawl gear. Without pink shrimp, approximately 59% of the nongroundfish OA trawl fleet would have VMS. Indirect impact VMS position data from 1,453 longline, pot, nongroundfish trawl, and line gear vessels can be combined with data on fishing gear impacts and habitat to better understand effort shifts and the potential effects on the physical environment.

PHYSICAL ENVIRONMENT - Continued	
PHYSICAL STRUCTURE	Changes to the physical environment as a result of VMS regulations
Alternative 6A Vessels with RCA restrictions; except pink shrimp trawl	Direct impact Data from approximately 1,583 vessels: 349 vessels using longline gear (282 directed groundfish, 65 Pacific halibut, and 2 CA halibut); 193 vessels using pot gear (145 directed groundfish, 6 prawn, 21 Dungeness crab and 21 CA sheephead); 77 vessels using nongroundfish trawl gear (23 ridgeback prawn, 14 sea cucumber, and 40 CA halibut vessels), 882 vessels using line gear (590 groundfish directed, 58 CA halibut, 10 HMS vessels, and 234 salmon troll vessels); and 72 vessels using net gear (25 HMS and 47 CA halibut) could be used to maintain the integrity of habitat protection areas. Unforeseen effects from longline, pot, line, and nongroundfish trawl gear (excluding pink shrimp trawl) on the physical environment resulting from illegal fishing in the habitat protection areas will likely be reduced as a result of the deterrent effect. Proposed habitat protection areas are most restrictive to bottom trawl gear. Without pink shrimp, approximately 59% of the nongroundfish OA trawl fleet would have VMS. Indirect impact VMS position data from approximately 1,583 longline, pot, nongroundfish trawl, and line gear vessels can be combined with data on fishing gear impacts and habitat to better understand effort shifts and the potential effects on the physical environment.
Alternative 6B Vessels with RCA restrictions: except salmon troll north that retain only yellowtail rockfish and pink shrimp trawl	Direct impact Essentially the same as Alt. 6A except that data that could be used to maintain the integrity of areas closed to protect habitat from fishing gear impacts is not available for 176 salmon troll vessels that retain only yellowtail rockfish north of 40°10' N. lat. Total of 1,525 vessels. Indirect impact Essentially the same as Alt. 6A except that position data from 176 salmon troll vessels that retain only yellowtail rockfish north of 40°10' N. lat. would not be available.
Alternative 7 Vessel >12 ft with RCA restriction; except, pink shrimp trawl	Direct impact Essentially the same as 6A except that data from approximately 22 vessels (6 longline, 2 pot, and 14 line gear vessels) would not be available. Total of 1,561 vessels. Indirect impact Essentially the same as 6A except that data from approximately 22 vessels would not be available. However, it is likely that none of these small vessels fish seaward of 3 miles.
Alternative 8 Excludes all low impact OA fisheries, those where the incidental catch of overfished species is projected to be minimal	Direct impact Data from 1,463 vessels: 349 vessels using longline gear (282 directed groundfish, 65 Pacific halibut, and 2 CA halibut); 145 vessels using directed groundfish pot gear; 40 vessels using CA halibut trawl gear, and; 882 vessels using line gear (590 groundfish directed, 58 CA halibut, and 234 salmon troll vessels) could be used to maintain the integrity of habitat protection areas. Unforeseen effects from longline, pot, line, and CA halibut nongroundfish trawl gear on the physical environment resulting from illegal fishing in the habitat protection areas will likely be reduced as a result of the deterrent effect. Proposed habitat protection areas are most restrictive to bottom trawl gear. Approximately 31% of the OA nongroundfish trawl fleet would have VMS. Indirect impact VMS position data from approximately 1,463 vessels can be combined with data on fishing gear impacts and habitat to better understand effort shifts and the potential effects on the physical environment. This alt. provides trawl data for only 31% of the OA non groundfish trawl fleet. Understanding where nongroundfish bottom trawl effort is distributed is important because trawl gear is believed to have a greater impact on physical habitat than other OA fishing gears.

PHYSICAL ENVIRONMENT - Continued	
PHYSICAL STRUCTURE	Changes to the physical environment as a result of VMS regulations
Alternative 9 Directed OA vessels - those that land more than 500 lb of groundfish in a calendar year.	Direct impact Data from 1,123 vessels: 349 vessels using longline gear (282 directed groundfish, 65 Pacific halibut, and 2 CA halibut); 150 vessels using pot gear (145 groundfish directed, 1 Dungeness crab,2 prawn and 2 sheephead); 9 vessels using CA halibut and 3 vessels using pink shrimp trawl gear, 15 vessels using CA halibut net gear, and; 597 vessels using line gear (590 groundfish directed, 1 HMS and 6 salmon troll vessels) could be used to maintain the integrity of habitat protection areas. Unforeseen effects from longline, pot, line, and nongroundfish trawl gear on the physical environment resulting from illegal fishing in the habitat protection areas will likely be reduced as a result of the deterrent effect. Proposed habitat protection areas are most restrictive to bottom trawl gear. Approximately 7% of the OA nongroundfish trawl fleet would have VMS. Indirect impact Provides VMS position data from approximately 1,123 longline, pot, nongroundfish trawl, and line gear vessels that can be combined with data on fishing gear impacts and habitat to better understand effort shifts and the potential effects on the physical environment. This alternative provides trawl data for only 7% of the OA non groundfish trawl fleet. Understanding where nongroundfish bottom trawl effort is distributed is important because trawl gear is believed to have a greater impact on physical habitat than other OA fishing gears.
Alternative 10 No Action, No VMS requirements. Discontinue the use of RCA management and adust trip limits and seasons accordingly.	Direct impact No direct impacts beyond what has been considered in previous NEPA documents for status quo. Indirect impact Little data available to assess OA fishing location and intensity.
Each of the alternatives identifies and estimated number of vessels that are likely to be affected by the VMS requirement. These values are based on the average level of participation from 2000 to 2004, except for pink shrimp trawl which was based on 2003-2004. It is important to point out that these values may not be the actual number of vessels that would continue to use a particular gear type if VMS requirements were adopted.	

4.1.1 Physical structure

The proposed action pertains to a VMS monitoring program that provides vessel position information for monitoring fishing locations in relation to time/area closures. The fleet coverage level, that portion of the overall OA fishing fleet that would be required to have VMS and provide declaration reports, is the primary difference between the proposed alternatives. Each of the alternatives defines the portion of the OA fleet, that would be required to carry and use VMS transceivers and provide gear declaration reports. Alternative 10 is the only alternative that goes beyond VMS coverage by discontinuing the non-trawl and trawl RCA requirements for the OA fisheries.

Direct effects on the physical environment result from changes to the structure of the benthic environment as a result of fishing practices. Direct effects on the physical environment from VMS could occur if, as a result of the position information being collected, changes to the physical environment from OA groundfish fishing either increased of decreased. VMS data could be used to maintain the integrity of habitat protection areas designed to protect the physical environment from fishing gear impacts and would therefore provide a positive benefit.

In June 2005, the Council reviewed the Pacific Coast Groundfish, Essential Fish Habitat Designation and Minimization of Adverse Impacts, Draft EIS (EFH EIS). In response to the EFH EIS, the Council recommended that NMFS implement specific habitat protection measures under Amendment 19 to the FMP. Measures to protect benthic habitat included: 1) Prohibit dredge, beam trawl, and bottom trawl gear with footrope diameter greater than 19" throughout the EEZ; 2) prohibit bottom trawl fishing within the EEZ seaward of 700 fathoms; 3) prohibit bottom trawl with footrope greater than 8" shoreward of 100 fathoms; 4) close specified areas to bottom trawl (Scottish seine gear would be exempt); 5) close specified areas to any type of bottom contact gear, and; 6) Close specified areas to all fishing. The Council's recommended action affects groundfish LE bottom trawl vessels that are already required to have VMS, as well as vessels using nongroundfish trawl gear that participate in the OA groundfish fishery and vessels using other OA gears that currently do not have VMS requirements.

The fishing gears used in the OA groundfish fishery each have different direct effects on the seabed or benthic environment. The amount of direct contact with the seabed, bottom structures, and benthic organisms varies widely between the different gears, as does the intensity of the contact. A brief summary of type of contact each OA gear makes with the seabed is presented in this EA. However, chapter 3, The Affected Environment, of the EFH EIS contains a full discussion of the fishing gears used by OA fishers, the effects of each gear on the seabed, and the organisms that are affected. The EFH EIS also describes the physical impacts on the environment under status quo management.

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 with weights or anchors at each end. The effect of a pot gear on the seabed is related to the weight and structure of the pot as well as to how far and fast the pot moves along the seabed while it is being retrieved. The gear, groundline, and weights or anchors can effect bottom organisms and structure if they are drug along the bottom before ascent (Rose et al.2002).

Longline 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). The anchors or weights, the hooks and the mainline on longline gear can produce effects on the seabed as they travel over the seabed during setting or retrieval. The key determinant of the effects of longlines on the seabed is how far the gear travels during setting and retreval. Significant travel distance is more likely during retrieval. If the hauling vessel is not directly 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 lines 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 of 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, resulting in disturbance to bottom organisms that are in the path of the groundline (Johnson 2002).

Trawling involves the towing of a funnel shaped net or nets behind a fishing vessel. Trawl gear may be fished on the bottom, near the bottom, or up in the water column to catch a large variety of species. The mouth of a trawl net is spread horizontally in the water column by using 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. The footrope or ground rope is directly attached to the lower leading edge of the mouth of the net. The head rope is the top of the mouth of the net (also called floatline). 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 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.

Variations in the composition and design of the components of a trawl net changes the influence and 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 the most 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. The bridles are cables that connect the trawl doors to the trawl net. The bridles may also be in contact with the seabed for a part of the towing distance. Footrope effects are related in part to the contact force and the area over which this force is distributed. The netting may also retain objects and organisms that are undercut or suspended off the seabed by the passage of the footrope.

The pink shrimp trawl fishery commonly uses a four seam net in a box trawl that does not have a hood. It is a high-rise trawl. Unlike other cod-ends, the cod-end of shrimp net is generally not constructed with riblines that run the length of the cod-end. 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 doors are rigged with short bridles to the net. 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 (31-46cm). That is, the footrope of shrimp nets is not designed to contact the bottom. Tickler chains or ladder chains, 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. Unless chain is used or supplementary weights are added, the bridles 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.

In the OA fishery, there is a variety of commercial line gears that use hooks and lines in various configurations. These include vertical hook and line, jigs, handline, rod and reel, vertical and horizontal setline, troll, cable gear and stick gear. Vertical 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. The vertical hook and line anchor has contact with the seabed. Handline and jig fisheries use vertical, weighted monofilament lines on which baited hooks are attached at intervals using wire spreaders or individual leaders are attached with swivels. The jig (weight) is periodically dropped to the seabed to determine depth. Albacore (an HMS species) jigs are fished on the surface of the water. Fishing poles rigged with monofilament line of various strengths and hooks of various sizes and designs are used. When fishing near the bottom or near reefs, the sinkers may come in contact with the substrate. 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. The weight contacts the seabed and can bounce along the bottom.

Troll gear is used to harvest salmon and groundfish. Trolling involves towing multiple lines with multiple hooks behind a vessel moving at speeds suited to the fish desired. Salmon troll uses steel lines (main lines), attached to the poles by a tag line, which are weighted with 20-65 pound (9-29 kg) lead weights called cannonballs. 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 targeted. Salmon are fished pelagically as well as close to the bottom. Most salmon troll gear never comes in contact with the seabed. 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. One type of troll gear used for groundfish 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. This gear is used primarily to target lingcod and is very selective. The iron and steel "dingle" bars can contact the seafloor. The hooks and line can snag on break hard corals, while leaving soft corals unaffected. During retrieval, invertebrates and other lightweight organisms can also be dislodged as well as rocks, corals, kelps and other objects.

Gillnets are flat, rectangular nets that hang vertically in the water from a buoyed cork line that is weighted with a lead line. The nets are made of a lightweight multifilament nylon or monofilament strands with mesh sized to select the specific catch. Gillnets can either be fished as a set or anchor net (setnet). 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 benthic effects of a set gillnet fishing operation occurs during the retrieval of the gear. During retrieval 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. A trammel net is a gillnet made with two or more walls joined to a common float line.

One of the major benefits of VMS is its deterrent effect. VMS is expected to have a beneficial deterrent effect (the reduction in illegal fishing in closed areas when fishing vessel operators know that they are being monitored) by reducing the likelihood of unforeseen effects on the physical environment resulting from unknown illegal fishing in area that are closed to protect habitat from fishing gear effects. It has been demonstrated that if fishing vessel operators know that they are being monitored and that a credible enforcement action will result from illegal activity, then the likelihood of that illegal activity occurring is significantly diminished. In this context, VMS is a preventive measure that may reduce potential violations.

Indirect impacts from fishery management actions include changes in fishing practices that affect the physical environment, but are further away in time or location than those occurring as a direct impact. Area management involves closing and sometimes opening areas formerly closed to specific OA fishing gear groups. When the size or location of closed areas change, the fishing fleet makes shifts in fishing effort. Understanding the nature of effort shifts, especially understanding where the effort shifts to (and the habitat types most common in these areas) and where the effort shifts from (and the habitat types most common in these areas), is critical to understanding how management actions will likely increase or decrease beneficial and adverse impacts to habitat.

VMS is expected to provide data that can be used in combination with data on fishing gear impacts and habitat to better understand effort shifts and the potential effects on the physical environment. Therefore, VMS provides an indirect benefit to the physical environment. The amount of information available for assessing the impacts of fishing effort on the physical environment varies under each of the alternatives. The indirect effects vary between the alternatives and depends on the proportion of the fleet that is required to carry VMS and provide declaration reports, as well as the potential impacts associated with a particular gear type.

Comparison of the Alternatives

Alternative 1, Status Quo, would continue the requirement for declaration reports from OA vessels using nongroundfish trawl gear in the RCAs. Under Alternative 1, OA fishery position data would only be available from vessels who voluntarily use VMS units and from vessels that fish pursuant to the OA regulations, but carry VMS because the vessel is registered to a LE permit. Section 3.3 of the EIS, for the Proposed Acceptable Biological Catch and Optimum Yield Specifications and Management Measures for the 2005-2006 Pacific Coast Groundfish Fishery, addressed the physical impacts on the environment under status quo management. In addition, EFH EIS describes the physical impacts on the environment under status quo management.

Alternative 2 maintains the declaration provisions of status quo, but adds the VMS and declaration reporting requirements for approximately 322 vessels (282 directed groundfish, 38 Pacific halibut, and 2 CA halibut) using longline gear to take and retain, possess or land groundfish. Of the alternatives that require VMS, Alternative 2 would require the smallest proportion of the OA fleet (only vessels using longline gear) to have and use VMS and therefore provide the least amount of data for monitoring vessel compliance with habitat protection areas or for assessing fishing effort and intensity relative habitat areas of concern. Longline gear primarily affects the benthic environment when it is slides on the bottom during setting and retrieval. Given the mobility of vessels within the fishery, directed longline vessels could choose to change gears to avoid the VMS requirements.

Approximately 515 vessels would be required to have VMS under Alternative 3. Alternative 3, includes the same vessels as Alternative 2, but adds the VMS and declaration reporting requirements for approximately 193 vessels (145 directed, 21 Dungeness crab, 6 prawn, and 21 CA sheephead) using pot gear to take and retain, possess or land groundfish. The addition of the pot gears to the VMS program under Alternative 3 will aid in maintaining the integrity of closed areas that are designed to protect the benthic environment from the longline and pot gear impacts. Pots affect benthic habitat where individual pots contact seabed and when gear is dragged along the bottom during retrieval. Similar to Alternative 2, under Alternative 3, some vessels may choose to fish with line gear to avoid the VMS requirements. Alternative 3 would provide more data than Alternative 2, however it would provide less data than Alternative 4A which would require VMS to be carried by 592 vessels.

Alternatives 4A and 4B add VMS coverage for nongroundfish trawl vessels to the pot and longline vessels identified under Alternative 3. The primary difference between Alternatives 4A and 4B is that Alternative 4A adds the VMS and declaration reporting requirement for approximately 77 vessels (23 ridgeback prawn, 14 sea cucumber and 40 California halibut vessels) using nongroundfish trawl gear. While Alternative 4B includes all of the nongroundfish trawl vessels identified under Alternative 4A plus 54 pink shrimp vessels. Many vessels that fish for pink shrimp are also registered to LE groundfish permits and therefore already have VMS requirements. Alternative 4B adds those pink shrimp vessels that are not also registered to LE groundfish permits. Approximately 646 vessels would be required to have and use VMS under Alternative 4B.

When reviewing the EFH EIS the Council made recommendations to NMFS that recognized the need to adopt measures to protect benthic habitat from fishing gear impacts, particularly from bottom trawl gear impacts that occur from both groundfish and nongroundfish bottom trawl gear. The need to monitor all bottom trawl vessels for compliance with VMS was also recognized by the Council. Alternative 4A and 4B would aid in maintaining the integrity of habitat protection areas in relation to longline, pot and trawl gear incursions. Deterring illegal trawling in habitat protection areas is most important because trawl gear is believed to have a greater negative effect on benthic organisms and structure than other OA fishing gears. Alternative 4A Includes approximately 59% of the OA nongroundfish trawl vessels that currently do not have VMS requirements while Alternative 4B includes all of the nongroundfish trawl vessels. The benefits of maintaining the integrity of the habitat protections areas where bottom trawling is prohibited is greatest under Alternative 4B.

Alternative 5A includes vessels using longline, pot, trawl or line gear, except: pink shrimp trawl and salmon troll. Therefore, Alternative 5A includes the same vessels as Alternative 4A, but adds the VMS and declaration reporting requirements for approximately 590 groundfish, 58 California halibut, and 10 HMS vessels using line gear. The total number of vessels required to have and use VMS under Alternative 5A is 1,250. Alternative 5B is based on the Enforcement Consultant's recommendations to the Council. This alternative is the same as 5A except that it excludes vessels in fisheries where incidental catch of overfished species was considered to be very low, but it does include salmon troll vessels. Alternative 5B includes approximately 1,453 vessels. Of the OA fishing gears, the line gears are projected to have the least contact with the benthic habitat and will therefore have fewer habitat area closures than bottom or pink shrimp trawl. Because Alternative 5A and 5B exclude the pink shrimp trawl vessels, the ability to maintain the integrity of habitat areas closed to bottom trawling is reduced over Alternative 4B.

Alternative 6A, applies to any vessel engaged in commercial fishing to which an RCA restriction applies. Data from approximately 1,583 vessels: 349 vessels using longline gear (282 directed groundfish, 65 Pacific halibut, and 2 CA halibut); 193 vessels using pot gear (145 directed groundfish, 6 prawn, 21 Dungeness crab and 21 CA sheephead); 77 vessels using nongroundfish trawl gear (23 ridgeback prawn, 14 sea cucumber, and 40 CA halibut vessels), 882 vessels using line gear (590 groundfish directed, 58 CA halibut, 10 HMS vessels, and 234 salmon troll vessels) and 72 vessels using net gear (25 HMS and 47 CA halibut) could be used to maintain the integrity of habitat protection areas. Alternative 6A affects the largest number of OA vessels and would therefore provide the largest amount of position data for monitoring incursions into habitat protection areas or for assessing fishing effort and intensity relative to habitat areas of concern. Because Alternative 6A excludes the pink shrimp trawl vessels, it only includes about 59% of the OA nongroundfish trawl vessels. Therefore, the ability to maintain the integrity of habitat areas closed to bottom trawling is reduced over Alternative 4B. The impacts on the physical environment resulting from Alternative 6B are essentially the same as Alternative 6A except that data that could be used to maintain the integrity of areas closed to protect habitat from fishing gear impacts would not be available for salmon troll vessels that retain only yellowtail rockfish north of 40°10' N. lat. Alternative 6B includes 176 salmon troll vessels as compared to 234 under Alternative 6A. Because salmon troll gear is believed to have minimal contact with the seabed, Alternative 6B provides only a slightly greater ability to maintain the integrity of habitat protection areas from salmon troll impacts. Impacts on the physical environment resulting from Alternative 7 are essentially the same as 6A except that data from approximately 22 vessels (6 longline, 2 pot, and 14 line gear vessels) would not be available. It is likely that none of these small vessels are fishing outside of 3 miles.

Alternative 8 excludes the low impact OA fisheries, those where the incidental catch of overfished species is projected to be minimal: Dungeness crab pot, spot prawn pot, sea cucumber trawl, ridgeback prawn trawl, HMS line, and California sheephead pot. Approximately 1,463 vessels are included under Alternative 8: 349 vessels using longline gear (282 directed groundfish, 65 Pacific halibut, and 2 CA halibut); 145 directed groundfish vessels using pot gear; 40 California halibut vessels using trawl gear, and; 882 vessels using line gear 590 groundfish directed, 58 California halibut, and 234 salmon troll vessels). Data from the sea cucumber, ridgeback prawn, and pink shrimp trawl vessels would not be included under Alternative 8. Proposed habitat protection areas are most restrictive to bottom trawl gear. Therefore, the ability to maintain the integrity of habitat protection areas from trawl fishing gear impacts associated with these vessels and to gather data that may be used to better understand effort shifts and the potential effects on the physical environment is reduced over Alternatives 4A-7. Under Alternative 8, approximately 31% of the OA nongroundfish trawl fleet would have VMS.

Because Alternative 9 excludes those vessels with minimal annual catch of groundfish, those that land less than 500 lb of groundfish in a calendar year, it includes fewer nongroundfish trawl vessels than Alternative 8. Under Alternative 9, data from 1,123 vessels could be used to maintain the integrity of habitat protection areas from longline, pot, trawl, line, net and other fishing gear impacts. Vessels included under Alternative 9 are: 349 vessels using longline gear (282 directed groundfish, 65 Pacific halibut, and 2 CA halibut); 150 vessels using pot gear (145 groundfish directed, 1 Dungeness crab, 2 prawn and 2 sheephead); 9 California halibut 3 pink shrimp vessels using trawl gear, 15 vessels using CA halibut net gear, and; 597 vessels using line gear 590 groundfish directed, 1 HMS and 6 salmon troll vessels). Unforeseen effects from longline, pot, line, and nongroundfish trawl gear on the physical environment resulting from illegal fishing in the habitat protection areas will likely be reduced as a result of the deterrent effect. However, only about 7% of the OA nongroundfish trawl fleet would have VMS under Alternative 9. Proposed habitat protection areas are most restrictive to bottom trawl gear. Therefore, the ability to maintain the integrity of habitat protection areas from trawl fishing gear impacts associated with these vessels and to gather data that may be used to better understand effort shifts and the potential effects on the physical environment is reduced over Alternatives 4A-7.

The projected impacts on habitat resulting from Alternative 10, are essentially the same as those identified under Alternative 1 except that secondary benefits to the physical habitat resulting from the existence of nontrawl and nongroundfish trawl RCAs for the OA fisheries may no longer exist. Although RCAs were not developed for habitat protection, but rather to reduce fishing effort in areas where overfished species were most abundant, there may have a secondary benefit, particularly in respect to the non-groundfish trawl RCAs.

4.2 Biological Impacts

BIOLOGICAL ENVIRONMENT - COMPARISON OF THE ALTERNATIVES	
TOTAL CATCH	Changes in groundfish mortality levels as a result of VMS regulations
Alternative 1 Status quo	Direct impacts A higher level of fishing mortality than those being used to estimate total catch, may affect the integrity of closed areas if incursions result in higher rates of overfished species catch than is projected. Indirect impacts Little specific information on OA fishing location data is available for understanding impacts of effort shifts on adult and juvenile groundfish populations, or for refining overfished species total catch estimates. Declaration reports may be used to estimate the number of vessels/trips in conservation areas by nongroundfish trawl vessels.
Alternative 2 Vessels using longline gear	Direct impacts Data from approximately 322 vessels (282 directed groundfish, 38 Pacific halibut, and 2 CA halibut) using longline gear to take and retain, possess or land OA groundfish can be used to maintain the integrity of RCAs. The risk of the actual catch exceeding the OYs for overfished species due to illegal fishing in the RCAs is reduced for directed groundfish and Pacific halibut longline vessels that take and retain, possess or land groundfish. Maintaining the integrity of the RCAs will reduce the risk of exceeding the yelloweye rockfish OY as a result of Pacific halibut vessel incursions into the RCAs. No change over Alt.1 for HMS longline vessels because pelagic longline is currently prohibited gear in the EEZ. Indirect impacts Fishing effort and location data from 322 longline vessels could improve the understanding of groundfish mortality. Data can be combined with observer, survey, and fish ticket data to better estimate: 1) total fishing mortality, 2) impacts on juveniles and other fishery resources related to changes in fishing locations and intensity, 3) fishing intensity (amount of time vessels are in an area), and 4) changes in fishing location and intensity over time.
Alternative 3 Vessels using longline or pot gear	In **addition** to the impacts from the 322 vessels identified under Alt. 2: Direct impacts Data from approximately 193 vessels (145 directed, 21 Dungeness crab, 6 prawn, and 21 CA sheephead) using pot gear to take and retain, possess or land OA groundfish can be used to maintain the integrity of RCAs. The risk of actual catch exceeding the OYs for overfished species is reduced for directed groundfish pot and prawn vessels. However, the risks of exceeding the OYs due to incursions by Dungeness crab, CA sheephead, and prawn pot vessels is relatively low Indirect impacts Fishing effort and location data from approximately 193 vessels could improve the understanding of groundfish mortality for pot vessels in the same ways as identified under Alt. 2 for longline vessels.
Alternative 4A Vessels using longline, pot or trawl gear, except: pink shrimp trawl	In **addition** to impacts from the 515 vessels identified under Alt. 2 & Alt. 3: Direct impacts Data from approximately 77 vessels (23 ridgeback prawn, 14 sea cucumber and 40 CA halibut vessels) using nongroundfish trawl gear can be used to maintain the integrity of RCAs. The risk of actual catch exceeding the OYs for overfished species is reduced for nongroundfish trawl vessels. Maintaining the integrity of the RCAs will reduce the risk of exceeding the bocaccio or canary rockfish OYs as a result of CA halibut vessel incursions into the RCAs. Indirect impacts Fishing effort and location data from approximately 77 vessels could improve the understanding of groundfish mortality for trawl vessels in the same ways as identified under Alt. 2 for longline vessels.

BIOLOGICAL ENVIRONMENT - COMPARISON OF THE ALTERNATIVES	
TOTAL CATCH	Changes in groundfish mortality levels as a result of VMS regulations
Alternative 4B Vessels using longline, pot or trawl gear	In **addition** to impacts from the 515 vessels identified under Alt. 2 & Alt. 3: Direct impacts Data from approximately 131 vessels (54 pink shrimp, 23 ridgeback prawn, 14 sea cucumber and 40 CA halibut vessels) using nongroundfish trawl gear can be used to maintain the integrity of RCAs. The risk of actual catch exceeding the OYs for overfished species is reduced for nongroundfish trawl vessels. Maintaining the integrity of the RCAs will reduce the risk of exceeding the bocaccio or canary rockfish OYs as a result of CA halibut vessel incursions into the RCAs. No change over Alt.4A, because pink shrimp vessels are not prohibited from fishing in the RCAs. Indirect impacts Fishing effort and location data from approximately 131 vessels could improve the understanding of groundfish mortality for trawl vessels in the same ways as identified under Alt. 2 for longline vessels.
Alternative 5A Vessels using longline, pot, trawl or line gear, except: pink shrimp trawl and salmon troll	In **addition** to impacts from the 592 vessels identified under Alt. 2, 3, and 4A: Direct impacts Data from approximately 658 vessels (590 groundfish directed, 58 CA halibut, and 10 HMS) using line gear that take and retain, possess or land OA groundfish can be used to maintain the integrity of RCAs. The risk of actual catch exceeding overfished species OYs is reduced for directed groundfish vessels. Maintaining the integrity of the RCAs will reduce the risk of exceeding the bocaccio or canary rockfish OYs as a result of CA halibut vessel incursions into the RCAs. No change over Alt. 1 for HMS line vessels because they are not projected to catch overfished species. The risk of exceeding the OYs for canary rockfish, lingcod, bocaccio, widow or yelloweye rockfish as the result of salmon troll vessels altering their gear to catch groundfish in the RCAs are greater than Alt. 5B. Indirect impacts Fishing effort and location data from approximately 658 line gear vessels that could improve the understanding of groundfish mortality for line vessels in the same ways as identified under Alt. 2 for longline vessels.
Alternative 5B Vessels using longline, pot, trawl or line gear, except: pink shrimp trawl, HMS longline and line, and Dungeness crab pot gear	Direct impacts Data from 1,453 vessels: 322 vessels using longline gear (282 directed groundfish, 38 Pacific halibut, and 2 CA halibut); 172 vessels using pot gear (145 directed groundfish, 6 prawn, and 21 CA sheephead); 77 vessels using nongroundfish trawl gear (23 ridgeback prawn, 14 sea cucumber, and 40 CA halibut vessels), and 882 vessels using line gear (590 groundfish directed, 58 CA halibut, 10 HMS vessels, and 234 salmon troll vessels) can be used to maintain the integrity of RCAs. No change over Alt.1 for HMS. Overfished fished species catch projections for the salmon troll fishery represent incidental fishing mortality. In 2005, salmon troll vessels are projected to encounter 1.6 mt or 33% of the canary rockfish taken in all OA fisheries, or 3.42% of the OY. The risk of exceeding the OYs for canary rockfish, lingcod, bocaccio, widow or yelloweye rockfish are reduced. VMS deters mixed fishing strategies where vessels alter gear to catch groundfish within the RCAs. The risks of exceeding the OYs due to incursions by Dungeness crab is relatively low Indirect impacts Fishing effort and location data from the 1,453 vessel identified above could improve the understanding of groundfish mortality for line vessels in the same ways as identified under Alt. 2 for longline vessels

BIOLOGICAL ENVIRONMENT - COMPARISON OF THE ALTERNATIVES	
TOTAL CATCH	Changes in groundfish mortality levels as a result of VMS regulations
<u>Alternative 6A</u> Vessels with RCA restrictions; except pink shrimp trawl	<u>Direct impacts</u> Data from approximately 1,583 vessels: 349 vessels using longline gear (282 directed groundfish, 65 Pacific halibut, and 2 CA halibut); 193 vessels using pot gear (145 directed groundfish, 6 prawn, 21 Dungeness crab and 21 CA sheephead); 77 vessels using nongroundfish trawl gear (23 ridgeback prawn, 14 sea cucumber, and 40 CA halibut vessels), 882 vessels using line gear (590 groundfish directed, 58 CA halibut, 10 HMS vessels, and 234 salmon troll vessels) and 72 vessels using net gear (25 HMS and 47 CA halibut) could be used to maintain the integrity of RCAs. The risk of the actual catch exceeding the OYs for overfished species due to illegal fishing in the RCAs is reduced for directed groundfish fisheries. Maintaining the integrity of the RCAs will reduce the risk of exceeding the yelloweye rockfish OY as a result of Pacific halibut vessel incursions into the RCAs. Overfished species catch projections for the salmon troll fishery represent incidental fishing mortality. The risk of exceeding the OYs for canary rockfish, lingcod, bocaccio, widow or yelloweye rockfish are reduced. VMS deters mixed fishing strategies where vessels alter gear to catch groundfish within the RCAs. In 2005, salmon troll vessels are projected to encounter 1.6 mt or 33% of the canary rockfish taken in all OA fisheries, or 3.42% of the OY. No change over Alt. 1 for HMS line and sea cucumber vessels because they are not projected to catch overfished species <u>Indirect impacts</u> Fishing effort and location data from the 1,583 vessels identified above could improve the understanding of groundfish mortality for line vessels in the same ways as identified under Alt. 2 for longline vessels.
<u>Alternative 6B</u> Vessels with RCA restrictions: except salmon troll north that retain only yellowtail rockfish and pink shrimp trawl	<u>Direct impacts</u> The ability to maintain the integrity of the RCAs is slightly less than Alt. 6A, because salmon troll vessels fishing north of 40°10' N. lat. that only land yellowtail rockfish would be excluded. 1,525 vessels are included under this alternative. <u>Indirect impacts</u> Increased data on fishing effort is slightly less than those identified under Alt. 6A, because salmon troll vessels fishing north of 40°10' N. lat. that only land yellowtail rockfish would be excluded.
<u>Alternative 7</u> Vessel >12 ft with RCA restriction; except, pink shrimp trawl	<u>Direct impacts</u> The ability to maintain the integrity of the RCA is slightly less than Alt. 6A because approximately 22 vessels (those <12 feet in length) less than that identified under Alt. 6A are excluded. 1,561 vessels are included under this alternative. Few if any of these vessels are likely to fish in Federal waters. <u>Indirect impacts</u> Increased data on fishing effort is slightly less than that identified under Alt. 6A; approximately 22 vessels (those <12 feet in length) less than those identified under Alt. 6A are excluded. Few if any of these vessels are likely to fish in Federal waters.
<u>Alternative 8</u> Excludes all low impact OA fisheries, those where the incidental catch of overfished species is projected to be minimal.	<u>Direct impact</u> Data from vessels: 349 vessels using longline gear (282 directed groundfish, 65 Pacific halibut, and 2 CA halibut); 145 vessels using directed groundfish pot gear; 40 vessels using CA halibut trawl gear, 47 vessels using CA halibut net gear, and; 882 vessels using line gear (590 groundfish directed, 58 CA halibut, and 234 salmon troll vessels) could be used to maintain the integrity of RCAs. The risk of actual catch exceeding the OYs for overfished species as the result of incursions into the RCAs is reduced for directed groundfish, and for those incidental fisheries that have the greatest potential for catching ovefished species. The risk of actual catch exceeding the OYs for overfished species is higher for nongroundfish trawl vessels than it is under Alt. 4A-7. <u>Indirect impact</u> Provides VMS position data from approximately 1,463 vessels, identified in the preceding paragraph, that can be combined with observer, survey, and fish ticket data to improve the understanding of groundfish mortality for pot vessels in the same ways as identified under Alt. 2 for longline vessels.

BIOLOGICAL ENVIRONMENT - COMPARISON OF THE ALTERNATIVES	
TOTAL CATCH	Changes in groundfish mortality levels as a result of VMS regulations
Alternative 9 Directed vessels. those that land more than 500 lb of groundfish in a calendar year.	Direct impact Data from 1,123 vessels: 349 vessels using longline gear (282 directed groundfish, 65 Pacific halibut, and 2 CA halibut); 150 vessels using pot gear (145 groundfish directed, 1 Dungeness crab, 2 prawn and 2 sheephead); 9 vessels using CA halibut and 3 vessels using pink shrimp trawl gear, 15 vessels using CA halibut net gear, and; 597 vessels using line gear (590 groundfish directed, 1 HMS and 6 salmon troll vessels) could be used to maintain the integrity of the RCAs. The risk of the actual catch exceeding the OYs for overfished species due to illegal fishing in the RCAs by directed groundfish vessels is reduced. Maintaining the integrity of the RCAs will reduce the risk of exceeding the yelloweye rockfish OY as a result of Pacific halibut vessel incursions into the RCAs. Overfished species catch projections for the salmon troll fishery represent incidental fishing mortality. The risk of exceeding the OYs for canary rockfish, lingcod, bocaccio, widow or yelloweye rockfish is greater than Alt. 5A-8 if vessels alter gear to catch groundfish within the RCAs. The risk of exceeding the bocaccio or canary rockfish OYs as a result of CA halibut vessel incursions into the RCAs is greater than Alt 4A-8. Indirect impact Provides VMS position data from approximately 1,123 vessels, identified in the preceding paragraph, that can be combined with observer, survey, and fish ticket data to improve the understanding of groundfish mortality for pot vessels in the same ways as identified under Alt. 2 for longline vessels.
Alternative 10 No Action. No VMS requirements. Discontinue the use of RCA management and adust trip limits and seasons accordingly.	Direct impact Overfished species catch is expected to increase for the directed fisheries, the non-groundfish trawl fisheries except pink shrimp, and the Pacific halibut fishery unless additional management measures, such as extended closed seasons, are used to restrict the fishery. Indirect impact Little data available to assess OA fishing location and intensity.
Each of the alternatives identifies and estimated number of vessels that are likely to be affected by the VMS requirement. These values are based on the average level of participation from 2000 to 2004, except for pink shrimp trawl which was based on 2003-2004. It is important to point out that these values may not be the actual number of vessels that would continue to use a particular gear type if VMS requirements were adopted.	

4.2.1 Fishing mortality

Direct impacts on fishing mortality include changes in the mortality of target and non-target species (incidental catch). This action would expand the VMS program to the OA gear sectors to monitor fishing location in relation to time-area closures. Direct benefits result if the integrity of RCAs are maintained as a result of VMS requirements.

To monitor the attainment of OYs, the total catch level must be estimated for each species or species group. The fishing mortality level (total catch level) for each species is the sum of retained catch and discarded catch (incidental or targeted catch that is not retained and landed by the vessel). There is no exact measure of discard amounts in the OA fisheries. For all species except lingcod, sablefish, and nearshore rockfish species, it is assumed that discarded fish are dead or die soon after being returned to the sea. Total catch estimates of overfished species in the LE fisheries are currently based on a bycatch accounting model (for further information on current bycatch model see the preamble discussion in the proposed rules for the Harvest Specifications and Management Measures from 2003, 2004 and 2005-2006; January 7, 2003, 68 FR 936 or Section 3.3 of the EIS, for the Proposed Acceptable Biological Catch and Optimum Yield Specifications and Management Measures for the 2005-2006 Pacific Coast Groundfish Fishery, addressed the physical impacts on the environment under status quo management.) which has applied depth-related discard assumptions since 2003. At this time, total catch estimates of overfished species taken in the OA fishery are based on landed catch from fish tickets, assumed discard rates, discard and discard mortality assumptions, expertise from state fisheries managers, and industry advisory body input. However, as observer and other data become available more formal bycatch modeling is expected to be used for a portion (directed) or perhaps all of the OA fisheries. The current bycatch model for the LE fisheries uses overfished species bycatch rates that are representative of fishing outside the RCAs, and would be higher if areas within the RCAs were included. An OA fishery bycatch model would likely be similar for the directed OA fisheries.

Discard assumptions used for modeling the fishery to estimate total catch of overfished species have been based on bycatch rates for areas where fishing is expected to occur. If the RCAs were not adequately maintained, landed catch would have higher bycatch rate associated with it than that assumed by the model. This is especially a concern for those overfished species that constrain the fisheries and for which the OY is fully attained each fishing year. If incursions into the RCAs occur, the estimated total mortality would likely be underestimated and the risk of exceeding the OYs for overfished species increased, with the risk being greatest for species most frequently encountered by the OA gears (bocaccio, lingcod, yelloweye rockfish and canary rockfish), which the RCAs are intended to protect. If the true discard rates are higher than the discard assumptions used to estimate total catch, the OYs could unknowingly be exceeded. If the OYs are substantially exceeded, a stock's ability to rebuild could be impaired. If a rebuilding deficit is created for an overfished stock because the OY is repeatedly and unknowingly exceeded, the stock may not be able to recover within the specified rebuilding time. For stocks in the precautionary zone (B25%-B40%), the stock biomass could be further reduced, possibly leading to an overfished status.

Indirect impacts from fishery management actions include changes in fishing practices that affect the biological environment, but are further away in time or location than those occurring as a direct impact. The prohibition of fishing in certain areas or during certain times is used to reduce overall fishing effort and to protect vulnerable populations. When depth-based RCA management was adopted, large areas of the continental shelf were closed to groundfish fishing to protect overfished species. This was expected to result in effort shifts to open areas that are shoreward and seaward of the conservation areas. Over time, area management involves closing and sometimes opening formerly closed areas. When the size or location of closed areas change, the fishing fleet makes shifts in fishing effort. Knowing when and where fishing is occurring is necessary for: understanding total fishing mortality; evaluating possible impacts on the adult and juvenile groundfish species, assessing impacts with non-groundfish species, and determining if regulatory changes are needed.

Commercial data is primarily in the form of landing receipts or "fish tickets," which are filled out by fish buyers at the time of delivery from a fishermen. Fish tickets are a major source of information on the amount of fish and which provide information on the total weight landed by species or market categories, price per pound, and the condition of the catch. Little specific information on fishing locations is available for the OA fleet. Therefore, little is known about fishing patterns in the West Coast groundfish OA fishery or how fishing effort shifts from closed areas to the remaining open fishing areas.

Logbooks are a useful tool for verifying landing receipts and for tracking fishing activity. The information recorded in logbooks typically consists of date, boat name and identification number, crew size, catch location, numbers or pounds of fish, gear type used, mesh size, principle target species, associated species taken and landing receipt number. Logbook data is not available from the directed OA fisheries at this time, but are for a few incidental fisheries such as the California gill and trammel nets, traps, and trawl gear fisheries. Without effort data, estimates of catch per unit of effort (CPUE) cannot be made. CPUE is the number or weight of fish caught per unit of effort. Typically, effort is evaluated by gear type, gear size, and length of time the gear is used. CPUE can be used as a measure of relative abundance for a particular species and can be used to understand abundance changes over time. VMS can aid in estimating CPUE based on fishing location and days at sea.

VMS systems provide accurate harvest location data that could be used to estimate the distribution of fishing effort throughout the WOC. Hourly position reports allow changes in fishing location and intensity to be monitored and assessed, they also allow the number of vessel trips to be verified. Because VMS would be required to be operated continuously after a vessel fishes in the OA fishery in Federal waters, data from additional non-groundfish fisheries off the West Coast may also be available. When VMS position information can be combined with data collected by at-sea observers it can be used to better understand the impacts of the effort shift on adult and juvenile populations. Overfished species bycatch estimates may be refined with VMS data. The response time for management to address unintended impacts on stocks resulting from effort shifts could be improved with VMS. However, the ability to understand the extent of the impacts resulting from effort shifts on groundfish and other resources would depend on the amount, availability and applicability of other data such as at-sea observer data for the different gears and sectors of the OA fishery.

<u>Comparison of the Alternatives</u> The level of fleet coverage, that portion of the overall OA fishing fleet that would be required to have VMS and provide declaration reports, is the primary difference between the alternatives. Each of the alternatives defines the portion of the OA fleet that would be required to carry and use VMS transceivers and provide gear declaration reports. Alternative 10 is the only alternative that goes beyond VMS coverage by discontinuing the non-trawl and trawl RCA requirements for the OA fisheries.

Alternative 1, Status Quo, would continue the requirement for declaration reports from OA vessels using nongroundfish trawl gear in the RCAs. Under Alternative 1, OA fishery position data would only be available from vessels who voluntarily use VMS units and from vessels that fish pursuant to the OA regulations, but carry VMS because the vessel is registered to a LE permit. Under Alternative 1, a higher level of fishing mortality than that being used to estimate total catch may result if the integrity of closed areas are not maintained and incursions result in higher rates of overfished species catch than projected. The difficulty in maintaining the integrity of closed areas is greatest under status quo, Alternative 1.

Alternative 2 maintains the declaration provisions of status quo, but adds the VMS and declaration reporting requirements for approximately 322 vessels (282 directed groundfish, 38 Pacific halibut, and 2 CA halibut) that use longline gear to take and retain, possess or land groundfish. Of the alternatives that require VMS, Alternative 2 requires the smallest proportion of the OA fleet (only vessels using longline gear) to have and use VMS and therefore provides the least amount of data for monitoring the integrity of the RCAs or for assessing fishing effort and intensity relative to fishing fleet activity. The risk to overfished species as a result of incursions into the RCAs is reduced for the directed vessels using longline gear. Table 3.3.3.7 shows the projected catch of overfished species for 2005 for the OA directed groundfish and incidental fisheries. The Pacific halibut longline fishery is one of the incidental fisheries with the greatest potential impacts on overfished species if incursions into the RCA occur. The Pacific halibut fishery is projected to take 1.92% of the yelloweye rockfish OY with the RCAs being maintained. Having VMS to maintain the integrity of the RCAs in relation to Pacific halibut longline vessels will reduce the risk of exceeding the yelloweye rockfish OY as a result of Pacific halibut vessel incursions into the RCAs. Data collected from the longline vessels can be combined with observer, survey, and fish ticket data to better estimate: 1) total fishing mortality, 2) impacts on juveniles and other fishery resources related to changes in fishing locations and intensity, 3) fishing intensity (amount of time vessels are in an area), and 4) changes in fishing location and intensity over time. Given the mobility of vessels within the fishery, directed longline vessels could choose to change gears to avoid the VMS requirements.

Approximately 515 vessels would be required to have VMS under Alternative 3. Alternative 3, includes the same vessels as Alternative 2, but adds the VMS and declaration reporting requirements for approximately 193 vessels (145 directed, 21 Dungeness crab, 6 prawn, and 21 CA sheephead) using pot gear to take and retain, possess or land groundfish. The addition of the pot gears to the VMS program under Alternative 3 will aid in maintaining the integrity of RCAs. Therefore, the risk to overfished species, as a result of incursions into the RCAs is reduced for the directed vessels using longline and pot gear. Table 3.3.3.7 shows the projected catch of overfished species for 2005 for the OA directed groundfish and incidental fisheries. When considering the impacts of the incidental pot fisheries on overfished species, the California sheephead pot fishery and the spot prawn trap fishery would be considered the lowest impact OA fisheries because no overfished species fishing mortality is projected for these fisheries, and the Dungeness crab pot fishery with 0.5 mt of lingcod (0.02% of the lingcod OY) would have only slightly greater impacts on overfished species. Some fisheries encounter fewer overfished species because the target species and the overfished species do not co-occur or occur in low abundance, or because the fishing gear is designed in a way that captures the target species but does not capture the overfished species. For such incidental fisheries, the potential risk of incursions into the RCAs (when incidental groundfish is retained or targeted within the RCA) is lower than for fisheries where the target species co-occur with overfished species or are vulnerable to the fishing gear. Table 3.3.3.1 shows that the groundfish landings in the Dungeness crab fishery and the prawn pot fisheries were very low between 2000 and 2004 (less than 0.3 mt per year). The groundfish landings by vessels targeting California sheephead were somewhat higher (2.0 in 2000, 4.8 in 2001, and 0.7 in 2003) in the years before RCAs were created. Similar to Alternative 2, under Alternative 3, some vessels may change to line gear to avoid the VMS requirements.

Alternatives 4A and 4B add VMS coverage for nongroundfish trawl vessels to the pot and longline vessels identified under Alternative 3. The primary difference between Alternatives 4A and 4B is that Alternative 4A adds the VMS and declaration reporting requirement for approximately 77 vessels (23 ridgeback prawn, 14 sea cucumber and 40 California halibut vessels) using nongroundfish trawl gear. While Alternative 4B includes all of the nongroundfish trawl vessels identified under Alternative 4A plus 54 pink shrimp vessels. Many vessels that fish for pink shrimp are also registered to LE groundfish permits and therefore already have VMS requirements. Alternative 4B adds those pink shrimp vessels that are not also registered to LE groundfish permits. Approximately 646 vessels would be required to have and use VMS under Alternative 4B. The nongroundfish trawl fisheries with the greatest impacts on overfished species include the pink shrimp and California halibut trawl (overfished species impacts were not provided by gear type) fisheries (Table 3.3.3.1). The California Halibut trawl fishery has a specific RCA defined for the fishery. The risk of actual catch of overfished species exceeding the OYs as a result of RCA incursions by California halibut vessels is reduced with VMS. RCA areas have also been defined for California sea cucumber and the ridgeback prawn trawl fishery. Under the current management regime, which includes RCAs, the sea cucumber trawl fishery would be considered the lowest impact OA trawl fisheries because no overfished species fishing mortality is projected for the fishery. The ridgeback prawn trawl fishery has a slightly greater impact with 0.1 mt of bocaccio (0.03% of the bocaccio OY) projected to be taken. Though the risk of actual catch of overfished species exceeding the OYs as a result of RCA incursions by sea cumber and ridgeback prawn trawl vessels is lower than for California halibut vessels, it is further reduced with VMS. Pink shrimp vessels must provide declaration reports when fishing within a trawl RCA, but are otherwise not subject to RCA restrictions. The effect of Alternatives 4A and 4B is the same because no overfished species catch projection would not change over current projections. Fishing effort and location data under both alternatives could provide information that can be used to better understanding groundfish mortality for trawl vessels in the same ways as identified under Alt. 2 for longline vessels.

Alternative 5A includes the same vessels as Alternative 4A, but adds the VMS and declaration reporting requirements for approximately 658 vessels (590 groundfish, 58 California halibut, and 10 HMS vessels) using line gear to take and retain, possess or land groundfish (excludes salmon troll vessels). In total, alternative 5A applies to 1,250 vessels. The risk of actual catch exceeding overfished species OYs as a result if incursions into the RCAs is reduced for all directed groundfish vessels. Maintaining the integrity of the RCAs for nongroundfish trawl and line vessels will reduce the risk of exceeding the bocaccio or canary rockfish OYs as a result of California halibut vessel incursions into the RCAs. Under Alternative 5A, there is no change over Alternative 1 for HMS line vessels. Overfished species catch projections for the salmon troll fishery represent incidental fishing mortality. The risk of exceeding the OYs for canary rockfish, lingcod, bocaccio, widow or yelloweye rockfish as a result of salmon troll fishing where the gear is altered or used to catch groundfish within the RCAs may be reduced. VMS data could also be used to improve managers' understanding of groundfish mortality for line vessels in the same ways as identified under Alt. 2 for longline vessels.

Alternative 5B, includes slightly more vessels than 5A because all salmon troll vessels that land groundfish are included. HMS and Dungeness crab vessels are excluded under alternative 5B. Data from 1,453 vessels: 322 vessels using longline gear (282 directed groundfish, 38 Pacific halibut, and 2 CA halibut); 172 vessels using pot gear (145 directed groundfish, 6 prawn, and 21 CA sheephead); 77 vessels using nongroundfish trawl gear (23 ridgeback prawn, 14 sea cucumber, and 40 CA halibut vessels), and 882 vessels using line gear (590 groundfish directed, 58 CA halibut, 10 HMS vessels, and 234 salmon troll vessels) can be used to maintain the integrity of RCAs. In 2005, salmon troll vessels were projected to encounter 1.6 mt or 33% of the canary rockfish taken in all OA fisheries, or 3.42% of the canary rockfish OY (Table 3.3.3.7). The risk of exceeding the OYs for canary rockfish, lingcod, bocaccio, widow or yelloweye rockfish as a result of salmon troll fishing where the gear is altered or used to catch groundfish within the RCAs may be reduced. The risks of exceeding the OYs due to incursions by Dungeness crab is relatively low. VMS data could also be used to improve managers' understanding of groundfish mortality for line vessels in the same ways as identified under Alt. 2 for longline vessels.

Alternative 6A, applies to any vessel engaged in commercial fishing to which an RCA restriction applies. Alternative 6A would apply to the largest number of OA vessels and would therefore provide the largest amount of data for monitoring the integrity of the RCAs. Data from approximately 1,583 vessels: 349 vessels using longline gear (282 directed groundfish, 65 Pacific halibut, and 2 CA halibut); 193 vessels using pot gear (145 directed groundfish, 6 prawn, 21 Dungeness crab and 21 CA sheephead); 77 vessels using nongroundfish trawl gear (23 ridgeback prawn, 14 sea cucumber, and 40 CA halibut vessels), 882 vessels using line gear (590 groundfish directed, 58 CA halibut, 10 HMS vessels, and 234 salmon troll vessels) and 72 vessels using net gear (25 HMS and 47 CA halibut) could be used to maintain the integrity of RCAs. Unlike Alternatives 2-5B, which include only Pacific halibut vessels that take and retain, possess or land groundfish, all Pacific halibut vessels would be included under Alternative 6A. Maintaining the integrity of the RCAs will reduce the risk of exceeding the yelloweye rockfish OY as a result of Pacific halibut vessel incursions into the RCAs. There is no change over Alternative 1 for HMS line and sea cucumber vessels because they are not projected to catch overfished species. The risk of exceeding the OYs for canary rockfish, lingcod, bocaccio, widow or yelloweye rockfish as a result of salmon troll fishing where the gear is altered or used to catch groundfish within the RCAs may be reduced. Alternative 6B applies to any vessel engaged in commercial fishing to which an RCA restriction applies, except salmon troll vessels fishing north of 40°10' N. lat. that land only yellowtail rockfish. Alternative 6B affects approximately 58 fewer vessels annually than does Alternative 6A. The risk of incursions into the RCAs occurring under Alternative 6B are similar to Alternative 6A, with the only difference being the ability to monitor the fishing locations of salmon troll vessels fishing in the north that retain only yellowtail rockfish. Impacts resulting from Alternative 7 are almost the same as Alternative 6A because it applies to the same vessels, except that 22 vessels less than 12 feet in length would be excluded. It is unlikely that vessels under 12 feet in length fish in Federal waters and would therefore not trigger the VMS requirement. VMS data could also be used to improve managers' understanding of groundfish mortality for line vessels in the same ways as identified under Alt. 2 for longline vessels. The benefits of position data availability should be considered in the longer term because there is currently very little data (observer or otherwise) from OA vessels on the amounts and types of bycatch in their fisheries. In the short-term, using effort data obtained from a VMS system to estimate total catch and to monitor the attainment of OYs will be limited until more data becomes available.

Alternative 8 excludes the low impact OA fisheries, those where the incidental catch of overfished species is projected to be minimal: Dungeness crab pot, spot prawn pot, sea cucumber trawl, ridgeback prawn trawl, HMS line, and California sheephead pot. Data from 1,463 vessels includes data from: 349 vessels using longline gear (282 directed groundfish, 65 Pacific halibut, and 2 CA halibut); 145 vessels directed groundfish vessels using pot gear; 40 California halibut vessels using trawl gear, 47 vessels using California halibut net gear, and; 882 vessels using line gear 590 groundfish directed, 58 California halibut, and 234 salmon troll vessels). Data from the seas cucumber, ridgeback prawn, and pink shrimp trawl vessels would not be included under Alternative 8. Therefore, the ability to maintain the integrity of RCAs from incursions with the fishing gears associated with the greatest projected catch of overfished species would result in impacts similar to Alternatives 5B-7. Because the low projected bycatch for the sea cucumber and ridgeback prawn trawl fisheries are linked to the areas which the fisheries occur, the lack of VMS for these vessels may undermine the integrity of the nongroundfish trawl RCAs that are used to managed the catch of overfished species by these vessels.

Under alternative 9 data from 1,123 vessels could be used to maintain the integrity of RCAs from longline, pot, trawl, line, net and other fishing gear impacts. Vessels included under Alternative 9 are: 349 vessels using longline gear (282 directed groundfish, 65 Pacific halibut, and 2 CA halibut); 150 vessels using pot gear (145 groundfish directed, 1 Dungeness crab, 2 prawn and 2 sheephead); 9 California halibut and 3 pink shrimp vessels using trawl gear, 15 vessels using CA halibut net gear, and; 597 vessels using line gear 590 groundfish directed, 1 HMS and 6 salmon troll vessels). Because Alternative 9 excludes those vessels with minimal annual catch of groundfish, those that land less than 500 lb of groundfish in a calendar year, it includes fewer nongroundfish trawl vessels than Alternative 8, as well as very few California halibut line gear, and salmon troll vessels. The overfished species impacts projected for the California halibut fishery are 0.03% of the bocaccio OY, 0.21% of the canary rockfish OY, and 0.08% of the lingcod OY, however these are not gear specific projections. The California halibut trawl fishery has a specific RCA defined for the fishery. The risk of actual catch of overfished species exceeding the OYs as a result of RCA incursions by California halibut vessels is greater under Alternative 9 than under Alternatives 2-3, but less than 4A-8. The risk of exceeding the OYs for canary rockfish, lingcod, bocaccio, widow or yelloweye rockfish as a result of salmon troll fishing where the gear is altered or used to catch groundfish within the RCAs is likely to be reduced and is similar to Alternatives 2-5A. Small amounts of incidentally caught species may continue to be landed rather than discarded by the vessels to avoid VMS requirements. Providing managers with an opportunity to collect length and age structure data from species that may otherwise not be available.

The projected impacts resulting from Alternative 10 on overfished species catch is expected to increase for the directed fisheries, the non-groundfish trawl fisheries except pink shrimp, and the Pacific halibut fishery unless additional management measures, such as extended closed seasons, are used to seriously restrict the fishery. Little data is available to assess OA fishing location and intensity.

The OA fishery does not require participants to have permits or gear endorsements. Directed groundfish participants using fixed gear have the mobility to choose between the legal OA fixed gears for harvesting groundfish. Therefore, if VMS requirements under Alternative 2 or 3 were implemented, it will likely result in some directed groundfish participants changing gear to avoid the VMS requirements. Because a substantial proportion of the directed groundfish fleet is required to use VMS under Alternatives 4-9, the number of directed groundfish vessel operators that are likely to change gear to avoid VMS requirements is reduced. Vessels that incidentally catch groundfish while targeting other species are less likely to change gears to avoid VMS requirements. This is because the various state and federal requirements for the target fishery they are participating in generally restricts the type of gear participants can use. However, participants that catch groundfish incidentally with longline, pot, line, or net gear are not considered to be in the OA groundfish vessels unless they take and retain, possess or land groundfish. This is different from the nongroundfish trawl gear vessels. Therefore, these participants may choose to avoid the VMS requirements by not retaining groundfish, though they would continue to catch groundfish incidentally to the target fishery. The number of participants that would choose to discard groundfish to avoid VMS requirements is unknown; however, a substantial number of participants in the incidental groundfish fisheries land less than 500 lb of groundfish annually (Table 3.3.3.9) and may choose to avoid VMS requirements by discarding the groundfish catch. This type of VMS avoidance would likely occur more frequently with California halibut longline and line gear vessels, Dungeness crab pot vessels, prawn pot vessels, HMS line gear vessels, and salmon troll gear where a large number of vessels land less than 500 lb of groundfish per year. These vessels are excluded under Alternative 8 and 9. Nongroundfish trawl vessels have less ability of avoid VMS since all vessels, regardless of whether or not groundfish are landed, are included under Alternatives 4A through 7.

4.2.2 Other Biological Resources

Non-groundfish species interactions

The action is to expand the VMS program to monitor the integrity of closed areas in relation to OA fishing activities. None of the management alternatives is expected to have an adverse effect on the incidental mortality levels of CPS, Dungeness crab, Pacific pink shrimp, Pacific halibut, forage fish or miscellaneous species over what has been considered in previous NEPA analyses. Information on where fishing effort is occurring (Alternatives 2- 7) may be positive because it may allow NMFS observer data and data from other sources to be joined together to derive a better understand of potential fishing related impacts on these species.

Salmonids

The action is to expand the VMS program to monitor the integrity of closed areas in relation to OA fishing activities. None of the management alternatives is expected to have an adverse effect on the incidental mortality levels of listed salmon species over what has been considered in previous NEPA analyses. Information on where fishing effort is occurring (Alternatives 3- 7) may have a positive effect because it could be joined with NMFS observer data and data from other sources to derive a better understand of potential fishing related impacts on these species.

Marine Mammals

The action is to expand the VMS program to monitor the integrity of closed areas in relation to OA fishing activities The West Coast groundfish fisheries are considered Category III fisheries, where the annual mortality and serious injury of a stock by the fishery is less than or equal to 1% of the PBR level (potential biological removal for mammal species). Information on where fishing effort is occurring (Alternatives 3- 7) may have a positive effect because it could be joined with NMFS observer data and data from other sources to derive a better understand of potential fishing related impacts on these species.

Seabirds

The action is to expand the VMS program to monitor the integrity of closed areas in relation to OA fishing activities. None of the proposed management alternatives are likely to affect the incidental mortality levels of seabirds over what has been considered in previous NEPA analyses. Information on where fishing effort is occurring (Alternatives 3- 7) may have a positive effect because it could be joined with NMFS observer data and data from other sources to derive a better understand of potential fishing related impacts on these species.

Sea Turtles

The action is to expand the VMS program to monitor the integrity of closed areas in relation to OA fishing activities. None of the proposed management alternatives are likely to affect the incidental mortality levels of sea turtles over what has been considered in previous NEPA analyses. Information on where fishing effort is occurring (Alternatives 3- 7) may have a positive effect because it could be joined with NMFS observer data and data from other sources to derive a better understand of potential fishing related impacts on these species.

Endangered Species

Species listed under the ESA are identified in Section 3.2 of this EA. Specific discussion of species listed under the ESA can be found above in the sections titled salmonids, marine mammals, sea birds and sea turtles.

4.3 Socio-economic Impacts

This section of the EA looks at impacts, positive and negative, on the socio-economic environment. Basic information regarding the people and the fisheries that are projected to be affected by the management alternatives was presented in Section 3 of this document. The following section differs in that it discusses what is projected to happen to the affected people, what social changes are expected to occur, and, how changes are expected to affect fishing communities. Changes in harvest availability to the different sectors of the fishery, changes in income and revenue, costs to participants; the effectiveness and costs of enforcing the management measures, effects on fishing communities, and how the actions affect safety of human life at sea will be examined in the following impact analysis.

Circumstances vary substantially between OA target fisheries and gear groups. In addition, little social and economic information is available on the various OA fisheries and the participants. Therefore, it is not possible to produce a detailed cost benefit study for VMS implementation in the OA fishery. The following analysis takes a general approach by examining; the costs and benefits to the OA fishery participants that are likely to result from the alternative VMS actions relative to economic status of the fishery participants; the ecological health of the resources; the geographical nature of the fishery; the type of fishing conducted (directed or incidental); the type of gear used; the quantity and size of vessels; fisheries enforcement; the management regime; and safety of human life at-sea.

SOCIO-ECONOMIC ENVIRONMENT - COMPARISON OF THE ALTERNATIVES	
FISHERY ENFORCEMENT	Changes in the ability to enforce groundfish fishery regulations as a result of VMS regulations
Alternative 1 Status quo	Direct impact Declaration reports may aid in identifying OA trawl vessels legally fishing in conservation areas. Indirect impacts The RCAs may need to be simplified to be more enforceable.
Alternative 2 Vessels using longline gear	Direct impact Accurate and timely position data will allow enforcement resources to be used efficiently to maintain the integrity of RCAs in relation to approximately 322 vessels (282 directed groundfish, 38 Pacific halibut, and 2 CA halibut vessels) that take and retain, possess or land OA groundfish. Deterrent effect will likely reduce the number of area violations by vessels using OA longline gear. Can be used to target at-sea and dockside inspections of OA vessels using longline gear. Indirect impact VMS position data from 322 longline vessels: may be used as basis for enforcement actions; may be used to establish probable cause for investigations; may be beneficial to homeland security activities, and; may be used to support enforcement actions for closed area management in the Pacific Halibut directed fishery.
Alternative 3 Vessels using longline or pot gear	In **addition** to the impacts from the 322 vessels under Alt. 2: Direct impact Accurate and timely position data will allow enforcement resources to be used efficiently to maintain the integrity of RCAs in relationship to approximately 193 vessels (145 directed, 21 Dungeness crab, 6 prawn, and 21 CA sheephead vessels) vessels using pot gear that take and retain, possess or land groundfish. Deterrent effect will likely reduce the number of area violations by vessels using OA pot gear. Can be used to target at-sea and dockside inspections of OA vessels using pot gear. Indirect impact VMS position data from 322 longline and 193 pot vessels: may be used as basis for enforcement actions; may be used to establish probable cause for investigations; may be beneficial to homeland security activities, and; may be used to support enforcement actions for closed area management in the Dungeness crab and spot prawn pot fisheries.
Alternative 4A Vessels using longline, pot or trawl gear, except: pink shrimp trawl	In **addition** to impacts from the 515 vessels under Alt. 2 and 3: Direct impact Accurate and timely position data will allow enforcement resources to be used efficiently to maintain the integrity of RCAs in relation to approximately 77 vessels (23 ridgeback prawn, 14 sea cucumber and 40 CA halibut vessels) using nongroundfish trawl gear to take and retain, possess or land OA groundfish. Deterrent effect will likely reduce the number of area violations by vessels using nongroundfish trawl gear. Can be used to target at-sea and dockside inspections of OA vessels using nongroundfish trawl gear. Indirect impact VMS position data from 322 longline, 193 pot, and 77 trawl (except shrimp trawl) vessels: may be used as basis for enforcement actions; may be used to establish probable cause for investigations; may be beneficial to homeland security activities, and; may be used to support enforcement actions for closed area management in the ridgeback prawn, sea cucumber, and CA halibut fisheries excluding pink shrimp.

SOCIO-ECONOMIC ENVIRONMENT - Continued	
FISHERY ENFORCEMENT	Changes in the ability to enforce groundfish fishery regulations as a result of VMS regulations
Alternative 4B Vessels using longline, pot or trawl gear	In **addition** to impacts from the 515 vessels under Alt. 2 and 3: Direct impact Accurate and timely position data allow enforcement resources to be used efficiently to maintain the integrity of RCAs in relation to approximately 131 vessels (54 pink shrimp, 23 ridgeback prawn, 14 sea cucumber and 40 CA halibut vessels) using nongroundfish trawl gear. Deterrent effect will likely reduce the number of area violations by vessels using nongroundfish trawl gear. No change over Alt. 4A for pink shrimp vessels because fishing in the RCA is permitted. Can be used to target at-sea and dockside inspections of OA vessels using nongroundfish trawl gear. Indirect impact VMS position data from 322 longline, 193 pot, and 131 trawl vessels: may be used as basis for enforcement actions; may be used to establish probable cause for investigations; may be beneficial to homeland security activities, and; may be used to support enforcement actions for closed area management in the ridgeback prawn, sea cucumber, and CA halibut fisheries.
Alternative 5A Vessels using longline, pot, trawl or line gear, except: pink shrimp trawl and salmon troll	In **addition** to impacts from the 592 vessels under Alt. 2, 3 and 4A, Direct impact Accurate and timely position data will allow enforcement resources to be used efficiently to maintain the integrity of RCAs in relation to approximately 658 (590 vessels using line gear to target groundfish, 10 HMS, and 58 CA halibut OA vessels) using line gear to take and retain, possess or land groundfish. Deterrent effect will likely reduce the number of area violations by vessels using line gear. Can be used to target at-sea and dockside inspections for OA vessels using line gear. Indirect impact VMS position data from 320 longline,193 pot, 77 trawl (except shrimp trawl), and 658 line (except salmon troll) vessels: may be used as basis for enforcement actions; may be used to establish probable cause for investigations; may be beneficial to homeland security activities; and may be used for closed area management in the line fisheries excluding salmon troll.
Alternative 5B Vessels using longline, pot, trawl or line gear, except: pink shrimp trawl, HMS longline, HMS line, and Dungeness crab pot gear	Direct impact Accurate and timely position data will allow enforcement resources to be used efficiently to maintain the integrity of RCAs in relation to 1,453 vessels: 322 vessels using longline gear (282 directed groundfish, 38 Pacific halibut, and 2 CA halibut); 172 vessels using pot gear (145 directed groundfish, 6 prawn, and 21 CA sheephead); 77 vessels using nongroundfish trawl gear (23 ridgeback prawn, 14 sea cucumber, and 40 CA halibut vessels), and 882 vessels using line gear (590 groundfish directed, 58 CA halibut, 10 HMS vessels, and 234 salmon troll vessels). Deterrent effect will likely reduce the number of area violations for incidental OA fisheries including salmon fishery area management measures. Can be used to target at-sea and dockside inspections for OA vessels Indirect impact VMS position data from 320 longline (excludes 2 HSM vessels), 172 pot (excludes 21 Dungeness crab vessels), 77 trawl (excludes shrimp trawl), and 882 line (includes 234 salmon troll vessels but excludes 10 HMS vessels), may be used as basis for enforcement actions; may be used to establish probable cause for investigations; may be beneficial to homeland security activities; and; may be used for closed area management in the in OA incidental fisheries excluding pink shrimp, HMS longline, HMS line and Dungeness crab pot fisheries, but including salmon troll.

SOCIO-ECONOMIC ENVIRONMENT - Continued	
FISHERY ENFORCEMENT	Changes in the ability to enforce groundfish fishery regulations as a result of VMS regulations
Alternative 6A Vessels with RCA restrictions; except pink shrimp trawl	Direct impact Accurate and timely position data available from approximately 1,583 vessels: 349 vessels using longline gear (282 directed groundfish, 65 Pacific halibut, and 2 CA halibut); 193 vessels using pot gear (145 directed groundfish, 6 prawn, 21 Dungeness crab and 21 CA sheephead); 77 vessels using nongroundfish trawl gear (23 ridgeback prawn, 14 sea cucumber, and 40 CA halibut vessels), 882 vessels using line gear (590 groundfish directed, 58 CA halibut, 10 HMS vessels, and 234 salmon troll vessels) and 72 vessels using net gear (25 HMS and 47 CA halibut). Deterrent effect will likely reduce the number of area violations for OA incidental fisheries including the salmon fishery. Can be used to target at-sea and dockside inspections for all OA vessels with RCA restrictions, including salmon troll coastwide. Indirect impact VMS position data from 349 longline, 193 pot, 77 trawl, and 892 line vessels: may be used as basis for enforcement actions; may be used to establish probable cause for investigations; may be beneficial to homeland security activities; and; may be used for closed area management in the in OA incidental fisheries with RCA restrictions, including salmon troll.
Alternative 6B Vessels with RCA restrictions: except salmon troll north that retain only yellowtail rockfish and pink shrimp trawl	Direct impact Slightly less accurate and timely position data than identified under Alt. 6A, because 58 salmon troll vessels fishing north of 40°10' N. lat. that only land yellowtail rockfish would be excluded Indirect impact VMS position data from 349 longline, 193 pot, 77 trawl, and 834 line vessels: may be used as basis for enforcement actions; may be used to establish probable cause for investigations; may be beneficial to homeland security activities; and; may be used for closed area management in the in OA incidental fisheries with RCA restrictions.
Alternative 7 Vessel >12 ft with RCA restriction; except, pink shrimp trawl	Direct impact Slightly less accurate and timely position data than identified under Alt. 6A because approximately 22 vessels (6 longline, 2 pot, and 14 line gear vessels <12 feet in length) fewer vessels (1,383 vessels) than those identified under Alt. 6A are excluded. Few if any of these vessels fish in Federal waters. Indirect impact VMS position data from 343 longline, 191 pot, 77 trawl, and 878 line vessels: may be used as basis for enforcement actions; may be used to establish probable cause for investigations; may be beneficial to homeland security activities; and; may be used for closed area management in the in OA incidental fisheries with RCA restrictions.
Alternative 8 Excludes all low impact OA fisheries, those where the incidental catch of overfished species is projected to be minimal.	Direct impact Accurate and timely position data available from 1,463: 349 vessels using longline gear 282 directed groundfish, 65 Pacific halibut, and 2 CA halibut); 145 vessels directed groundfish vessels using pot gear; 40 CA halibut vessels using trawl gear, 47 vessels using CA halibut net gear, and; 882 vessels using line gear 590 groundfish directed, 58 CA halibut, and 234 salmon troll vessels). Deterrent effect will likely reduce the number of area violations by vessels identified under this alternative. Indirect impact VMS position data from the 1,463 vessels identified under this alt.: may be used as basis for enforcement actions; may be used to establish probable cause for investigations; may be beneficial to homeland security activities; and; may be used for closed area management in the in OA incidental fisheries with RCA restrictions.

SOCIO-ECONOMIC ENVIRONMENT - Continued	
FISHERY ENFORCEMENT	Changes in the ability to enforce groundfish fishery regulations as a result of VMS regulations
Alternative 9 Directed vessels, those that land more than 500 lb of groundfish in a calendar year.	Direct impact Accurate and timely position data available from 1,123 vessels: 349 vessels using longline gear (282 directed groundfish, 65 Pacific halibut, and 2 CA halibut); 150 vessels using pot gear (145 groundfish directed, 1 Dungeness crab,2 prawn and 2 sheephead); 9 CA halibut and 3 pink shrimp vessels (2003-2004 avg. number)using trawl gear, 15 vessels using CA halibut net gear, and; 597 vessels using line gear 590 groundfish directed, 1 HMS and 6 salmon troll vessels). Deterrent effect will likely reduce the number of area violations by vessels identified under this alternative. Indirect impact VMS position data from the 1,123 vessels identified under this alt.: may be used as basis for enforcement actions; may be used to establish probable cause for investigations; may be beneficial to homeland security activities; and; may be used for closed area management in the in OA incidental fisheries with RCA restrictions.
Alternative 10 No Action. No VMS requirements. Discontinue the use of RCA management and adust trip limits and seasons accordingly.	Direct impact Enforcement of OA fishery interactions with RCAs would no longer be necessary. Indirect impact Scarce enforcement resources may be used elsewhere to monitor for potential fishery violations other than those related to the OA fishery interactions with RCAs.
Each of the alternatives identifies and estimated number of vessels that are likely to be affected by the VMS requirement. These values are based on the average level of participation from 2000 to 2004, except for pink shrimp trawl which was based on 2003-2004. It is important to point out that these values may not be the actual number of vessels that would continue to use a particular gear type if VMS requirements were adopted.	

4.3.1 Fishery Enforcement

Direct impacts on enforcement from fishery management actions includes; changes in the availability of information that directly aids enforcement officers in identifying violations; changes in information that helps enforcement officers to separate those individuals who are complying with the regulatory requirements from those who are not; and changes that alter the level of compliance by fishers.

At the present time there are 8 NMFS agents covering the Pacific Coast groundfish fishery. These officers and agents are responsible for enforcing all conservation regulations in the Pacific Coast groundfish fishery (e.g. size limits, trip limits, gear restrictions, etc). They are also responsible for monitoring all other fisheries in areas that are regulated by NMFS. In addition, there are state enforcement officers in California, Oregon, and for Washington that cover the groundfish fishery as well as other state fisheries. At this time, state enforcement resources (personnel and budgets) are extremely limited.

Implementing depth-based management measures over large geographic areas marked the transition to a much greater dependence upon at-sea enforcement. Maintaining the integrity of the conservation areas is largely dependent upon the ability to enforce such management measures. In the past, fishery management measures, such as landing limits, size limits, and species landing restrictions were largely enforced by the relatively easy and inexpensive method of dockside enforcement. Enforcing depth-based closed areas represents a more costly and difficult challenge, because effective enforcement requires frequent patrolling of the shoreward and seaward boundaries of the conservation areas. The single biggest factor that allows some operators to avoid compliance with closed area management measures is that much of the fishing activity takes place out of view of anyone other than the vessel crew. Because VMS provides reliable and accurate information on the location of vessels and can be used to identify where fishing activity takes place with a reasonable degree of accuracy, VMS is a practical means of monitoring vessels activity in relation to area restrictions.

VMS will potentially show enforcement officers breaches of time/area restrictions. VMS can show officers those vessels that are following the rules as well those that are not. In doing so, it makes the activities of investigating officers much more cost effective because less time will be spent pursuing false trails and fishing operators who are following the rules. However, patrols by both sea and air will still be necessary for fully effective monitoring and management, even with an effective VMS program. A patrolling aircraft or vessel can spend considerable time and fuel investigating legitimate fishing vessels that will appear on their radar. Providing access to VMS data for patrol craft can minimize the effort spent confirming radar contacts of vessels fishing legitimately and thereby increase the efficiency of surveillance patrols. Further, identifying legitimate fishing vessels to patrol craft via VMS may help them choose particular contacts for more productive investigation when several contacts are made by radar.

In some cases, enforcement officers will have particular vessels or particular situations for which they may wish to conduct an at-sea or landing inspection without warning to the vessel operator. Without VMS, it is extremely difficult to determine where a vessel is located at-sea or where and at what time it might enter port. VMS provides a reliable means of achieving this with potential savings in time and other expense in moving officers and aircraft or patrol vessels to the correct location at the appropriate time.

Vessel position data and fishery declarations, which are otherwise not available from this sector of the groundfish fleet, would be used to identify vessels fishing in the closed areas and to target landing and at-sea inspections. Accurate and timely position data is necessary to allow enforcement resources to be used efficiently to maintain the integrity of RCAs. In addition, the deterrent effect of VMS will likely reduce the number of closed area violations.

One of the major benefits of VMS is its deterrent effect. If fishing vessel operators know that they are being monitored and that a credible enforcement action will result from illegal activity, then the likelihood of that illegal activity occurring is significantly diminished. In this context, VMS is a preventive measure rather than a cure. To be effective as a deterrent, the VMS program must maintain its credibility in the eyes of the vessel operators and its use must be kept at the forefront of their minds if the deterrent effect is to be maintained. The credibility of the system can only be maintained if all operational issues are followed up, particularly those that affect a vessel, such as failure of the vessel to report on schedule. The presence of the VMS equipment on the vessel will be a reminder to operators of its monitoring operation.

The OA fleet consists of smaller sized vessels, with many being under 40 feet in length (Table 3.3.3.4). Smaller vessels are generally not able to withstand rough seas as well as larger vessels. Because much of the OA groundfish fleet is comprised of small vessels, much of the effort is thought to occur in waters near the seaward boundary of the nontrawl RCAs. It is presumed that fishers with smaller vessels (<40 ft) fishing seaward of the RCAs are more likely to encroach on the seaward boundary of the RCAs, because of the desire to fish nearer to shore for safety and to reduce fuel consumption and general wear and tear on the vessel. Table 4.3.1.1 shows the proportion of OA vessels by target fishery that are less than 40 feet in length. From this table, it can be seen that a large portion of the vessels that participate in the directed fisheries and who have a greater than 5% dependency on groundfish are small vessels. Many of the nearshore vessels may fish exclusively in state waters.

Table 4.3.1.1. Percent of OA vessels less than 40 feet (ft) in length, November 2000 through October 2001.

More than 5% of annual revenue from groundfish	
Target species	Vessel less than 40 ft in length
Sablefish	72%
Nearshore Rockfish	91%
Shelf Rockfish	90%
Slope rockfish	82%
Less than 5% of annual revenue from groundfish	
Sablefish	32%
Nearshore Rockfish	78%
Shelf Rockfish	60%
Slope rockfish	51%
Halibut	65%
Shrimp/prawn	21%
Dungeness crab	56%
Salmon	72%
HMS	31%
CPS	29%

Source: EIS, for the Proposed Acceptable Biological Catch and Optimum Yield Specifications and Management 2005-2006

Indirect impacts on enforcement from fishery management actions include change in the availability of information used for conducting further investigations or used with other sources of information to better understand compliance behavior.

VMS positions can be efficient in identifying possible illegal fishing activity and can provide a basis for further investigation by one or more of the traditional enforcement measures. VMS positions in themselves can also be used as the basis for an enforcement action. The positions may also be used to establish "probable cause" before pursuing some types of investigations, for example, in obtaining a search warrant. While not being evidence of sufficient significance by itself, VMS position data could provide sufficient evidence to lead an officer to believe that an illegal act had occurred that warrants further investigation.

Expansion of the VMS program clearly supports an enforcement mission and may also have indirect benefits to Homeland Security activities. Increased border security correlates directly with increased risk within our EEZ and along our coastline for illegal entry. In March 2002, the "Citizen Corps" initiative was announced, which includes the expansion of "Neighborhood Watch" to include the participation of ordinary citizens in detecting and preventing terrorism. Under "Coastal Watch", the Coast Guard requests fishers to report suspicious activities for investigation and intelligence purposes. Critical decisions on the deployment of enforcement assets could be based on VMS position reports. Satellite communication could also update essential information during a law enforcement response. Investigative methodologies could be enhanced via surveillance data maintained within VMS, such as easily identifying potential witnesses to incidents, locating U.S. vessels in areas of suspicious activity for assistance and support and increased intelligence gathering capabilities. By expanding the number of U.S. fishing vessels operating with VMS, NOAA and fishers are expanding the capability to detect and prevent terrorism and other criminal activity in the EEZ. VMS also supports the Coast Guard's "Coastal Watch" initiative, which was developed in response to their homeland defense activities.

<u>Comparison of the Alternatives</u>
VMS would not replace or eliminate traditional enforcement measures such as aerial surveillance, boarding at-sea via patrol boats, landing inspections and documentary investigation. Traditional enforcement measures may need to be activated in response to information received via the VMS. The level of VMS coverage in the OA fleet varies between the alternatives. Therefore, the degree to which a VMS program would aid enforcement in identifying vessels that are legally or illegally operating in the RCAs or benefit enforcement in conducting further investigations, would depend on the proportion of vessels required to carry and use VMS as well as the amount of time the vessels engage in fisheries in areas with the RCA restrictions.

Alternative 1 requires nongroundfish trawl vessels to provide declaration reports prior to leaving port on a trip in which fishing occurs in an RCA. Under Alternative 1, OA fishery position data would be available from vessels that voluntarily use VMS units and from vessels that fish pursuant to the OA regulations, but carry VMS because the vessel is registered to a LE permit. The greatest difficulty in maintaining the integrity of closed areas and the least efficient use of limited state and federal enforcement resources occurs under status quo, Alternative 1.

Alternative 2 maintains the provisions of status quo, but adds the VMS and declaration reporting requirements for approximately 322 longline vessels (282 directed groundfish, 38 Pacific halibut, and 2 California halibut vessels) using longline gear to take and retain, possess or land groundfish. Of the alternatives that require VMS, Alternative 2 requires the smallest proportion of the OA fleet (only vessels using longline gear) to have and use VMS and therefore provides the least amount of data for monitoring incursions. If the groundfish species pursued by the directed longline vessels are in high abundance in the RCA (primarily shelf areas,) fishers may be willing to take the risk to fishing within the boundaries of the RCA particularly if the rate of detection is low. Because Pacific halibut are also found within the RCAs, some fishers may be willing to risk fishing within the RCAs, particularly if the perception of being detected is low. In recent years, the directed halibut fishery south of Point Chehalis has occurred in 3-6 one day 10 hour long openings per year. Given the short duration of the directed halibut fishery, requiring the Pacific halibut vessels that retain groundfish to have VMS would provide a large amount of position data over a very short period of time. Some fishers, those who do not otherwise fish in the groundfish fishery and who only land small amounts of incidentally caught groundfish caught during the primary halibut season, may well choose to discard incidentally caught groundfish, rather than incur the cost of VMS and the burden of installation. HMS longline gear is currently not permitted in the EEZ off the West Coast; therefore, no additional HMS vessels over those affected by status quo would be included as a result of Alternative 2. Because the fishery occurs outside the RCA, HMS longline vessels would transit through the RCA and therefore pose a minimal risk to the integrity of the RCAs. Monitoring HMS longline vessels in relation to the RCA requirements is a lower priority to enforcement.

Alternative 3 includes the same vessels as Alternative 2, but adds the VMS and declaration reporting requirements for vessels using pot gear that take and retain, possess or land OA groundfish. Approximately 515 vessels, those identified under Alternative 2 plus approximately 193 vessels using pot gear (145 directed, 21 Dungeness crab, 6 prawn, and 21 CA sheephead) would be included under Alternative 3. Alternative 3 would provide more data position reports than Alternative 2, however it would provide fewer position reports than Alternative 4A. A small proportion of the Dungeness crab vessels, less than 3% (21 vessels per year out of 801 vessels per year), land the groundfish incidentally taken during the Dungeness crab season. Landing groundfish taken in Dungeness crab pots is not allowed in the states of Washington and XXOregonXX. The Dungeness crab fishery primarily occurs in depths between 5-100 fathoms of water. When the nontrawl RCAs extend from shore to 100 fm, any groundfish retained by a pot vessel fishing for Dungeness crab would be required to have been caught seaward of the 100 fm line. In addition, regulations prohibit vessels from fishing both shoreward and seaward of the RCA on the same trip. VMS could be used to determine if all fishing on a trip in which groundfish was retained occurred seaward of the RCA, or if fishing actually occurred within the RCA on trips in which groundfish was landed. Because few if any vessels target Dungeness crab offshore of 100 fm, Alternative 3 is expected to affect few Dungeness crab vessels. This would not be an issue for nontrawl RCA areas that are defined by a shoreward fathom curve that is seaward of areas where Dungeness crab fishing occurs. VMS would aid enforcement in maintaining the integrity of the shoreward boundary. However, Table 3.3.3.9 shows that the majority of Dungeness crab vessels landing groundfish between 2000 and 2004 have landed less than 100 lb of groundfish in an entire year. Therefore, it is likely that many if not all of the 21 vessels per year that land groundfish, would discard the groundfish to avoid the VMS requirements. Between 2000 and 2004, Table 3.3.3.1 shows that these vessels landed about 0.3 mt of groundfish with an exvessel value of 1,104 per year.

The California nearshore fisheries include vessels that use traps or pot gear to harvest species managed under the groundfish plan as well as non-groundfish such as California Sheephead and Scorpionfish. Of the 68 vessels per year that landed sheephead, 21 vessels retained OA groundfish. Because the nearshore fishery primarily occurs in state waters, it is likely that many of these vessels would not be subject to the VMS requirements; therefore, no VMS position data would be available to enforcement from these vessels. The OA nontrawl RCA between 40°10 and 34°27 N. lat. has a seaward boundary of 150 fm year-round and a shoreward boundary of 20 fm during the summer (May-August) and 30 fm for the remainder of the year. Similarly, the proposed OA nontrawl RCA south of 34°27 N. lat. has a seaward boundary of 150 fm year-round and a shoreward boundary of 60 fm throughout the year. When the shoreward boundary is deeper than 20 fm, it is likely that some vessels will enter the EEZ to fish and be required to carry VMS for the remainder of the year. During the period when the fishery is constrained to 20 fm, there may be a greater incentive for some fishers to harvest nearshore species in deeper water. VMS would be an effective deterrent to illegal fishing in the RCAs. Traditional enforcement measures will likely continue to be the dominant enforcement tool used for monitoring the integrity of the RCAs shoreward line, particularly north of 34°27 N. lat. In the area south of 34°27 N. lat, there may be more incentive for vessels to fish in the EEZ because the shoreward boundary of the RCA extends further into the EEZ. Between 2000 and 2004, Table 3.3.3.1 shows that the California sheephead vessels landed about 1.5 mt of groundfish per year with an exvessel value of $14,558 per year.
Of the 28 vessels per year that landed prawns taken with pot gear, 6 vessels per year retained OA groundfish. Between 2000 and 2004, Table 3.3.3.1 shows that these vessels landed about 0.1 mt of

groundfish per year with an exvessel value of $949 per year. Table 3.3.3.9 shows that the amount of groundfish landed by prawn vessels between 2000 and 2004 varied, with most vessels landing less than 500 lb per year. However, between 1 and 4 vessels per year landed more than 500 lb of groundfish per year. It is likely that most if not all of the vessels that land less than 500 lb per year of groundfish, would discard the groundfish to avoid the VMS requirements.

Alternatives 4A and 4B add VMS coverage for nongroundfish trawl vessels to those vessels identified under Alternative 3. The primary difference between the two alternatives is that Alternative 4A excludes pink shrimp and adds the VMS and declaration reporting requirement for approximately 77 vessels (23 ridgeback prawn, 14 sea cucumber and 40 California halibut vessels) using nongroundfish trawl gear. Alternative 4B includes all of the nongroundfish trawl vessels identified under Alternative 4B, plus 54 pink shrimp vessels. Many vessels that fish for pink shrimp are also registered to LE groundfish permits and therefore already have VMS requirements. Alternative 4B adds those pink shrimp vessels that are not also registered to LE groundfish permits. Having VMS would be expected to be an effective deterrent and aid enforcement in maintaining the integrity of the shoreward line of the RCAs. Because the overfished species impacts projected for the California halibut fishery are 0.03% of the bocaccio OY, 0.21% of the canary rockfish OY, and 0.08% of the lingcod OY, the fishery was considered a higher impact OA incidental fishery. The ridgeback prawn trawl fisheries is considered to have slight impacts on overfished species (defined as those fisheries that take only a single overfished species, with small amounts by weight and proportion of the available OY -less than 0.05%,) given the current management regime, which includes RCA management. Similarly, the sea cucumber trawl fishery is considered one of the lowest impact OA fisheries because no overfished species catch is projected under the current management regime which includes RCAs. Alternative 4B results in no change over Alternative 4A for monitoring incursions into the RCAs because pink shrimp vessels are permitted to fish in the RCA.

Alternative 5A includes the same vessels as Alternative 4A, but adds the VMS and declaration reporting requirements for approximately 1,250 vessels, those identified under Alternatives 2, 3,and 4 plus 590 directed groundfish, 58 California halibut, and 10 HMS vessels using line gear to take and retain, possess or land groundfish(excludes salmon troll vessels). During the period when the fishery is constrained to 20 fm there may be a greater incentive for some fishers to harvest in deeper water. VMS would be an effective deterrent to illegal fishing in the RCAs. As stated above, traditional enforcement measures will likely continue to be the dominant enforcement tool used for monitoring the integrity of the RCA shoreward line, particularly north of 34°27 N. lat. In the area south of 34°27 N. lat, there may be more incentive for vessels to fish in the EEZ because the shoreward boundary of the RCA extends further into the EEZ. Alternative 5B includes slightly more vessels than 5A at 1,453. Although 10 HMS line and 21 Dungeness crab vessels are excluded under Alternative 5B, 234 salmon troll vessels are included. The inclusion of line vessels more than doubles the number of vessels that would be required to have and use VMS. Though this is a large increase in vessels, the system developed for LE vessels already has the capacity to process these position data. Table 3.3.3.9 shows that the majority of line vessels landing groundfish in the OA incidental fisheries using HMS line, California halibut line and the salmon troll gear between 2000 and 2004 have landed less than 100 lb in an entire year. Therefore, it is likely that many of these vessels would discard the groundfish to avoid the VMS requirements.

In general, VMS is an efficient enforcement tool for monitoring if a fishing trip occurred entirely inside or outside an RCA. Using VMS in this way would allow enforcement to determine which cumulative trip limits applied to a particular vessel. However, for salmon troll vessels north of 40°10 N. lat., there has been an allowance to retain yellowtail rockfish only on a trip that occurred both inside and outside and RCA. VMS would be most suited for monitoring cumulative trip limits of groundfish species other than yellowtail rockfish taken and retained by salmon troll vessels north of 40°10 N. lat.

Alternative 6A, which applies to any vessel engaged in commercial fishing to which a RCA restriction applies, includes the largest number of OA vessels, 1,583 vessels. Therefore, Alternative 6A would provide the largest amount of data for enforcement purposes. Including most vessels in the VMS program could be expected to result in time savings for officers in the field and allow them time to conduct more focused investigations than would otherwise be possible. Alternative 6B affects approximately 1,525 vessels annually, 58 fewer than does Alternative 6A. Alternative 7 is essentially the same as Alternative 6A, 1,561 vessels, because it applies to the same vessels except that vessels less than 12 feet in length would be excluded. Most if not all of the 22 vessels that are under 12 feet in length are unlikely to fish in Federal waters and would therefore not trigger the VMS requirement.

Alternative 8 excludes the low impact OA fisheries, those where the incidental catch of overfished species is projected to be minimal: Dungeness crab pot, spot prawn pot, sea cucumber trawl, ridgeback prawn trawl, HMS line, and California sheephead pot. Data from 1,463 vessels includes data from: 349 vessels using longline gear (282 directed groundfish, 65 Pacific halibut, and 2 CA halibut); 145 vessels directed groundfish vessels using pot gear; 40 California halibut vessels using trawl gear, 47 vessels using CA halibut net gear, and; 882 vessels using line gear 590 groundfish directed, 58 California halibut, and 234 salmon troll vessels) would be available to enforcement. Data from the sea cucumber, ridgeback prawn, and pink shrimp trawl vessels would not be included under Alternative 8. The enforcement benefits of this alternative are similar to Alternative 6A except that the exclusion of many nongroundfish trawl vessels where there are specific RCA requirements may result in undetected incursions, with the exception of the pink shrimp fishery.

Because Alternative 9 excludes those vessels with minimal annual catch of groundfish, those that land less than 500 lb of groundfish in a calendar year, it includes fewer nongroundfish trawl vessels than Alternative 8. Under Alternative 9, data from 1,123 vessels could be used to maintain the integrity of RCAs from longline, pot, trawl, line, net and other fishing gear impacts. Vessels included under Alternative 9 are: 349 vessels using longline gear (282 directed groundfish, 65 Pacific halibut, and 2 CA halibut); 150 vessels using pot gear (145 groundfish directed, 1 Dungeness crab,2 prawn and 2 sheephead); 9 California halibut 3and pink shrimp vessels using trawl gear, 15 vessels using CA halibut net gear, and; 597 vessels using line gear 590 groundfish directed, 1 HMS and 6 salmon troll vessels). Many of the longline, pot, and line gear vessels that may choose to avoid VMS by discarding bycatch would be excluded under Alternative 9. Therefore the actual benefit to enforcement is similar to Alternatives 5A-7 for these vessels. The exclusion of many nongroundfish trawl vessels may also result in undetected incursions, with the exception of the pink shrimp fishery for which there are no RCA requirements. The benefit to enforcement for nongroundfish trawl is similar to Alternatives 1-3 for these vessels.

Alternative 10, the no action alternative, would have no VMS requirements, but the use of RCA management would be discontinued and management measures such as trip limits and closed seasons would be used to reduce the catch of overfished species. Enforcement of OA fishery interactions with RCAs would no longer be necessary. Scarce enforcement resources may be used elsewhere to monitor for potential fishery violations other than those related to the OA fishery interactions with RCAs.

The OA fishery does not require participants to have permits or gear endorsements. Directed groundfish participants using fixed gear have the mobility to choose between the legal OA fixed gears for harvesting groundfish. Therefore, if VMS requirements under Alternative 2 or 3 were implemented, it will likely result in some directed groundfish participants changing gear to avoid the VMS requirements. Because a substantial proportion of the directed groundfish fleet is required to use VMS under Alternatives 4-9, the number of directed groundfish vessel operators that are likely to change gear to avoid VMS requirements is reduced. Vessels that incidentally catch groundfish while targeting other species are less likely to change gears to avoid VMS requirements. This is because the various state and federal requirements for the target fishery they are participating in generally restricts the type of gear participants can use. However, participants that catch groundfish incidentally with longline, pot, line, or net gear are not considered to be in the OA groundfish vessels unless they take and retain, possess or land groundfish. This is different from the nongroundfish trawl gear vessels. Therefore, these participants may choose to avoid the VMS requirements by not retaining groundfish, though they would continue to catch groundfish incidentally to the target fishery. The number of participants that would choose to discard groundfish to avoid VMS requirements is unknown; however, a substantial number of participants in the incidental groundfish fisheries land less than 500 lb of groundfish annually (Table 3.3.3.9) and may choose to avoid VMS requirements by discarding the groundfish catch. This type of VMS avoidance would likely occur more frequently with California halibut longline and line gear vessels, Dungeness crab pot vessels, prawn pot vessels, HMS line gear vessels, and salmon troll gear where a large number of vessels land less than 500 lb of groundfish per year. These vessels are excluded under Alternatives 8 and 9. Nongroundfish trawl vessels have less ability of avoid VMS since all vessels, regardless of whether or not groundfish are landed, are included under Alternatives 4A through 7.

SOCIO-ECONOMIC ENVIRONMENT - COMPARISON OF THE ALTERNATIVES	
FISHERY MANAGEMENT	Changes to how the fisheries are managed as a result of the collection of VMS position data
Alternative 1 Status quo	Direct impact The use of area management regulations may need to be simplified, or buffers around closed areas added so the integrity of closed areas can be maintained. The use of management regulations that limit the duration or number of trips are less likely to be considered without adequate monitoring mechanisms. Indirect impact Little position and effort data is available from OA fisheries. Without adequate position and effort data, the use of observer and survey data for refining OA fishery total catch estimates for inseason management is limited. Non-groundfish fisheries continue to occur in the RCA, but incidental groundfish landings other than yellowtail rockfish in the salmon troll fishery north of 40°10' N. lat. cannot be retained or landed. Similarly, if a vessel fishes in the RCA on a trip, groundfish cannot be retained from areas outside the RCAs on the same trip. Some vessels may misreport catch for areas other than where it was caught.
Alternative 2 Vessels using longline gear	Direct impact VMS would allow for greater flexibility in the use of management rules with geographical area restrictions including: seasonal access, closed areas, depth restrictions, limited by duration, or number of trips for approximately 320 vessels (282 directed groundfish, 38 Pacific halibut, and 2 CA halibut OA vessels) using longline gear to take and retain, possess or land OA groundfish. VMS will provide accurate longline fishing location data and thereby help to maintain the integrity of data used for modeling and groundfish management decisions. Accurate fishing location data may be beneficial to Pacific halibut management. Indirect impact Increased OA longline position and effort data could be used along with declaration reports, observer data, survey information, and fish ticket data to better refine estimates of total fishing mortality and improve the ability to manage the fishery inseason to stay within the harvest guidelines and OYs. VMS may result in increased bycatch and lost landings data if incidental groundfish catch by Pacific halibut vessels is not retained. The added cost of VMS may result in vessels with the lowest exvessel revenue from groundfish choosing to not retain groundfish to avoid VMS requirements. HMS longline gear is currently prohibited in EEZ.
Alternative 3 Vessels using longline or pot gear	In **addition** to impacts from the 322 vessels identified under Alt. 2: Direct impact VMS would allow for greater flexibility in the use of management rules for approximately 193 vessels (145 directed, 21 Dungeness crab, 6 prawn, and 21 CA sheephead vessels) using pot gear to take and retain, possess or land OA groundfish. VMS will provide accurate pot and longline fishing location data and thereby help to maintain the integrity of data used for modeling and groundfish management decisions. Accurate fishing location data may be beneficial to Pacific halibut, possibly Dungeness crab, prawn, and CA nearshore species management. Indirect impact Increased longline and pot position and effort data could be used along with declaration reports, observer data, survey information, and fish ticket data to better refine estimates of total fishing mortality and improve the ability to manage the fishery inseason to stay within the harvest guidelines and OYs. The added cost of VMS may result in vessels with the lowest exvessel revenue from groundfish choosing to not retain groundfish to avoid VMS requirements.

SOCIO-ECONOMIC ENVIRONMENT - Continued	
FISHERY MANAGEMENT	Changes to how the fisheries are managed as a result of the collection of VMS position data
Alternative 4A Vessels using longline, pot or trawl gear, except pink shrimp trawl	In **addition** to impacts from the 515 vessels identified under Alt. 2 and 3: Direct impact VMS would allow for greater flexibility in the use of management rules for approximately 23 ridgeback prawn, 14 sea cucumber and 40 CA halibut OA vessels using nongroundfish trawl gear take and retain, possess or land OA groundfish. VMS will provide accurate pot, longline and nongroundfish trawl (except pink shrimp) fishing location data and thereby help to maintain the integrity of data used for modeling and groundfish management decisions. Accurate fishing location data may be beneficial to Pacific halibut, Dungeness crab, prawn, and CA nearshore species management, prawn, sea cucumber, and CA halibut management. Indirect impact Increased longline, pot and nongroundfish trawl position and effort data could be used along with declaration reports, observer data, survey information, and fish ticket data to better refine estimates of total fishing mortality and improve the ability to manage the fishery inseason to stay within the harvest guidelines and OYs.
Alternative 4B Vessels using longline, pot or trawl gear	In **addition** to impacts from the 515 vessels identified under Alt. 2 and 3: Direct impact VMS would allow for greater flexibility in the use of management rules for approximately 646 vessels: 131 vessels (54 pink shrimp, 23 ridgeback prawn, 14 sea cucumber and 40 CA halibut) using nongroundfish trawl gear. VMS will provide accurate pot, longline and nongroundfish trawl fishing location data and thereby help to maintain the integrity of data used for modeling and groundfish management decisions. Accurate fishing location data may be beneficial to Pacific halibut, Dungeness crab, prawn, and CA nearshore species management, prawn, sea cucumber, and CA halibut management. No change over Alt.4A for pink shrimp vessels. Indirect impact Increased longline, pot and nongroundfish trawl position and effort data from 646 vessels could be used along with declaration reports, observer data, survey information, and fish ticket data to better refine estimates of total fishing mortality and improve the ability to manage the fishery inseason to stay within the harvest guidelines and OYs.
Alternative 5A Vessels using longline, pot, trawl or line gear, except: pink shrimp trawl and salmon troll.	In **addition** to impacts from the 592 vessels identified under Alt. 2, 3, and 4: Direct impact VMS would allow for greater flexibility in the use of management rules for approximately 658 vessels (590 groundfish, 58 CA halibut, and 10 HMS vessels) using line gear to take and retain, possess or land OA groundfish. VMS will provide accurate pot, longline, nongroundfish trawl (except pink shrimp), and line gear (except salmon troll) fishing location data and thereby help to maintain the integrity of data used for modeling and groundfish management decisions. Accurate fishing location data may be beneficial to Pacific halibut, Dungeness crab, prawn, and CA nearshore species management, prawn, sea cucumber, HMS and CA halibut management. Indirect impact Increased longline, pot and nongroundfish trawl position and effort data could be used along with declaration reports, observer data, survey information, and fish ticket data to better refine estimates of total fishing mortality and improve the ability to manage the fishery inseason to stay within the harvest guidelines and OYs. The added cost of VMS may result in vessels with the lowest exvessel revenue from groundfish choosing to not retain groundfish to avoid VMS requirements.

SOCIO-ECONOMIC ENVIRONMENT - Continued	
FISHERY MANAGEMENT	Changes to how the fisheries are managed as a result of the collection of VMS position data
Alternative 5B Vessels using longline, pot, trawl or line gear, except: pink shrimp trawl, HMS longline & line, and Dungeness crab pot gear.	Direct impact 1,453 vessels: 322 vessels using longline gear (282 directed groundfish, 38 Pacific halibut, and 2 CA halibut); 172 vessels using pot gear (145 directed groundfish, 6 prawn, and 21 CA sheephead); 77 vessels using nongroundfish trawl gear (23 ridgeback prawn, 14 sea cucumber, and 40 CA halibut vessels), and 882 vessels using line gear (590 groundfish directed, 58 CA halibut, 10 HMS vessels, and 234 salmon troll vessels). VMS would allow for greater flexibility in the use of management rules for pot (except Dungeness crab), longline, nongroundfish trawl (except pink shrimp), and line gear (except HMS and salmon troll), and will thereby help to maintain the integrity of data used for groundfish management and possibly salmon management. VMS will provide accurate pot (except Dungeness crab), longline, nongroundfish trawl (except pink shrimp), and line gear (except HMS and salmon troll) fishing location data and thereby help to maintain the integrity of data used for modeling and groundfish management decisions. Accurate fishing location data may be beneficial to Pacific halibut, prawn, and CA nearshore species, prawn, sea cucumber, and CA halibut management. Indirect impact VMS data from vessels identified under Alt. 2, 3, 4, and 5A (excluding Dungeness crab and HMS vessels) plus approximately 234 salmon troll vessels could be used along with declaration reports, observer data, survey information, and fish ticket data to better refine estimates of total fishing mortality and improve the ability to manage the fishery inseason to stay within the harvest guidelines and OYs. The added cost of VMS may result in vessels with the lowest exvessel revenue from groundfish choosing to not retain groundfish to avoid VMS requirements.
Alternative 6A Vessels with RCA restrictions	Direct impact VMS would allow for greater flexibility in the use of management rules for 1,583 vessels: 349 vessels using longline gear (282 directed groundfish, 65 Pacific halibut, and 2 CA halibut); 193 vessels using pot gear identified under Alt. 3; vessels using trawl gear (approximately 32 ridgeback prawn, 14 Sea cucumber, and 34 CA halibut vessels); 892 vessels using line gear as identified under Alt. 5B (includes salmon troll coastwide); and 72 vessels using net gear (25 HMS and 47 CA halibut). VMS would allow for greater flexibility in the use of management rules for pot (except Dungeness crab), longline, nongroundfish trawl (except pink shrimp), and line gear (except HMS and salmon troll), and will thereby help to maintain the integrity of data used for groundfish management and possibly salmon management. VMS will provide accurate pot, longline, nongroundfish trawl (except pink shrimp), and line gear fishing location data and thereby help to maintain the integrity of data used for modeling and groundfish management decisions. Accurate fishing location data may be beneficial to Pacific halibut management, Dungeness crab, prawn, HMS, CA nearshore species, salmon, sea cucumber, and CA halibut management. Indirect impact Increased position and effort data from 1,583 vessels: 349 vessels using longline gear are included (282 directed groundfish, 65 Pacific halibut, and 2 CA halibut); 193 vessels using pot gear identified under Alt. 3; all vessels using trawl gear (approximately 32 ridgeback prawn, 14 Sea cucumber, and 34 CA halibut vessels); 892 vessels using line gear as identified under Alt. 5B (includes salmon troll coastwide) to take and retain, possess or land OA groundfish; vessels using net gear (approximately 3 CPS vessels); and 4 vessels using other OA gears. Data could be used along with declaration reports, observer data, survey information, and fish ticket data to better refine estimates of total fishing mortality and improve the ability to manage the fishery inseason to stay within the harvest guidelines and OYs. The added cost of VMS may result in vessels with the lowest exvessel revenue from groundfish choosing to not retain groundfish to avoid VMS requirements.

SOCIO-ECONOMIC ENVIRONMENT - Continued	
FISHERY MANAGEMENT	Changes to how the fisheries are managed as a result of the collection of VMS position data
<u>Alternative 6B</u> Vessels with RCA restrictions except salmon troll north that retain only yellowtail rockfish	<u>Direct impact</u> VMS would allow for greater flexibility in the use of management rules for slightly fewer vessels than those identified under Alt. 6A, because 58 salmon troll vessels fishing north of 40°10' N. lat. that only land yellowtail rockfish would be excluded. VMS will provide slightly less data than Alt. 6A and thereby help to maintain the integrity of data used for modeling and groundfish management decisions. Accurate fishing location data may be beneficial to Pacific halibut, Dungeness crab, prawn, HMS, CA nearshore species, sea cucumber, CA halibut and salmon management (excluding salmon troll vessels fishing north of 40°10' N. lat.) <u>Indirect impact</u> VMS would decrease position and effort data for slightly fewer vessels than those identified under Alt. 6A, because salmon troll vessels fishing north of 40°10' N. lat. that only land yellowtail rockfish would be excluded. Fewer salmon vessels would be expected to discard groundfish to avoid VMS requirements.
<u>Alternative 7</u> Vessel >12 ft with RCA restrictions	<u>Direct impact</u> VMS would allow for greater flexibility in the use of management rules for slightly less vessels than those identified under Alt. 6A. Approximately 22 vessels under 12 ft in length would be excluded. VMS will provide slightly less data than Alt. 6A and thereby help to maintain the integrity of data used for modeling and groundfish management decisions. Accurate fishing location data may be beneficial to Pacific halibut, Dungeness crab, prawn, HMS, CA nearshore species, sea cucumber, CA halibut and salmon management (excluding salmon troll vessels fishing north of 40°10' N. lat.) <u>Indirect impact</u> Similar to those impacts identified under Alt.6A. because 22 vessels under 12 ft in length would be excluded. Few if any of these vessels are expected to fish in Federal waters.
<u>Alternative 8</u> Excludes all low impact OA fisheries, those where the incidental catch of overfished species is projected to be minimal.	<u>Direct impact</u> Includes data from 1,463 vessels: 349 vessels using longline gear 282 directed groundfish, 65 Pacific halibut, and 2 CA halibut); 145 vessels directed groundfish vessels using pot gear; 40 CA halibut vessels using trawl gear, 47 vessels using CA halibut net gear, and; 882 vessels using line gear 590 groundfish directed, 58 CA halibut, and 234 salmon troll vessels). VMS would allow for greater flexibility in the use of management rules for vessels identified under this alternative. For the incidental OA vessels identified under this alternative, accurate VMS fishing location data may be beneficial to the nongroundfish target fisheries management. <u>Indirect impact</u> Increased position and effort data from 1,463. Data could be used along with declaration reports, observer data, survey information, and fish ticket data to better refine estimates of total fishing mortality and improve the ability to manage the fishery inseason to stay within the harvest guidelines and OYs. The added cost of VMS may result in vessels with the lowest exvessel revenue from groundfish choosing to not retain groundfish to avoid VMS requirements.
SOCIO-ECONOMIC ENVIRONMENT - Continued	

FISHERY MANAGEMENT	Changes to how the fisheries are managed as a result of the collection of VMS position data
<u>Alternative 9</u> Directed vessels. those that land more than 500 lb of groundfish in a calendar year.	<u>Direct impact</u> Includes data from 1,123 vessels: 349 vessels using longline gear (282 directed groundfish, 65 Pacific halibut, and 2 CA halibut); 150 vessels using pot gear (145 groundfish directed, 1 Dungeness crab,2 prawn and 2 sheephead); 9 CA halibut and 3 pink shrimp vessels using trawl gear, 15 vessels using CA halibut net gear, and; 597 vessels using line gear 590 groundfish directed, 1 HMS and 6 salmon troll vessels). VMS would allow for greater flexibility in the use of management rules for vessels identified under this alternative. For incidental OA vessels identified under this alternative, accurate VMS fishing location data may be beneficial to the nongroundfish target fisheries management. <u>Indirect impact</u> Increased position and effort data from 1,123. Data could be used along with declaration reports, observer data, survey information, and fish ticket data to better refine estimates of total fishing mortality and improve the ability to manage the fishery inseason to stay within the harvest guidelines and OYs.
<u>Alternative 10</u> No Action. No VMS requirements. Discontinue the use of RCA management and adust trip limits and seasons accordingly.	<u>Direct impact</u> The use of RCA management would be discontinued and management measures such as trip limits and closed seasons would need be used to reduce the catch of overfished species. Keeping overfished catch within the OY may required extensive closures. <u>Indirect impact</u> Little data available to managers to assess OA fishing location and intensity.
Each of the alternatives identifies and estimated number of vessels that are likely to be affected by the VMS requirement. These values are based on the average level of participation from 2000 to 2004, except for pink shrimp trawl which was based on 2003-2004. It is important to point out that these values may not be the actual number of vessels that would continue to use a particular gear type if VMS requirements were adopted.	

4.3.2 Fishery Management

Direct impacts on fishery management actions include changes in the availability of information that directly aids fishery managers in administering time/areas restrictions. These restrictions typically include: seasonal access restrictions to resources, closed area management, depth restrictions, trip duration restrictions, or limits on the number trips. Deterring misreporting of catch for areas other than where fish were caught is also a direct effect on management because accurate information is needed to maintain the integrity of data used for management decisions made during the fishing season.

When there is a high degree of error or potential non-compliance associated with time/area restrictions, meeting management objectives is more difficult. Therefore, managers must be more conservative in order to meet harvest objectives. Having greater flexibility in the use of management rules with time/area restrictions is advantageous because it allows managers to deal with harvest issues on a refined level, rather than having to be more conservative to buffer for greater error or potential non-compliance. If problems can be identified early, prompt action can be taken to minimize the impacts on the groundfish fleet or the stock. For example, if fishing effort by some or all sectors of the fishery shifts to areas where data indicates that higher bycatch are likely, preseason projections may be inaccurate. If managers can identify such shifts, they may be able to restrict access to areas of high bycatch to keep overall catch within the harvest specifications.

Some mis-reporting and transcription errors can be addressed using VMS. Misreporting of catch directly undermines efforts to manage fisheries properly and impedes progress toward the goal of sustainable fisheries. Deterring the misreporting of catch taken in areas other than where fish were caught helps to maintain the integrity of data used for management decisions.

When linked with a personal computer, laptop or data terminal, VMS systems with 2-way communications (currently 2-way systems are not required in the groundfish fishery) can provide commercial fishers with the opportunity to report catch information electronically to home offices and fisheries managers. Under VMS, detailed commercial catch data and details of specific areas fished (provided by GPS) could be recorded using on-board computers or a mobile terminal and transmitted directly to a central database. The central database could be programmed to analyze the aggregate data from all vessels as it is received, thereby enabling the performance of the fishery to be monitored in ‘real time’, allowing more effective and timely fisheries management strategies to be developed. Satellite technology has the potential to quickly transform fisheries management from being reactive, based on limited historical data, to a pro-active process involving decisions based on analysis of real time data about the fishery. Fisheries management strategies are underpinned by catch data supplied by fishers and processors. There is usually a substantial delay before fish tickets, the primary information source to assess fishing activities, is received, analyzed and available in a format suitable for use by fisheries managers.

Indirect impacts on fishery management include change in the availability of information used as a basis for making management recommendations and decisions that are more distant in time. VMS position data along with data from other sources may be combined and analyzed to better understand the effectiveness of management actions at achieving the intended results and to make recommendations for future measures.

Typically, fisheries management rules are designed to achieve sustainable and profitable fishing through a variety of methods. This usually includes some form of licensed vessel access to particular areas, restrictions on gear types, restrictions on fishing time, quotas on the amounts of particular species that may be caught, etc. Fishery management is most effective when catch in the fishery can be quantified and measured. This means measuring the quantity of fish being caught and identifying the place where the fish are caught. VMS does not provide information on the quantity of fish being caught nor does the system being proposed for the OA groundfish fishery require that the VMS system be used as a means of communicating catch information, though some VMS transceivers can be used as a communication tool. VMS does, however, clearly make it possible to improve the availability of data in relation to the location of fish catch.

Data gathered from commercial fisheries are needed to assess the effectiveness of management regulations. Logbooks, landing surveys, VMS, and observers are different fishery dependent methods used to collect data on harvest location. Interception at sea by an independent vessel can also be used to obtain harvest location data. The cost of collecting data directly from fishery participants tends to be lower than collecting the data from an independent source. This is because it is a byproduct of the fishing activity. Some forms of fishery dependent data, particularly unverified logbooks and landing surveys, are more subject to bias than other methods and their collection and use in measuring the effectiveness of management measures requires added care such as verification procedures. Alternatives 2 -7 provide for expanded VMS coverage that has the potential of producing reliable and useful position data for assessing the effectiveness of OA fishery management measures relating to time and area management. At a minimum, the data can be used to efficiently monitor fishing location and to verify times and dates for the OA fleet where logbook data is generally not available. It can also be used to provide information on days at sea and effort by area. When combined with observer data, broader interpretations of position data may be possible.

Understanding where fishing effort is occurring in real time may provide insight into understanding information reported on fish tickets and be useful in understanding how management measures affect fishing behavior. Knowing where a vessel is fishing, as compared to where the catch is being landed, may be valuable in assessing the effectiveness of trip limit management lines and differential trip limits. The data provided by VMS are cost effective and accurate over large geographical areas. Accurate and timely data on fishing locations are necessary to assess effectiveness of closed areas and the overall results of the management scheme.

VMS data can be combined with observer data to assess the effectiveness of management measures. However, the value in combining observer data with VMS data for non-enforcement purposes depends on the amount of observer data on catch and discards that is available from the different gears and fishing strategies. At this time, there is little data on the OA fisheries. In the long term, when observer data becomes available, VMS may provide information that results in a better understanding of fishery location and a spatial understanding of fish stocks.

As noted above, electronic logbooks have been developed that can be integrated with VMS transceivers with two-way communications. If electronic logbooks could be combined with a VMS system for all or a portion of the OA fisheries, there would be several indirect benefits to management and to the quality and availability of information on which management decisions are based. First, there is only a single data entry function and this can be performed very soon after each fishing operation is completed (at-sea or shoreside depending on the individual fishery). Paper logbooks must first be filled out by the fisher and then submitted to a government agency for data entry before logbook data can be used. In performing the data entry function, the fisher will interact directly with the editing checks for the data and a more complete and accurate data record can be required before the data record is accepted by the computer system. Having electronically recorded the data, the operator may produce a hard copy and also transmit the data to the fisheries agency or other recipients such as the fishing company, allowing that data to be easily incorporated into appropriate databases. As a result, improvements in timeliness, accuracy and reduced costs are possible. When the data is in the database and available to be analyzed, it can be used to improve the ability of managers to measure the effectiveness and economic impacts of management measures.

<u>Comparison of the Alternatives</u>
The level of fleet coverage, that portion of the overall OA fishing fleet that would be required to have VMS and provide declaration reports, is the primary difference between the alternatives. Each of the alternatives defines the portion of the OA fleet, that would be required to carry and use VMS transceivers and provide gear declaration reports. Alternative 10 is the only alternative that goes beyond VMS coverage by discontinuing the non-trawl and trawl RCA requirements for the OA fisheries.

Alternative 1 requires nongroundfish trawl vessels to provide declaration reports prior to leaving port on a trip in which fishing occurs in an RCA. Under Alternative 1, the least amount of data would be available to support a flexible management regime or to deter misreporting of catch. However, this is the alternative that is most likely to result in incidentally caught groundfish being retained because the added cost for retaining incidentally caught groundfish is minimal and may be used to offset the cost of the fishing trip for the target species.

Alternative 2 maintains the declaration provisions of status quo, but adds the VMS and declaration reporting requirements for approximately 322 vessels (282 directed groundfish, 38 Pacific halibut, and 2 CA halibut) vessels using longline gear to take and retain, possess or land groundfish. Of the alternatives that require VMS, Alternative 2 would require the smallest proportion of the OA fleet (only vessels using longline gear) to have and use VMS and therefore provide the least amount of data that can be used along with declaration reports, observer data, survey information, and fish ticket data to better refine estimates of total fishing mortality and improve the ability to manage the fishery inseason to stay within the harvest guidelines and OYs. VMS may result in increased bycatch and lost landings data if incidental groundfish catch by Pacific halibut vessels is not retained. The added cost of VMS may result in vessels with the lowest exvessel revenue from groundfish choosing to not retain groundfish to avoid VMS requirements. Given the mobility of vessels within the fishery, directed longline vessels could choose to change gears to avoid the VMS requirements. VMS will provide accurate longline fishing location data and thereby help to maintain the integrity of data used for modeling and groundfish management decisions. Accurate fishing location data may be beneficial to Pacific halibut management. The added cost of VMS may result in vessels with the lowest exvessel revenue from groundfish choosing to not retain groundfish to avoid VMS requirements.

Alternative 3, includes the same vessels as Alternative 2, but adds the VMS and declaration reporting requirements for approximately 193 vessels (145 directed, 21 Dungeness crab, and 6 prawn, 21 CA sheephead) using pot gear to take and retain, possess or land OA groundfish. Therefore, Alternative 3 would provide more data than Alternative 2; however, it would provide less data than Alternative 4A. The addition of the pot gears to the VMS program will allow for greater flexibility in the use of management rules for vessels using pot gear that take and retain, possess or land OA groundfish. VMS will provide accurate pot and longline fishing location data and thereby help to maintain the integrity of data used for modeling and groundfish management decisions. Accurate fishing location data may be beneficial to Pacific halibut, possibly Dungeness crab, prawn, and CA nearshore species management. Similar to Alternative 2, under Alternative 3, some vessels may change to line gear to avoid the VMS requirements. Table 3.3.3.9 groups vessels into weight categories (less than 100 lb per year, 101-500 lb per year, 500-1000 lb per year, and more than 1000 lbs per year) based on the annual weight of groundfish landed between 2000-2004. Table 3.3.3.9 shows that the majority of Dungeness crab vessels landing groundfish between 2000 and 2004 have landed less than 100 lb in an entire year. Therefore, it is likely that most if not all of the 21 vessels per year that land groundfish would discard the groundfish to avoid the VMS requirements. Between 2000 and 2004, Table 3.3.3.1 shows that Dungeness crab vessels landed about 0.3 mt of groundfish per year with an exvessel value of $1,104.

Alternatives 4A and 4B add VMS coverage for nongroundfish trawl vessels to the vessels identified under Alternative 3. The primary difference between the 2 alternatives is that Alternative 4A adds the VMS and declaration reporting requirement for approximately 77 vessels (23 ridgeback prawn, 14 sea cucumber and 40 California halibut vessels) using nongroundfish trawl gear that take and retain, possess or land groundfish. Alternative 4B includes all of the nongroundfish trawl vessels identified under Alternative 4A plus 54 pink shrimp vessels. Many vessels that fish for pink shrimp are also registered to LE groundfish permits and therefore already have VMS requirements. Alternative 4B adds those pink shrimp vessels that are not also registered to LE groundfish permits. VMS would allow for greater flexibility in the use of management rules for vessels using nongroundfish trawl gear. VMS will provide accurate pot, longline and nongroundfish trawl (except pink shrimp on 4A) fishing location data and thereby help to maintain the integrity of data used for modeling and groundfish management decisions. Accurate fishing location data may be beneficial to Pacific halibut, Dungeness crab, prawn, and CA nearshore species management, prawn, sea cucumber, and CA halibut management. This may be valuable for those monitoring fisheries that have area restrictions. Alternative 4B results in no change over Alternative 4A for pink shrimp vessels because fishing in the RCA is permitted for these vessels. Increased longline, pot and nongroundfish trawl position and effort data could be used along with declaration reports, observer data, survey information, and fish ticket data to better refine estimates of total fishing mortality and improve the ability to manage the fishery inseason to stay within the harvest guidelines and OYs.

Alternative 5A includes the same vessels as Alternative 4A, but adds the VMS and declaration reporting requirements for approximately 590 vessels groundfish, 58 CA halibut, and 10 HMS vessels using line gear to take and retain, possess or land groundfish (excludes salmon troll vessels). VMS would allow for greater flexibility in the use of management rules for the vessels identified under this alternative. VMS will provide accurate pot, longline, nongroundfish trawl (except pink shrimp), and line gear (except salmon troll) fishing location data and thereby help to maintain the integrity of data used for modeling and groundfish management decisions. Accurate fishing location data may be beneficial to Pacific halibut, Dungeness crab, prawn, and CA nearshore species management, prawn, sea cucumber, HMS and CA halibut management Alternative 5B does not include vessels in fisheries that are projected to have minimal impacts on overfished species (10 HMS line and 2 longline, 21 Dungeness crab pot), it includes approximately 234 salmon troll vessels. Under this alternative, VMS would allow for greater flexibility in the use of management rules for pot (except Dungeness crab), longline, nongroundfish trawl (except pink shrimp), and line gear (except HMS and salmon troll), and will thereby help to maintain the integrity of data used for groundfish management and possibly salmon management. VMS will provide accurate pot (except Dungeness crab), longline, nongroundfish trawl (except pink shrimp), and line gear (except HMS and salmon troll) fishing location data and thereby help to maintain the integrity of data used for modeling and groundfish management decisions. Accurate fishing location data may be beneficial to Pacific halibut, prawn, and CA nearshore species, prawn, sea cucumber, and CA halibut management. Alternatives 5A and 5B may also benefit salmon management which has area restrictions.

Alternative 6A, which applies to any vessel engaged in commercial fishing to which an RCA restriction applies, includes the largest number of OA vessels. Approximately 1,583 vessels are included under Alternative 6A: 349 vessels using longline gear are included (282 directed groundfish, 65 Pacific halibut, and 2 CA halibut); 193 vessels using pot gear identified under Alternative 3; all vessels using trawl gear (approximately 32 ridgeback prawn, 14 Sea cucumber, and 34 CA halibut vessels); 892 vessels using line gear as identified under Alt. 5B (includes salmon troll coastwide) that take and retain, possess or land OA groundfish; and 72 vessels using net gear (25 HMS and 47 CA halibut). VMS would allow for greater flexibility in the use of management rules for pot (except Dungeness crab), longline, nongroundfish trawl (except pink shrimp), and line gear (except HMS and salmon troll), and will thereby help to maintain the integrity of data used for groundfish management and possibly salmon management. VMS will provide accurate pot, longline, nongroundfish trawl (except pink shrimp), and line gear fishing location data and thereby help to maintain the integrity of data used for modeling and groundfish management decisions. Accurate fishing location data may be beneficial to Pacific halibut management, Dungeness crab, prawn, HMS, CA nearshore species, salmon, sea cucumber, and CA halibut management. Data could be used along with declaration reports, observer data, survey information, and fish ticket data to better refine estimates of total fishing mortality and improve the ability to manage the fishery inseason to stay within the harvest guidelines and OYs. Alternative 6A would provide the most VMS data and would support the most flexible management regime.

Alternative 6B affects approximately 58 less vessels annually than does Alternative 6A, all of whom use salmon troll gear north of 40°10' N. lat. and retain only yelloweye rockfish. Alternative 7, is much the same as Alternative 6A except that data from approximately 22 vessels (6 longline, 2 pot, and 14 line gear vessels) would not be available because the vessels less than 12 feet in length would be excluded. However, most if not all vessels under 12 feet in length are not expected to fish in Federal waters and would therefore not trigger the VMS requirement.

Alternative 8 excludes the low impact OA fisheries, those where the incidental catch of overfished species is projected to be minimal: Dungeness crab pot, spot prawn pot, sea cucumber trawl, ridgeback prawn trawl, HMS line, and California sheephead pot. Data from 1,463 vessels includes data from: 349 vessels using longline gear (282 directed groundfish, 65 Pacific halibut, and 2 CA halibut); 145 vessels directed groundfish vessels using pot gear; 40 California halibut vessels using trawl gear, 47 vessels using CA halibut net gear, and; 882 vessels using line gear 590 groundfish directed, 58 California halibut, and 234 salmon troll vessels). VMS would allow for greater flexibility in the use of management rules for vessels identified under this alternative. For the incidental OA vessels identified under this alternative, accurate VMS fishing location data may be beneficial to the nongroundfish target fisheries management. Data could be used along with declaration reports, observer data, survey information, and fish ticket data to better refine estimates of total fishing mortality and improve the ability to manage the fishery inseason to stay within the harvest guidelines and OYs.

Because Alternative 9 excludes those vessels with minimal annual catch of groundfish, those that land less than 500 lb of groundfish in a calendar year, it includes fewer nongroundfish trawl vessels than Alternative 8. Under Alternative 9, data from 1,123 vessels could allow for greater flexibility in the use of management rules for the vessels under this alternative. Vessels included under Alternative 9 are: 349 vessels using longline gear (282 directed groundfish, 65 Pacific halibut, and 2 CA halibut); 150 vessels using pot gear (145 groundfish directed, 1 Dungeness crab,2 prawn and 2 sheephead); 9 California halibut 3and pink shrimp vessels using trawl gear, 15 vessels using CA halibut net gear, and; 597 vessels using line gear 590 groundfish directed, 1 HMS and 6 salmon troll vessels). VMS would allow for greater flexibility in the use of management rules for vessels identified under this alternative. For the incidental OA vessels identified under this alternative, accurate VMS fishing location data may be beneficial to the nongroundfish target fisheries management. Only small amounts of data are likely to be available from the California halibut, and salmon troll fisheries.

Alternative 10, the no action alternative would have no VMS requirements, but the use of RCA management would be discontinued and management measures such as trip limits and closed seasons would be used to reduce the catch of overfished species. Little data would be available to managers to assess OA fishing location and intensity.

SOCIO-ECONOMIC ENVIRONMENT - COMPARISON OF THE ALTERNATIVES	
HARVESTERS & PROCESSORS	Changes in fishery participation costs and groundfish revenue as a result of the requirement to carry and use VMS.
Alternative 1 Status quo	Direct impacts No change in fishery participation costs for harvesters. Because enforcement has less ability to target enforcement activities, vessels without VMS or declaration reports may be the subject of more investigations and boardings than vessels with VMS or those providing declaration reports. The RCAs may need to be simplified, or buffers around closed areas added so the integrity of closed areas can be maintained; fishers will likely encounter increased costs from fishing in areas where catch rates are lower. Indirect impacts Potential future groundfish catch levels may be reduced and stability in the fishery may be decreased if non-compliance with depth-based management measures results in higher than projected of overfished species catch.
Alternative 2 Vessels using longline gear	Direct impacts: Per vessel costs for a transceiver unit with installation are $1,200-$2,700 in Year 1, and $250-$625 in subsequent years. Annual operating cost to harvesters include: maintenance $60-$160 and transmission fees $192-$730. Fishers who land groundfish taken incidentally in non-groundfish fisheries and fishers who are less dependent on groundfish may choose to exit the fishery by not retaining groundfish or by not targeting groundfish. An unknown portion of directed groundfish vessels using longline gear to take and retain, possess or land groundfish may choose to change gears to pot or line gear avoid VMS requirements. Estimated purchase cost of VMS services to the fishing industry if all vessels remain in the fishery is $448,224 - $1,458,660 year 1, $61,824 - $235,060 in subsequent years. Greater flexibility in the use of management rules with geographical areas restrictions allows greater access to healthy stocks than would otherwise not be allowed. Indirect impacts: Potential for future increases in groundfish catch levels could offset short-term economic loss associated with VMS if increased stability in the fishery results because the integrity of RCAs is maintained. Benefits of fishery stability would likely be greatest for fishers with high degrees of dependency on groundfish. If less dependent vessels leave the fishery, groundfish landings limits for healthy stocks could potentially increase for the remaining fishers. Vessels that purchase VMS units with 2-way communications could choose to use email communications to market catch that would otherwise be discarded at sea. If this were to occur, it could lead to greater efficiencies in seafood marketing and reduced discards for approximately 282 directed groundfish, 38 Pacific halibut, and 2 CA halibut vessels using OA longline gear. If a large portion of the fishery chose to use 2-way communications to contact a broader range of buyers and coordinate deliveries or to negociate purchase prices, it could result in shift in the processing sector. Processors buying low volumes of groundfish from a large number of fishers who each land small amounts, such as occurs in the live-fish fisheries, may have difficulty obtaining groundfish if the number of fishers who choose to exit the fishery is substantial in a given port.

SOCIO-ECONOMIC ENVIRONMENT - Continued	
HARVESTERS & PROCESSORS	Changes in fishery participation costs and groundfish revenue as a result of the requirement to carry and use VMS.
Alternative 3 Vessels using longline or pot gear	Direct impact: Per vessel costs are the same as Alt. 2. An unknown portion of directed groundfish vessels using pot gear may choose to change to line gear to avoid VMS requirements. Estimated purchase cost of VMS services to the fishing industry if all vessels remain in the fishery is $716,880 - $2,332,950 year 1, $98,880 - $375,950 in subsequent years. Greater flexibility in the use of management rules with geographical areas - slightly greater benefit than Alt. 2 because both longline and pot vessels that take and retain, possess or land groundfish are included. Indirect impact: Potential for future increases in groundfish catch levels slightly increased over Alt. 2., because the likelihood of the integrity of the RCAs being maintained increases when both longline and pot vessels that take and retain, possess or land groundfish are included. Benefits of fishery stability would be greatest for directed fishers who have a high degree of dependency on groundfish. Potential benefits of marketing efficiencies and potential shift in processing sector as identified under Alt. 2, plus approximately 193 vessels using pot gear could choose to use VMS communications as marketing tool. The risk to low volume processors is slightly greater than Alt. 2
Alternative 4A Vessels using longline, pot or trawl gear (except pink shrimp)	Direct impact: Per vessel costs are the same as Alt.2. Estimated purchase cost of VMS services to the fishing industry if all vessels remain in the fishery is $824,064 - $2,681,760 year 1, $113,664 - $432,160 in subsequent years. Greater flexibility in the use of management rules with geographical areas - slightly greater benefit than Alt. 3 because longline, pot, and nongroundfish trawl (excluding pink shrimp) vessels that take and retain, possess or land groundfish are included. Indirect impact: Potential for future increases in groundfish catch levels slightly increased over Alt. 3., because likelihood of RCA integrity being maintained is increased when longline, pot, and nongroundfish trawl (excluding pink shrimp) vessels are included. Benefits of fishery stability would be greatest for directed fishers who have a high degree of dependency on groundfish. Potential benefits of marketing efficiencies and potential shift in processing sector is as identified under Alt. 2 and 3, plus approximately 77 vessels using nongroundfish trawl gear could choose to use VMS communications as marketing tool. The risk to low volume processors is slightly greater than Alt. 3

SOCIO-ECONOMIC ENVIRONMENT - Continued	
HARVESTERS & PROCESSORS	Changes in fishery participation costs and groundfish revenue as a result of the requirement to carry and use VMS.
Alternative 4B Vessels using longline, pot or trawl gear	Direct impact: Per vessel costs are the same as Alt.2. Estimated purchase cost of VMS services to the fishing industry if all vessels remain in the fishery is $899,232 - $2,926,380 year 1, $124,032 -$471,580 in subsequent years. Greater flexibility in the use of management rules with geographical areas - benefits are the same as Alt. 4A because longline, pot, and nongroundfish trawl vessels that take and retain, possess or land groundfish are included. Cost to pink shrimp fishers increases without increase in direct benefits. Indirect impact: Potential for future increases in groundfish catch levels same as Alt. 4A., because likelihood of RCA integrity being maintained is increased when longline, pot, and nongroundfish trawl vessels are included. Benefits of fishery stability would be greatest for directed fishers who have a high degree of dependency on groundfish. Pink shrimp trawl is neutral because they use finfish excluders and do not have RCA restrictions. Potential benefits of marketing efficiencies and potential shift in processing sector is as identified under Alt. 2 and 3, plus approximately 131 vessels using nongroundfish trawl gear could choose to use VMS communications as marketing tool. Risk to low volume processors is slightly greater than Alt. 4B
Alternative 5A Vessels using longline, pot, trawl or line gear, except: pink shrimp trawl and salmon troll.	Direct impact: Per vessel costs are the same as Alt.2. Estimated purchase cost of VMS services to the fishing industry if all vessels remain in the fishery is $1,740,000 - $5,662,500 year 1, $240,000 - $912,500 in subsequent years. Greater flexibility in the use of management rules with geographical areas - slightly greater benefit than Alt. 4A because longline, pot, nongroundfish trawl (excluding pink shrimp), and line vessel (excluding salmon troll) that take and retain, possess or land groundfish are included. Indirect impact: Potential for future increases in groundfish catch levels slightly increased over Alt. 4A, because likelihood of RCA integrity being maintained is increased when longline, pot, nongroundfish trawl (excluding pink shrimp), and line vessel (excluding salmon troll) that take and retain, possess or land groundfish are included. Benefits of fishery stability would be greatest for fishers with high degree of dependency on groundfish. Potential benefits of marketing efficiencies and potential shift in processing sector as identified under Alt. 2, 3 and 4 except that approximately 590 groundfish, 58 CA halibut, and 10 HMS vessels using line gear to take and retain, possess or land groundfish could also receive potential benefits of marketing efficiencies and stability in the groundfish fishery. Risk to low volume processors is slightly greater than Alt. 4

Alternative 5B Vessels using longline, pot, trawl or line gear, except: pink shrimp trawl, HMS longline & line, and Dungeness crab pot gear.	Direct impact: Per vessel costs are the same as Alt.2. Estimated purchase cost of VMS services to the fishing industry if all vessels remain in the fishery is $2,022,576 - $6,582,090 year 1, $278,976 - $1,060,690 in subsequent years. Greater flexibility in the use of management rules with geographical areas - slightly greater than Alt. 5A because longline, pot, nongroundfish trawl (excluding pink shrimp), and line vessels that take and retain, possess or land groundfish are included. HMS and Dungeness crab vessels are not projected to have overfished species catch in 2005; therefore, excluding them would likely result in minimal if any changes to overfished species management flexibility. Indirect impact: Potential for future increases in groundfish catch levels slightly increased over Alt. 5A., because likelihood of RCA integrity being maintained is increased when longline, pot, nongroundfish trawl (excluding pink shrimp), and line vessels that take and retain, possess or land groundfish are included. Salmon troll vessels have a greater potential for taking constraining overfished species than do the Dungeness crab and HMS vessels that would be excluded under this alternative. Benefits of fishery stability would be greatest for fishers with high degree of dependency on groundfish. Potential benefits from marketing efficiencies and stability in the groundfish fishery as identified Alt. 2, 3, 4 and 5A, except Dungeness crab and HMS vessels, but for an additional 241 salmon troll vessels. Risk to low volume processors is slightly greater than Alt. 5A because salmon troll vessels are included
Alternative 6A Vessels with RCA restrictions	Direct impact: Per vessel costs are the same as Alt.2. Estimated purchase cost of VMS services to the fishing industry if all vessels remain in the fishery is $2,203,536 - $7,170,990 year 1, $303,936 - $1,155,590 in subsequent years. Greatest flexibility in the use of management rules with geographical areas because all longline, pot, nongroundfish trawl (excluding pink shrimp), and line vessel that have RCA restrictions would be included. Unlike 5B, all nongroundfish trawl vessels would be included rather than only those that take and retain, possess or land groundfish. Indirect impact: Potential for future increases in groundfish catch levels is greatest under this alternative, because likelihood of RCA integrity being maintained is increased when all vessels that have RCA restrictions are included. Benefits of fishery stability would be greatest for fishers with high degree of dependency on groundfish. Potential benefits from marketing efficiencies and stability in the groundfish fishery as identified under Alt. 2, 3, 4, & 5A and all Pacific halibut directed fishery vessels, vessels using salmon troll gear to take and retain, possess or land groundfish, and all vessels using nongroundfish trawl gear. Risk to low volume processors is similar to 5B

SOCIO-ECONOMIC ENVIRONMENT - Continued	
HARVESTERS & PROCESSORS	Changes in fishery participation costs and groundfish revenue as a result of the requirement to carry and use VMS.
Alternative 6B Vessels with RCA restrictions except salmon troll north that retain only yellowtail rockfish	Direct impact: Per vessel costs are the same as Alt. 2. Vessels that are likely to leave the fishery is the same as Alt. 6A except that the number of salmon trollers that are likely to leave the fishery is slightly less than under Alt. 6A because 58 vessels fishing north of 40°10' N. lat. that only land yellowtail rockfish would not be required to have VMS. The estimated purchase cost of VMS services to the fishing industry if all vessels remain in the fishery is $2,122,800 - $ 6,908,250 in year 1, $292,800 - $1,113,250 in subsequent years. Greater flexibility in the use of management rules with geographical areas (slightly less than 6A) because all longline, pot, nongroundfish trawl (excluding pink shrimp), and line vessels (excluding salmon troll north of 40°10' N. lat. that only land yellowtail rockfish) that have RCA restrictions would be included. Unlike Alt.5B, all nongroundfish trawl vessels would be included rather than only those that take and retain, possess or land groundfish. Indirect impact: Potential for future increases in groundfish catch levels is slightly less than to those identified under Alt. 6A; 58 salmon troll vessels fishing north of 40°10' N. lat. that only land yellowtail rockfish would be excluded. Potential benefits from marketing efficiencies as identified under Alt. 6A, because salmon troll vessels fishing north of 40°10' N. lat. that only land yellowtail rockfish would be excluded. The risk to low volume processors greatest, but similar to 5B
Alternative 7 Vessel >12 ft with RCA restrictions	Direct impact: Per vessel costs are the same as Alt. 2. Estimated purchase cost of VMS services to the fishing industry if all vessels remain in the fishery is $2,172,912 - $7,071,330 year 1, $299,712 - $1,139,530 in subsequent years. Greater flexibility in the use of management rules with geographical areas because all longline, pot, nongroundfish trawl (excluding pink shrimp), and line vessels >12 ft in length that have RCA restrictions would be included. Unlike Alt.5B, all nongroundfish trawl vessels would be included rather than only those that take and retain, possess or land groundfish. Basically, same as 6A because it is unlikely that many, if any, of the 22 vessels that are < 12 ft in length fish in Federal waters. Indirect impact: Potential for future increases in groundfish catch levels is similar to those identified under Alt.6A because 22 vessels under 12 ft in length would be excluded. Few if any of these vessels are likely to fish in Federal waters. Potential benefits from marketing efficiencies similar to those identified under Alt.6A because 22 vessels under 12 ft in length would be excluded. Few if any of these vessels are expected to fish in Federal waters. Risk to low volume processors is similar to 5B

SOCIO-ECONOMIC ENVIRONMENT - Continued	
HARVESTERS & PROCESSORS	Changes in fishery participation costs and groundfish revenue as a result of the requirement to carry and use VMS.
<u>Alternative 8</u> Excludes all low impact OA fisheries, those where the incidental catch of overfished species is projected to be minimal.	<u>Direct impacts</u> No change in fishery participation costs for harvesters. Per vessel costs are the same as Alt. 2. Estimated purchase cost of VMS services to the fishing industry if all vessels remain in the fishery is$2,036,496 -$6,627,390 year 1, $280,896 - $1,067,990 in subsequent years. Greater flexibility in the use of management rules with geographical areas for the 1,463 vessels included under this alternative: 349 vessels using longline gear (282 directed groundfish, 65 Pacific halibut, and 2 CA halibut); 145 vessels directed groundfish vessels using pot gear; 40 California halibut vessels using trawl gear, 47 vessels using CA halibut net gear, and; 882 vessels using line gear 590 groundfish directed, 58 California halibut, and 234 salmon troll vessels). <u>Indirect impact</u>: Potential for future increases in groundfish catch levels similar to Alt 6A. Benefits of fishery stability would be greatest for fishers with high degree of dependency on groundfish. Potential benefits from marketing efficiencies and stability in the groundfish fishery similar to those identified under Alt.6A for directed groundfish vessels.
<u>Alternative 9</u> Directed vessels. those that land more than 500 lb of groundfish in a calendar year.	<u>Direct impacts</u> No change in fishery participation costs for harvesters. Per vessel costs are the same as Alt. 2. Estimated purchase cost of VMS services to the fishing industry if all vessels remain in the fishery is $1,563,216 - $5,087,190 year 1, $215,616 - $819,790 in subsequent years. Greater flexibility in the use of management rules with geographical areas for the 1,123 vessels included under this alternative 349 vessels using longline gear (282 directed groundfish, 65 Pacific halibut, and 2 CA halibut); 150 vessels using pot gear (145 groundfish directed, 1 Dungeness crab,2 prawn and 2 sheephead); 9 California halibut 3and pink shrimp vessels using trawl gear, 15 vessels using CA halibut net gear, and; 597 vessels using line gear 590 groundfish directed, 1 HMS and 6 salmon troll vessels). <u>Indirect impact</u>: Potential for future increases in groundfish catch levels similar to Alt 6B. Benefits of fishery stability would be greatest for fishers with high degree of dependency on groundfish. Potential benefits from marketing efficiencies and stability in the groundfish fishery similar to those identified under Alt.6A for directed groundfish vessels.
<u>Alternative 10</u> No Action. No VMS requirements. Discontinue the use of RCA management and adust trip limits and seasons accordingly.	<u>Direct impacts</u> No change in fishery participation costs for harvesters. If the use of RCAs are eliminated, closed season and reduced trip limits would like result in a drastic reductions in directed OA fishing opportunity. <u>Indirect impacts</u> Potential future groundfish catch levels may be reduced and stability in the fishery may be decreased if non-compliance with depth-based management measures results in higher than projected of overfished species catch.
Each of the alternatives identifies and estimated number of vessels that are likely to be affected by the VMS requirement. These values are based on the average level of participation from 2000 to 2004, except for pink shrimp trawl which was based on 2003-2004. It is important to point out that these values may not be the actual number of vessels that would continue to use a particular gear type if VMS requirements were adopted.	

4.3.3 Harvesters and Processors

Direct Impacts**:** While the primary focus of VMS, from a resource management perspective, is with the collection of position data to monitor compliance with depth-based area management, there are very clear benefits to industry from VMS. The most evident direct benefit to industry resulting from the availability of VMS information is the flexibility in fishery management, such as the use of depth-based management.

To allow for a more liberal depth-based management regime, as has been in place since 2003, it was necessary for the Council and NMFS to take action to establish a monitoring program to ensure the integrity of these large irregularly-shaped depth-based conservation areas. With the 2003 Annual Specifications and Management Measures, the Council recommended along with depth-based management strategy, that NMFS include implementation of a VMS monitoring system to track movement of vessels through and within the RCAs. Without a depth-based management strategy, the fishery would be managed under the more seriously constrained limits on healthy stocks that co-occur with overfished species. Geographically defined areas would likely revert to those that were in place before September 2002. These areas tended to be nearshore or defined by a simple latitude lines.

A more liberal depth-based management regime is only possible if the integrity of the depth-based conservation areas can be ensured. Maintaining the integrity of the conservation areas largely depends upon the ability to enforce such management measures. Without the ability to ensure the integrity of the conservation areas, it is most likely that the depth-based management strategy will be discontinued. If this were the case, the management structure for those fisheries without VMS could well revert back to more restrictive limits or no limits on healthy stocks in order to protect overfished species.

When linked with a personal computer, lap top or data terminal, VMS systems with 2-way communications (currently 2-way systems are not required in groundfish fishery). Two-way systems can provide commercial fishers with the opportunity obtain information from processors or home offices and to report catch information electronically to home offices and fisheries managers. Under VMS, detailed commercial catch data and details of specific areas fished (provided by GPS) could be recorded using on-board computers or mobile terminals and transmitted directly to a central database. The central database could be programmed to analyze the aggregate data from all vessels as it is received, thereby enabling the performance of the fishery to be monitored in 'real time', allowing more effective and timely fisheries management strategies to be developed. This provides potential cost savings for fishermen, particularly if fishery management transforms from being reactive to being a proactive process involving decisions based on analysis of real time data about the fishery. Fisheries management strategies are underpinned by catch data supplied by commercial and recreational fishers. There is usually a substantial delay before this information is received, analyzed and available in a format suitable for use by fisheries managers and industry. Some mis-reporting and transcription errors can be addressed using VMS.

Cost burden: The cost burden of VMS includes the costs for installation, VMS transceiver unit, annual maintenance, replacement cost, cost to transmit hourly positions and declaration reports. Table 4.3.4.1 shows the estimated cost burden per vessel for VMS.

Table 4.3.3.1. Estimated burden, per vessel, for the VMS monitoring systems

	Alternative 1&10 Status quo	Alternatives 2-9 Cost per vessel for VMS and declaration reports
Installation - start up cost	$0	Minimal - not to exceed 4 hours or $200 Most are do-it yourself installation, manufacturer install approximately $200 do-it-yourself $120 5 min to complete installation report, $3 to send fax to NMFS
VMS transceiver/transponder unit - start up cost	$0	$1,000 - $2,500 ($3,800 if computer is added for 2-way communications including email)
Annual maintenance * Self * Professional	$0	2 hours or $60 per year 2 hours or $160 per year
Annual replacement costs (unit cost/years of service)	$0	$250-$625 per year (estimate based on 4 years of service)
Annual cost to transmit 24 hourly position reports	$0	$192-$730 ($15.99/mo-$2/day)
Annual cost to transmit exemption reports (4 min/rpt 2 per year)	$0	$0 (toll free call)
Annual cost to transmit declaration report (4 min/rpt- 12 time per year)	$0	$0 (toll free call)

Installation - The time burden for installation of the units is estimated at 4 hours per vessel, or $120. Personnel costs are estimated to be $30 per hour (Table 4.3.3.1.). The actual installation time for a VMS unit is estimated to be less than two hours, but a higher estimate of 4 hours/vessel is based on a worst case scenario where the power source (such as a 12 volt DC outlet) is not convenient to a location where the VMS unit can be installed. Most of the systems are do-it-yourself installations.

The installation of the Inmarsat-C Thrane units are do-it-yourself. The installation of software and attachment of a personal computer or lap top to an Inmarsat-C unit may also require dealer assistance. Satamatics and Orbcomm units can be self installed. However, vendor experience indicates that professional installations provide the best results for optimal unit performance.

Installation/Activation Report - Given that the VMS hardware and satellite communications services are provided by third parties as approved by NMFS, there is a need for NMFS to collect information on the individual vessel's installation in order to ensure that automated position reports will be received. This information collection would not increase the time burden for installation of VMS, but does require that a certification and checklist be returned to NMFS prior to using the VMS transceiver to meet regulatory requirements.

The checklist indicates the procedures to be followed by the installers. The VMS installer completes the NMFS issued checklist and signs the certification before returning it to NMFS. Signing the completed checklist shows that the installation was done according to the instructions and provides the Office of Law Enforcement with information about the hardware installed and the communication service provider that will be used by the vessel operator. Specific information that links a permitted vessel with a certain transmitting unit and communications service is necessary to ensure that automatic position reports will be received properly by NMFS. In the event that there are problems, NMFS will have ready access to a database that links owner information with installation information. NMFS can then apply troubleshooting techniques to contact the vessel operator and discern whether the problem is associated with the transmitting hardware or the service provider.

The time and cost burden of preparing and submitting installation information to NMFS is minor. Submission of a checklist would be required only for the initial installation or when the hardware or communications service provider changes. NMFS estimates a time burden of 5 minutes ($2.50 at $30 per hour) for completing the checklist and additional $3 for mailing/faxing to NMFS, for a total of $5.50 per occurrence (Table 4.3.3.1).

The ability for NMFS to ensure proper operation of the VMS unit prior to the vessel's departure will save time and money. The installation checklist and activation report are available over the internet website. These reports would be faxed or mailed to NMFS.

VMS transceiver unit On September 23, 1993, NMFS published proposed VMS standards at 58 FR 49285. On March 31, 1994, NMFS published final VMS standards at 59 FR 15180. These notices stated that NMFS endorses the use of VMS and defined specifications and criteria for VMS use. On September 8, 1998, NOAA published a request for information (RFI) in the Commerce Business Daily in which it stated the minimum VMS specifications necessary for NOAA's approval. The information was used as the basis for approving the mobile transceiver units and communications service providers for the Pacific coast groundfish fishery.

Units currently type approved for the Pacific Coast Groundfish Fishery are shown in (Table 4.3.3.2.) And include: Thrane and Thrane TT 3022D and 3026, Satamatics SAT101, and Stellar ST2500G. NMFS Type approved units are tested and approved by NMFS OLE. A list of VMS mobile transponder units and communications service providers approved by NOAA for the Pacific Coast groundfish fishery were published in the Federal Register on November 17, 2003 (68 FR 64860). Each time the list is revised, it will be published in the Federal Register. The cost of the transceivers currently type approved for the Pacific Coast groundfish fishery are shown in Table 4.3.3.2.

The North American Collection and Location by Satellite, Inc. (NACLS) is the sole service provider of the ArgoNet systems. The Argos Mar-GE and MAR-YX mobile transponder units costs $2,000. The ArgoNet MAR GE uses NOAA polar-orbiting satellites, and, as such, it is considered a NOAA Data Collection and Location System. The use of any NOAA Data Collection and Location System is governed by 15 CFR part 911. Under these regulations, the use of a NOAA Data Collection and Location System can be authorized only if it is determined that there are no commercial services available that are adequate. In addition, special provisions have been made because of cost effectiveness to the Government, resulting in a temporary approval (3 year approval was granted for the Atlantic pelagic longline fishery).

On June 10, 2002, 50 CFR 679.7(a)(18) required all vessels fishing in the Bering sea and Gulf of Alaska using pot, hook-and-line or trawl gear that are permitted to directly fish for Pacific cod, Atka mackerel or pollock to have an operable VMS transceiver. Vessels that also participate in the WOC fisheries (primarily LE vessels) qualified for reimbursements to the Argos MAR-GE as a result of their participation in the Alaska groundfish fishery. Allowing the use of Argos MAR-GE by WOC operating vessels that have purchased these units for participation in the Alaska groundfish fisheries would eliminate the cost of purchasing, installing and maintaining a second unit for these vessels. As of April 15, 2004(69 FR 19985,) new provisions for the Alaska fisheries prohibit the installation of new Argos units. Replacement units will need to be compatible with the requirements of both fisheries or vessels will need to purchase separate units. Similarly, allowing vessels to use units they have already purchased for other business purposes, providing they are a type-approved model with the required software and hardware, would also eliminate the cost of purchasing, installing and maintaining a second unit for these vessels. The number of OA vessels that currently have VMS transceivers is unknown.

Most of the VMS transceiver units can be operated for extended periods from the same DC power source used to run other on board electronic equipment and so should increase power consumption only marginally.

Maintenance of transponder unit Once a vessel is used for fishing in the OA fishery in Federal waters, the vessel operator is required to operate the VMS unit continuously for the remainder of the year. This means that the vessel operator will need to maintain the transponder unit, antennas, and the electrical sources that power the system themselves or have it serviced by a professionally.

When an operator is aware that transmission of automatic position reports has been interrupted, or when notified by NMFS that automatic position reports are not being received, they must contact NMFS and follow the instructions provided. Such instructions may include, but are not limited to, manually communicating to a location designated by NMFS the vessel's position or returning to port until the VMS is operable. There is a reporting burden associated with this requirement, but it is not expected to be substantial. The annual burden of these communications and the time required to maintain the antennas and electrical systems on the vessel operator is estimated to be approximately 2 hours per year or $60 if done by the vessels personnel, or $160 if professionally serviced (Table 4.3.3.1). In addition, some systems may require software to be updated. Many of the transponders can have their set of features upgraded by being reloaded/flashed with updated versions.

If a unit needs to be repaired, there may be fishing opportunity lost unless the unit can be quickly replaced.

Replacement cost (purchase price/years of service) The various VMS transceivers have similar life spans of about 4- 5 years before the units need to be replaced. Because of advancements in VMS systems or service providers that may no longer provide services, some models may become obsolete in less than 5 years. The purchase of these units may be considered as a tax deductible business expense during the first year of use. For depreciation purposes, VMS devices using satellite technology may qualify as "five-year property", although devices using cell phone technology probably will be treated similar to other cell phone equipment, as "seven-year property." For the purposes of this analysis, 4 years was used to estimate unit replacement costs. Table 4.3.3.1. shows the range of replacement costs.

Cost to transmit hourly positions The primary costs after purchase and installation of a VMS is the charge for the messages that communicate the vessel's position. Once installed and activated, position reports are transmitted automatically to NMFS via satellite. Once a vessel is used for fishing in the OA fishery in Federal waters, the vessel operator is required to operate the VMS unit continuously for the remainder of the year. The total costs for these messages depend on the system chosen for operation and the number of fishing days for units with a sleep function. Many of the systems have a sleep function. Position transmissions are automatically reduced when the vessel is in port. This allows for port stays without significant power drain or power shutdown. When the unit restarts, normal position transmissions automatically resume before the vessel goes to sea.

The estimated time per response varies with type of equipment and requirement. Upon installation, vessel monitoring or transponder systems automatically transmit data, which takes about 5 seconds, except when issued a VMS exemption or when the vessel is inactive in port and the VMS goes into sleep mode. Transmission costs vary between units, with some having daily rates or monthly rates. The daily rate for the Inmarsat D+, Inmarsat C, and Orbcom units is $2, while providers have begun providing packages as low as $15.99/mo for fishers who spend much of the month tied to the dock, resulting in reduced position reports (Table 4.3.3.1).

Table 4.3.3.2. VMS Equipment Currently in Type-approved for use in the Pacific Coast Groundfish Fisheries

Communication Service	Orbcomm	Inmarsat D+	Argos a/	Inmarsat-C
Transceiver/transponder name	**SST2500G-NMFS**	**Satamatics SAT101**	**MAR GE**	**Thrane and Thrane TT3022D, TT3026D**
Number of boats using				
Geographic coverage, when in line of sight of satellite or cell	Global	Global	Global	Global to 78°N/S
Communication between ship – shore	Two-way	Two-way	One-way, (ship-to-shore)	Two-way
Satellite type	Low earth orbit, Orbcomm Network	Geo-stationary, INMARSAT	Polar-orbiting, 5 NOAA meteorological	Geo-Stationary, INMARSAT
Time between the vessel position fix and receipt at NMFS	Within 5-10 minutes	Within 5-10 minutes	Varies per latitude, Alaska – 10-30min. avg. wait. HMS – 60-90min. wait	Within 5-10 minutes
Ability to poll/query the transceiver	Yes	Yes	No	Yes
Interval between position reports	Configurabel	Configurabel	30 - 60 minutes depending upon latitudes	Configurable for 5 minutes to 24 hours
Ability to change the interval between position reports	Remote from OLE	Remote from OLE	Factory reprogramming	Remotely from OLE
Position calculation (accuracy)	Integrated GPS (20 m)	Integrated GPS (20 m)	Integrated GPS (20m), reverts to Doppler when GPS blocked (350 or 1000m)	Integrated GPS (20m)
Automatic anti-tampering and unit status messages	Yes	Yes	Yes	Yes
Distress signal	Yes	Yes	Yes	Yes
Reduces power when stationary	Yes	Yes	Yes	Yes
Installation	Do-it-yourself	Do-it-yourself	Do-it-yourself	Dealer or electrician (costs not included), or do-it-yourself
Internal battery back-up	Yes	Yes	Yes, 48-hour	No
Log or memory buffer storing positions / number of positions	Yes	Yes	Yes, must download manually/?	Yes, auto, remote or manual download/ Trimble – 5000 Thrane – 100
Can send logbook/catch report data	Yes	Yes, limited	Yes, with computer	Yes, with computer
Transceiver/transponder cost	$1,200	$1,200	$2000 ($400 keypad optional)	Thrane TT3022D $2,500, TT3026M $1,550; additional $1,300 if optional computer for email is included
Daily communications cost for hourly positions	$2	$2	$5	$2

a/ The Argos MAR GE is only allowed for vessels that have been required to have this model for other fisheries such as the Alaska groundfish fishery

Exemption reports Exemption Reports would be sent by the vessel owner or operator whenever their vessel qualified for being excused from the requirement to operate the mobile transceiver unit continuously 24 hours a day throughout the calendar year (e.g. when the vessel will be operating outside of the EEZ for more than 7 consecutive days or the vessel will be continuously out of the water for more than 7 consecutive days). A vessel may be exempted from the requirement to operate the mobile transceiver unit continuously 24 hours a day throughout the calendar year if a valid exemption report is received by NMFS OLE and the vessel is in compliance with all conditions and requirements of the exemption. An exemption report would be valid until a second report was sent canceling the exemption.

Improved technology would be used to reduce the reporting burden on NMFS and the fishery participants. Vessels will call in exemption reports to a toll free number. With this system, vessels can call quickly and easily submit their report 24 hours a day.

Aside from the cost in time to summarize and call in a report, there will be no additional cost burden for respondents. All respondents are assumed to have access to a telephone. The telephone call will be placed through a toll-free number, so the respondent will not pay for the call. Two exemption reports are estimated to be submitted per vessel annually. Each report would require approximately 4 minutes to submit, for an average cost of $4 per vessel per year (at $30 per hour).

Declaration reports
Declaration reports are used to assist enforcement in identifying vessels that are legally fishing in conservation areas. Each declaration report is valid until cancelled or revised by the vessel operator. After a declaration report has been sent, the vessel cannot engage in any activity with gear that is inconsistent with that which can be used in the conservation area unless another declaration report is sent to cancel or change the previous declaration. Declaration reports are sent to NMFS and vessel operators receive confirmation that could be used to verify that the reporting requirement was met. It is necessary for a vessel owner, operator or representative to submit these reports because only they can make statements about where they intend to fish.

Vessels will call in declaration reports by dialing a toll-free, so the respondent will not pay for the call. The system allows vessels to quickly and easily submit their report 24 hours a day. Aside from the cost in time to summarize and call in a report, there will be no additional cost burden for respondents. All respondents are assumed to have access to a telephone.

Table 4.3.3.3 Range of VMS of projected costs to the fleet, by fishery and gear

Open access gear group	Average annual no. of vessels landing groundfish, 2000-2003	Cost to the fleet for VMS			Exvessel revenue from **all catch** for the by fishery for 2004	Exvessel revenue from **groundfish** for the by fishery for 2004
		Year 1, range of cost for purchase and installation of VMS units, - Per vessel cost - $1,200 -$2,500 ($3,800 with PC)	Subsequent years, range of costs for maintenance and replacement of VMS units Per vessel cost $80 - $785	Range of annual Transmission cost Per vessel cost $192 - $730		
Longline - groundfish directed	282	$338,400 - $761,400 ($1,071,600)	$87,420 - $221,652	$54,144 - $205,860	$1,429,412	$1,411,191
Longline - Pacific Halibut directed	65	$78,000 -$175,500 ($247,000)	$20,150 - $51,090 9	$12,480 -$47,450	$403,834	$28,920
Longline - CA Halibut	2	$2,400 -$5,400 ($7,600)	$620 - $1,572	$384 -$1,460	$3,749	--
Pot - groundfish directed	145	$174,000 - $391,500 ($551,000)	$44,950 - $113,970	$27,840 - $105,850	$990,939	$987,646
Pot - Dungeness crab	21	$25,200 - $56,700 ($79,800)	$6,510 - $16,506	$4,032 -$15,330	$70,436,411	$652
Pot - prawn/shrimp	6	$7,200 - $16,200 ($22,800)	$1,860 - $4,716	$1,152 -$4,380	$2,235,976	--
Pot - sheephead	21	$25,200 - $56,700 ($79,800)	$6,510 - $16,506	$4,032 -$15,330	$275,382	$7,088
Trawl - CA Halibut g/	40	$48,000 -$108,000 ($152,000)	$12,400 - $31,440	$7,680 -$29,200	$497,880	$35,637
Trawl - Sea Cucumber	14	$16,800 - $37,800 ($53,200)	$4,340 - $11,004	$2,688 -$10,220	$146,433	--
Trawl - Ridgeback Prawn	23	$27,600 - $62,100 ($87,400)	$7,130 - $18,078	$4,416 -$16,790	$140,523	$564
Trawl - Pink Shrimp	54	$64,800 - $145,800 ($205,200)	$16,740 - $42,444	$10,368 -$39,420	$5,776,643	$74
Line gear - groundfish directed	590	$708,000 - $1,53,000 ($2,242,000)	$182,900 - $463,740	$113,280 - $430,700	$2,512,737	$2,503,500
Line gear - CA halibut directed	58	$69,600 - $156,600 ($220,400)	$17,980 - $45,588	$11,136 -$42,340	$636,210	$5,674
Line gear - HMS	10	$12,000 - $27,000 ($38,000)	$3,100 - $7,860	$1,920 -$7,300	$1,492,405	$236
Line gear - Salmon troll (coastwide)	234	$280,800 - $631,800 ($889,200)	$72,540 - $183,924	$44,928 - $170,820	$25,824,244	$19,816
Line gear - Salmon troll (north only- no yellowtail)	176	$211,200 - $475,200 ($668,800)	$54,560 - $138,336	$33,792 - $128,480	$4,360,094	$13,046
Net gear - HMS	25	$30,000 - $67,500 ($95,000)	$7,750 - $19,650	$4,800 -$18,250	$1,383,716	$2,577
Net gear - CA halibut	47	$56,400 - $126,900 ($178,600)	$14,570 - $36,942	$9,024 - $34,310	XXX	$7,450

Each of the alternatives identifies and estimated number of vessels that are likely to be affected by the VMS requirement. These values are based on the average level of participation from 2000 to 2004, except for pink shrimp trawl which was based on 2003-2004. It is important to point out that these values may not be the actual number of vessels that would continue to use a particular gear type if VMS requirements were adopted.

Description of analysis regarding vessels not retaining groundfish if VMS is required A simple analysis of economic costs and benefits was conducted to determine a plausible number of vessels that would retain groundfish if doing so meant that those vessels would be required to carry a VMS. Vessel level revenues were compared against the cost of purchasing, installing, maintaining, and operating a VMS system over a 20 year period. The cost of purchasing a unit was amortized over 20 years using an interest rate of 6 percent. Assumed in this analysis is that the decision to fish or not to fish was independent of groundfish retention for those fisheries where groundfish is not the target. This assumes that groundfish gross revenues are merely viewed as a bonus by fishers not targeting groundfish. Based on this assumption, total groundfish gross revenues were compared to annual VMS costs to determine whether vessels would elect to carry a VMS system. For vessels directing their efforts at groundfish, the analysis differed in that a range of vessels remaining in the fishery is presented based on a likely range of profit margins that correspond to gross revenues. This is done because groundfish is the target for those vessels, and the decision to fish is most likely based on the net revenue generated by the target if incidental catch is not part of expected future revenues. The lower bound of this range is 7.5 percent of gross revenues and the upper bound is 30 percent of gross revenues. Based on conversations with fishers and experience with the fishing industry, this range is expected to encompass the actual profit margin of the fishery, though additional input is necessary to further refine this range. Table 4.3.3.5 presents this simple analysis of economic costs and benefits.

Table 4.3.3.5 Approximate Number of Vessels Landing Groundfish if a VMS System is Required

Fishery	2000	2001	2002	2003	2004	Average
HMS - Hook and Line	0	0	0	0	0	0
CPS - Net	0	0	0	0	0	0
Salmon - Troll	1	4	3	0	2	2
California Sheephead - Pot	5	9	7	2	8	6
Pacific Halibut - Longline	9	5	6	14	20	11
California Halibut - Trawl	10	10	9	1	6	7
California Halibut - Hook and Line and Longline	1	3	0	3	4	2
Pink Shrimp - Trawl	45	38	28	1	1	23
Ridgeback Prawn - Trawl	6	5	3	2	1	3
Shrimp - Pot	2	4	4	2	1	3
Dungeness Crab - Pot	0	0	1	1	1	1
Groundfish Directed - Pot	52 - 83	49 - 82	50 - 80	56 - 96	48 - 70	51 - 82
Groundfish Directed - Longline	78 - 165	71 - 158	64 - 146	80 - 177	60 - 126	71 - 154
Groundfish Directed - Hook and Line (non-longline)	85 - 272	107 - 254	97 - 252	77 - 223	106 - 239	94 - 248

The OA groundfish fishery consists of vessels that do not necessarily depend on revenue from the fishery as a major source of income and predominately fish for other species where they inadvertently catch and land groundfish. Fishers who land groundfish taken incidentally in non-groundfish fisheries operating in areas outside the RCAs, and fishers who are less dependent on groundfish may choose to exit the fishery by not retaining groundfish or by not targeting groundfish.

Table 4.3.3.6. shows the number of OA vessels by gross income levels of dependency for all West Coast landings. Between November 2000 and October 2001, 1,287 vessels landed groundfish in the OA sector of the groundfish fishery. Of these, 58% of the vessels (200) with a greater than 95% dependency on groundfish had less than $5,000 of gross income from West Coast landings. These vessels would be the vessels most affected by VMS requirements. A greater proportion of vessels with lower levels of dependency on groundfish fell within income categories greater than $5,000. However, this table does not represent landings for years when the RCA requirements or state nearshore LE programs were in place. Increases in higher valued groundfish catch in 2003, primarily sablefish, which may reduce the proportion of OA vessels in the lowest (<$5,000) income category, are not included in this table. Table 4.3.3.7 shows the annual fishing revenue for vessels landing groundfish in various OA target fisheries and with the different gears.

Table 3.3.3.6 Number of open access vessels by gross income levels of dependency for all West Coast landings (based on data from November 2000 - October 2001) a/

	Exvessel revenue from West Coast landings				
	<5,000	$5,000-$50,000	$50,000-$200,000	>$200,000	Total
<5%	45	268	169	34	516
>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	407	612	234	34	1,287

Extracted from table 6-17a DEIS, Proposed Acceptable Biological Catch and Optimum Yield Specifications and Management Measures for the 2005-2006 Pacific Coast Groundfish fishery
a/ open access vessels with more than half of their total landings value coming from groundfish are considered to be in the directed fishery

Table 4.3.3.6. Number of incidental open access vessels groundfish by exvessel group, 2000 - 2003 (based on 8/24/04 PacFin data)

Open access gear group	Number of open access vessels by groundfish exvessel revenue group				
	$0-$500	$501-$1000	$1001-$1500	$1501-$2000	>$2000
Longline -Groundfish Directed					
2000	76	27	25	11	164
2001	94	32	27	13	158
2002	59	30	17	12	145
2003	40	34	27	21	174
2004	40	27	19	13	123
Longline - Pacific Halibut					
2000	28	9	2	--	--
2001	28	3	2	1	1
2002	36	5	1	--	11
2003	23	6	2	2	5
2004	11	9	8	2	4
Longline - CA Halibut					
2000	5	--	–	--	–
2001	1	--	–	--	–
2002	2	--	–	--	–
2003	2	--	–	--	–
2004	2	–	–	–	–
Pot - Groundfish Directed					
2000	62	15	6	7	64
2001	48	14	16	1	61
2002	43	16	10	8	58
2003	31	12	14	7	70
2004	24	6	5	9	54
Pot - Dungeness crab					
2000	32	1	--	--	--
2001	24	1	--	--	--
2002	22	1	--	--	--
2003	16	1	--	--	--
2004	5	1	--	--	–

Open access gear group	Number of open access vessels by groundfish exvessel revenue group				
	$0-$500	$501-$1000	$1001-$1500	$1501-$2000	>$2000
Pot - prawn/shrimp					
2000	7	--	2	–	–
2001	2	2	1	1	1
2002	-	3	--	1	--
2003	4	--	1	1	--
2004	2	–	–	–	1
Pot - sheephead					
2000	16	3	--	--	2
2001	17	2	2	1	4
2002	21	5	--	1	1
2003	12	--	--	--	2
2004	8	4	3	--	1
Trawl - sea cucumber					
2000	--	--	--	--	--
2001	2	--	--	--	--
2002	2	--	--	--	--
2003	1	--	--	--	--
2004	1	--	--	--	--
Trawl - CA halibut					
2000	11	6	1	2	2
2001	22	5	3	1	2
2002	19	5	--	4	1
2003	16	--	--	--	1
2004	6	1	1	1	4
Trawl -Ridgeback Prawn					
2000	14	3	1	3	1
2001	10	2	3	--	1
2002	9	--	2	1	--
2003	10	--	2	--	--
2004	4	--	--	1	--
Trawl -Pink Shrimp					
2000	15	6	2	1	38
2001	11	8	1	6	25
2002	15	9	4	7	9
2003	5	1	--	--	--
2004	3	--	1	--	--
Line gear -Groundfish Directed					
2000	316	50	94	35	265
2001	236	52	66	31	250
2002	187	46	69	27	247
2003	154	36	68	26	217
2004	144	31	49	14	238
Line gear - CA halibut					
2000	68	1	--	--	--
2001	66	3	--	--	--
2002	58	--	--	--	--
2003	43	3	--	--	1
2004	40	4	--	1	--
Line gear - HMS					
2000	18	--	--	--	--
2001	12	--	--	--	--
2002	7	--	--	--	--
2003	3	2	--	--	--
2004	5	1	1	--	--
Line gear - Salmon troll (coastwide)					
2000	276	4	1	--	--
2001	238	5	--	--	--
2002	201	6	--	--	--
2003	197	2	1	1	1
2004	233	4	--	--	--

Open access gear group	Number of open access vessels by groundfish exvessel revenue group				
	$0-$500	$501-$1000	$1001-$1500	$1501-$2000	>$2000
Line gear - Salmon troll (north only)					
2000	209	3	--	--	--
2001	228	--	--	--	--
2002	143	5	--	--	--
2003	133	1	--	--	--
2004	155	2	--	--	--
Net gear - HMS					
2000	33	--	--	--	–
2001	26	1	--	--	–
2002	25	1	--	--	--
2003	20	--	–	–	–
2004	17	1	–	–	–
Net gear - CA Halibut					
2000	45	13	--	--	--
2001	38	9	--	--	--
2002	32	3	--	--	--
2003	33	4	--	–	–
2004	32	2	--	–	–

Each of the alternatives identifies and estimated number of vessels that are likely to be affected by the VMS requirement. These values are based on the average level of participation from 2000 to 2004, except for pink shrimp trawl which was based on 2003-2004. It is important to point out that these values may not be the actual number of vessels that would continue to use a particular gear type if VMS requirements were adopted.

Indirect impacts are caused by the action and are later in time or farther removed in distance, but are still reasonably foreseeable. Indirect impacts on harvesters and processors include, long-term changes in fishing opportunity, catch availability, and catch value that could result from the VMS requirement and collection of position data.

Short-term economic losses should be offset by future increases in catch levels if increased stability in the fishery results because the integrity of RCAs is maintained. The ability to know the precise location of vessels provides for speedy identification of suspicious or illegal fishing activity in relation to closed areas. Rather than spending significant resources on routine surveillance, enforcement resources can be directed to vessels operating in an unusual manner in the RCAs. Improved enforcement is in the interest of all fishers. Fishers and processors will be the ultimate beneficiaries when the fisheries regulations, developed for conservation and management are properly implemented and enforced. Maintaining the integrity of closed areas that are designed to protect overfished stocks, will aid in the recovery of the stocks and help to guaranteed the future of the industry.

With VMS, the law-abiding skipper can be satisfied that there will be less likelihood of the enforcement officers inspecting vessels that comply with the closed area regulations and a greater probability that inspection will focus on vessels that are suspected of violating the regulations. At times, the commercial fishing industry is subjected to criticism from members of the public and from other stakeholder groups regarding its responsibility to the environment in terms of complying with closure regulations intended to protect vulnerable species. While there may be some irresponsible operators, it is generally believed that the majority of commercial operators abide by closed area restrictions. VMS offers the commercial industry a mechanism to demonstrate its compliance with such regulations and hence honor its responsibility to the long-term sustainability of fisheries resources.

Electronic marketing is growing in importance in many industries, and could be developed for the fishing industry. If a sufficient number of vessels participating in the West Coast fisheries have 2-way communications through VMS and a computer, opportunities to market seafood through e-commerce services (electronic marketing systems) could become more readily available to the West Coast fishing industry. The ability to access the internet via Inmarsat makes likely that electronic marketing of seafood will become established as individual companies set up their own systems.

Electronic marketing systems could become a component used to match the supply of fish from a number of scattered producers with the demand from a variety of markets. An advantage of an electronic marketing systems is that the trading function is separate from the physical transfer of catch between sellers and buyers, which could allow prices to be formed centrally without the costly process of assembling buyers and sellers at a single location. As fishermen are made more aware of electronic market potential, they may choose to alter fishing practices to avoid gluts, avoid catching lower value species, or retain incidentally caught species because they find a buyer while still at sea. The overall result could be a more competitive market and improvement in the use of mixed catches, including the sale of fish that would otherwise have been discarded at sea. While electronic marketing of seafood has been technically possible for some years, extensive and high quality ship-to-shore communications were required to enable fishermen to communicate catch information to a shore-based computer linked into the system. Recent advancements in satellite technology, such as those made by Inmarsat makes it possible to bypass this impediment, allowing electronic marketing in the fishing industry much more feasible for small businesses, such as those found in the West Coast.

Comparison of the Alternatives
The level of fleet coverage, that portion of the overall OA fishing fleet that would be required to have VMS and provide declaration reports, is the primary difference between the alternatives. Each of the alternatives defines the portion of the OA fleet, that would be required to carry and use VMS transceivers and provide gear declaration reports. Alternative 10 is the only alternative that goes beyond VMS coverage by discontinuing the non-trawl and trawl RCA requirements for the OA fisheries.

Alternative 1, is the least expensive alternative in the short-term since it only requires nongroundfish trawl vessels to provide declaration reports prior to leaving port on a trip in which fishing occurs in an RCA. The greatest difficulty in maintaining the integrity of closed areas to ensure recovery of the overfished stocks occurs under status quo. In the long- term, if unmonitored incursions into the RCA affect the recovery of overfished stocks, fishing opportunity may be further reduced.

Alternatives 2-9 contain VMS requirements, for different groups of vessels within the OA fleet**.** The per vessel costs for a transceiver unit with installation is the same under all of the alternative: $1,200-$2,700 in Year 1, and $250-$625 in subsequent years. Annual operating cost to harvesters include: maintenance, $60-$160, and transmission fees, $192-$730. The added cost of VMS is likely to result in some fishers not retaining groundfish so as to avoid the VMS requirements. Table 3.3.3.9 shows the number of vessels by gear group that landed less than 500 lb of groundfish per year between 2000 and 2004. Some fishers may speculate that others will leave the fishery and trip limits will increase, others will pay for VMS and continue to retain groundfish. Fishers who land groundfish taken incidentally in non-groundfish fisheries and fishers who are less dependent on groundfish may choose to exit the fishery by not retaining groundfish or by not targeting groundfish during short periods between other fishing activities**.** Table 4.3.3.5 shows the number of vessels by assumed profit margins for OA incidental fisheries vessels by gears, 2000-2004**.**

Alternative 2 maintains the provisions of status quo, but adds the VMS and declaration reporting requirements for approximately 282 directed groundfish, 38 Pacific halibut, and 2 California halibut vessels using longline gear that take and retain, possess or land groundfish. Of the alternatives that require VMS, Alternative 2 requires the smallest proportion of the OA fleet (only 320 vessels using longline gear) to have and use VMS. The total cost of Alternative 2 to industry ranges between $448,224 - $1,458,660 year 1, $61,824 - $235,060 in subsequent years. An unknown portion of directed groundfish vessels using longline gear to take and retain, possess or land groundfish may choose to change gears to pot or line gear avoid VMS requirements.

Alternative 3 includes the same vessels as Alternative 2, but adds the VMS and declaration reporting requirements for approximately 193 vessels using pot gear. The estimated purchase cost of VMS services to the fishing industry if all vessels remain in the fishery is $716,880 - $2,332,950 year 1, $98,880 - $375,950 in subsequent years. An unknown portion of directed groundfish vessels using pot gear may choose to change to line gear to avoid VMS requirements.

Alternative 4A includes the same vessels as Alternative 3, but adds the VMS and declaration reporting requirement for approximately 23 ridgeback prawn, 14 sea cucumber and 40 California halibut vessels using nongroundfish trawl gear (excludes pink shrimp vessels) for a total of 592 vessels. Estimated purchase cost of VMS services to the fishing industry if all vessels remain in the fishery $824,064 - $2,681,760 year 1, $113,664 - $432,160 subsequent years. Alternative 4B includes all of the nongroundfish trawl vessels identified under Alternative 4A plus 54 pink shrimp vessels for a total of 646 vessels. Estimated purchase cost of VMS services to the fishing industry if all vessels remain in the fishery is $899,232 - $2,926,380 year 1, $124,032 -$471,580 in subsequent years.

Alternative 5A includes the same vessels as Alternative 4A, but adds the VMS and declaration reporting requirements for approximately 590 directed groundfish, 58 California halibut, and 10 HMS vessels using line gear to take and retain, possess or land groundfish(excludes salmon troll vessels). The total number of vessels under 5A is 1,250. The estimated purchase cost of VMS services to the fishing industry if all vessels remain in the fishery is $1,740,000 - $5,662,500 year 1, $240,000 - $912,500 in subsequent years. Alternative 5B, includes slightly more vessels than 5A because the number of salmon troll vessels that would be added under this alternative is greater than the number of HMS and Dungeness crab vessels that would not be included. Though alternative 5B does not include vessels in fisheries that are projected to have minimal impacts on overfished species (10

HMS line and 2 longline, 21 Dungeness crab pot), it includes approximately 234 salmon troll vessels. The estimated purchase cost of VMS services to the fishing industry if all vessels remain in the fishery is $2,022,576 - $6,582,090 year 1, $278,976 - $1,060,690 in subsequent years.

Alternative 6A, which applies to any vessel engaged in commercial fishing to which a RCA restriction applies, includes the largest number of OA vessels, 1,583 vessels. The estimated purchase cost of VMS services to the fishing industry if all vessels remain in the fishery is $2,203,536 - $7,170,990 year 1, $303,936 - $1,155,590 in subsequent years. Unlike 5B, 6A also includes all the salmon troll vessels that take and retain, posses or land groundfish. Therefore, Alternative 6A would provide coverage for the largest number of vessels, which supports the greatest flexibility in the use of management rules with geographical areas.

Alternative 6B, affects approximately 58 fewer vessels annually than does Alternative 6A, all of which use salmon troll gear. The estimated purchase cost of VMS services to the fishing industry if all vessels remain in the fishery is $2,122,800 - $6,908,250 in year 1, $2,92,800 - $1,113,250 in subsequent years. Under 6B, the vessels that are likely to leave the fishery is the similar to Alt. 6A, except that the number of salmon trollers that are likely to leave the fishery is slightly less under Alternative 6B because vessels fishing north of 40°10' N. lat. that only land yellowtail rockfish would not be required to have VMS. Alternative 7, is essentially the same as Alternative 6A because it applies to the same vessels except that vessels less than 12 feet in length would be excluded. It is likely that most, if not, all vessels under 12 feet in length will not fish in Federal waters and would therefore not trigger the VMS requirement. Under Alternative 7, the estimated purchase cost of VMS services to the fishing industry if all vessels remain in the fishery is $2,172,912 - $7,071,330 year 1, $299,712 - $1,139,530 in subsequent years.

Alternative 8 excludes the low impact OA fisheries, those where the incidental catch of overfished species is projected to be minimal: Dungeness crab pot, spot prawn pot, sea cucumber trawl, ridgeback prawn trawl, HMS line, and California sheephead pot. Data from 1,463 vessels includes data from: 349 vessels using longline gear (282 directed groundfish, 65 Pacific halibut, and 2 CA halibut); 145 vessels directed groundfish vessels using pot gear; 40 California halibut vessels using trawl gear, 47 vessels using CA halibut net gear, and; 882 vessels using line gear 590 groundfish directed, 58 California halibut, and 234 salmon troll vessels). The estimated purchase cost of VMS services to the fishing industry if all vessels remain in the fishery is $2,036,496 - $6,627,390 year 1, $280,896 - $1,067,990 in subsequent years.

Under Alternative 9 data from 1,123 vessels could be used to maintain the integrity of RCAs from longline, pot, trawl, line, net and other fishing gear impacts. Vessels included under Alternative 9 are: 349 vessels using longline gear (282 directed groundfish, 65 Pacific halibut, and 2 CA halibut); 150 vessels using pot gear (145 groundfish directed, 1 Dungeness crab,2 prawn and 2 sheephead); 9 California halibut and 3 pink shrimp vessels using trawl gear, 15 vessels using CA halibut net gear, and; 597 vessels using line gear 590 groundfish directed, 1 HMS and 6 salmon troll vessels). The estimated purchase cost of VMS services to the fishing industry if all vessels remain in the fishery is $1,563,216 - $5,087,190 year 1, $215,616 - $819,790 in subsequent years.

There is no cost of VMS to the industry under Alternative 10. However, if the RCA requirements are discontinued under Alternative 10 the cost to the directed OA fisheries will likely be quite high as a result of drastically reduced seasons and trip limits. It is also likely that LE fishers would also see season and trip limit reductions to compensate for the higher expected bycatch by the OA directed fisheries.

SOCIO-ECONOMIC ENVIRONMENT	
SAFETY	Changes in search and rescue capability resulting from the requirement to carry and use VMS
Alternative 1 Status quo	Direct impact EPIRBS are the primary devise used to identify a vessel's location in an emergency situation. VHF radios are also used.
Alternative 2 Vessels using longline gear	Direct impact May provide position information that can be used to aid in search and rescue efficiency for 320 OA longline vessels. If VMS transceiver unit has distress signal, it may further reduce response time in an emergency. Indirect impacts If VMS results in those fishers who are less dependent on groundfish revenue leaving the fishery, higher catch limits may result for those vessels that remain in the fishery. If fishing opportunity improves and profits to the individual vessel increase there may be fewer of these marginal vessels that tend to display more risk prone behavior including, the tendency to not adequately maintain equipment and vessels.
Alternative 3 Vessels using longline or pot gear	Direct impact & Indirect Impacts Same as Alt.2, but adds 145 directed, 21 Dungeness crab, 6 prawn, and 37 CA halibut vessels using pot gear
Alternative 4A Vessels using longline, pot or trawl gear, except pink shrimp trawl	Direct impact & Indirect Impacts Same as Alt. 2 and 3, but adds approximately 77 vessels (23 ridgeback prawn, 14 sea cucumber and 40 CA halibut vessels) using nongroundfish trawl gear (excludes pink shrimp vessels).
Alternative 4B Vessels using longline, pot or trawl gear	Direct impact & Indirect Impacts Same as Alt. 2 and 3, but adds approximately 131 vessels (54, pink shrimp, 23 ridgeback prawn, 14 sea cucumber and 40 CA halibut vessels) using nongroundfish trawl gear.
Alternative 5A Vessels using longline, pot, trawl or line gear, except: pink shrimp trawl and salmon troll	Direct impact & Indirect Impacts Same as Alt. 2, 3 and 4A, plus 658vessels (590 vessels groundfish, 58 CA halibut, and 10 HMS vessels) using line gear to take and retain, possess or land groundfish(excludes salmon troll vessels).
Alternative 5B Vessels using longline, pot, trawl or line gear, except: pink shrimp trawl, HMS longline & line, and Dungeness crab pot gear.	Direct impact & Indirect Impacts Same as Alt. 2, 3, 4A and 5A, except 10 HMS line and 2 longline, 21 Dungeness crab pot are not included, but an additional 234 salmon troll vessels are included. 1,307 vessels total.

SOCIO-ECONOMIC ENVIRONMENT - Continued	
SAFETY	Changes in search and rescue capability resulting from the requirement to carry and use VMS
Alternative 1 Status quo	Direct impact EPIRBS are the primary devise used to identify a vessel's location in an emergency situation. VHF radios are also used.
Alternative 6A Vessels with RCA restrictions	Direct impact May provide position information that can be used to aid in search and rescue efficiency for approximately 1,583 vessels: 349 vessels using longline gear as identified under Alt. 2 plus it includes all 65 Pacific halibut vessels; 193 vessels using pot gear identified under Alt. 3; 77 vessels using trawl gear (approximately 23 ridgeback prawn, 14 Sea cucumber, and 40 CA halibut vessels); 892 vessels using line gear 590 groundfish directed, 58 CA halibut, 234 salmon troll and 10 HMS vessels); and 72 vessels using net gear (25 HMS and 47 CA halibut). If VMS transceiver unit has distress signal, it may further reduce response time in an emergency. Indirect impacts If VMS results in those fishers who are less dependent on groundfish revenue leaving the fishery, higher catch limits may result for those vessels that remain in the fishery. If fishing opportunity improves and profits to the individual vessel increase there may be fewer of these marginal vessels that tend to display more risk prone behavior including, the tendency to not adequately maintain equipment and vessels.
Alternative 6B Vessels with RCA restrictions except salmon troll north that retain only yellowtail rockfish	Direct impact & Indirect Impacts Same as Alt. 6A, but affects approximately <58 fewer vessels annually than does 6A because salmon troll vessel fishing north of 40°10' N. lat. that only land yellowtail rockfish would be excluded.
Alternative 7 Vessel >12 ft with RCA restrictions	Direct impact & Indirect Impacts Same as Alt. 6A, but benefits are slightly reduced from those identified under Alt. 6A because approximately 22 vessels/yr (6 longline, 2 pot, and 14 line gear) each less than 12 feet in length, would not be carrying VMS transceivers.
Alternative 8 Excludes all low impact OA fisheries, those where the incidental catch of overfished species is projected to be minimal.	Direct impact May provide position information that can be used to aid in search and rescue efficiency for approximately 1,463 vessels: 349 vessels using longline gear 282 directed groundfish, 65 Pacific halibut, and 2 CA halibut); 145 vessels directed groundfish vessels using pot gear; 40 CA halibut vessels using trawl gear, 47 vessels using CA halibut net gear, and; 882 vessels using line gear 590 groundfish directed, 58 CA halibut, and 234 salmon troll vessels). If VMS transceiver unit has distress signal, it may further reduce response time in an emergency. Indirect impacts If VMS results in those fishers who are less dependent on groundfish revenue leaving the fishery, higher catch limits may result for those vessels that remain in the fishery. If fishing opportunity improves and profits to the individual vessel increase there may be fewer of these marginal vessels that tend to display more risk prone behavior including, the tendency to not adequately maintain equipment and vessels.
SOCIO-ECONOMIC ENVIRONMENT - Continued	

SAFETY	Changes in search and rescue capability resulting from the requirement to carry and use VMS
Alternative 1 Status quo	Direct impact EPIRBS are the primary devise used to identify a vessel's location in an emergency situation. VHF radios are also used.
Alternative 9 Directed vessels. those that land more than 500 lb of groundfish in a calendar year.	Direct impact May provide position information that can be used to aid in search and rescue efficiency for approximately 1,123 vessels: 349 vessels using longline gear (282 directed groundfish, 65 Pacific halibut, and 2 CA halibut); 150 vessels using pot gear (145 groundfish directed, 1 Dungeness crab,2 prawn and 2 sheephead); 9 CA halibut and 3 pink shrimp vessels using trawl gear, 15 vessels using CA halibut net gear, and; 597 vessels using line gear 590 groundfish directed, 1 HMS and 6 salmon troll vessels). If VMS transceiver unit has distress signal, it may further reduce response time in an emergency. Indirect impacts If VMS results in those fishers who are less dependent on groundfish revenue leaving the fishery, higher catch limits may result for those vessels that remain in the fishery. If fishing opportunity improves and profits to the individual vessel increase there may be fewer of these marginal vessels that tend to display more risk prone behavior including, the tendency to not adequately maintain equipment and vessels.
Alternative 10 No Action. No VMS requirements. Discontinue the use of RCA management and adust trip limits and seasons accordingly.	Direct impact & Indirect Impacts EPIRBS are the primary devise used to identify a vessel's location in an emergency situation. VHF radios are also used.

4.3.4 Safety of Human life

Direct Impacts on the safety of human life at sea primarily consists of changes in search and rescue capability.

Response time to any incident at sea requires clear communications about the problem and the needs of the vessel's crew, an ability to quickly identify the location of the vessel, and the capability to either provide adequate information or to reach the vessel for an at seas rescue. An EPIRB is an emergency notification devise that is automatically released when a vessel sinks. After the EPIRB is released, it floats to the surface and automatically begins sending out an emergency distress signal that identifies the vessel location. Unfortunately, these devices do not always work as intended and a certain proportion of the units fail to work at all.

Though VMS transceivers are not replacements for EPIRBS, they can aid the USCG in search and rescue efforts when other sources of emergency information are not available. If an EPIRB or other safety system fails to transmit a vessel's last location, or if the vessel's last location is in question, VMS could be used to identify the vessel's last known position. Similarly, if a vessel's position reports fail to be received over a period of time, it may be used to alert processing center staff to a potential problem that can be forwarded to the USCG for further investigation. Though VMS shows where a vessel is located it becomes ineffective should the power be lost or a vessel sinks. Unlike EPIRBS which have their own power source, VMS is dependent on the vessel for power. Most VMS systems have distress buttons and some allow for two-way communications. Having the 2-way communication can aid in obtaining information about vessel safety and medical issues.

Indirect impacts on safety as a result of VMS would result if VMS altered risk prone behavior. When fishing opportunity is reduced and profits are marginal, vessels may display more risk prone behavior and may not adequately maintain equipment and vessels. If VMS results in those fishers who are less dependent on groundfish revenue leaving the fishery, higher catch limits may result for those vessels that remain in the fishery. Though farther removed in time, increases in groundfish revenue from increased trip limits could result in vessels being better maintained. Similarly, if the integrity of the RCA can be maintained, the potential for recovery of overfished stocks is more likely and future harvest rates are more likely to increase

There is a certain degree of danger associated with groundfish fishing, however, little is known about the connection between fisheries management measures and incident, injury, or fatality rates in the fishery. Moreover, little is known about risk aversion among fishers or the values placed on increases or decreases in different risks.

There are safety concerns when small vessels are encouraged to fish in deeper waters and farther from assistance. Extended transits will result in longer exposure to harsh weather conditions, especially during winter months. This problem is compounded by the relatively small size and slow speed of many OA fishing vessels which will make it difficult for them to run from weather or return to port before sea conditions become hazardous. Small vessels are not able to withstand rough seas as well as larger vessels. The VMS provisions currently in regulation set a standard that prohibits groundfish directed vessels from drifting in the RCAs. This provision would apply to the OA fisheries as well.

Comparison of the Alternatives
Safety is expected to vary with the alternatives because of the difference in vessel coverage and the VMS information that may be available in an emergency situation. Table 4.3.1.1. Shows the percent of OA vessels less than 40 feet (ft) in length by dependency on the fishery for November 2000 through October 2001. During this time period, 90% or more of the most groundfish dependent vessels in the nearshore and shelf rockfish fleets were under 40 feet in length. With the creation of the RCAs it is assumed that many of the smaller vessels shifted their efforts off the shelf and in to nearshore areas. However 85% of the slope rockfish vessels and 72%of the sablefish vessels were also under 40 feet in length. When looking at the incidental OA fisheries for this time period, those with more than 50% of the fleet under 40 ft in length were

salmon (72%), Pacific halibut (65%), and Dungeness crab (56%). A large proportion of the less dependent groundfish vessels were also in fleets were more than 50% of the vessels were under 40 feet in length: nearshore (78%) and shelf rockfish (60%). Those alternatives that include the directed longline and pot vessels that are most likely to target slope species may benefit the smaller directed groundfish vessels that travel far from shore. Small vessels may be difficult to locate on the open ocean. If necessary, VMS position data could serve as a secondary source of information for locating these vessels in emergency situations.

No information regarding a vessel's fishing location is provided under Alternative 1, status quo. Alternative 2 maintains the provisions of status quo, but adds the VMS requirements for approximately 282 directed groundfish, 38 Pacific halibut, and 2 California halibut vessels using longline gear. Of the alternatives that require VMS, Alternative 2 requires the smallest proportion of the OA fleet (only 320 vessels using longline gear) to have and use VMS and would therefore provide the least safety benefit of the VMS alternatives.

Alternative 3, includes the same vessels as Alternative 2, but adds the VMS and declaration reporting requirements for approximately 193 vessels (145 directed, 21 Dungeness crab, 6 prawn, and 21 California sheephead vessels) using pot gear. Therefore, Alternative 3 would more vessels would have VMS units that Alternative 2, however there would less vessels than under Alternative 4A and therefore less of a safety benefit than Alternative 4A.

Alternatives 4A and 4B add VMS coverage for nongroundfish trawl vessels to the vessels identified under Alternative 3. The primary difference between the 2 alternatives is that Alternative 4A adds the VMS and declaration reporting requirement for approximately 77 vessels (23 ridgeback prawn, 14 sea cucumber and 40 California halibut vessels) using nongroundfish trawl gear that take and retain, possess or land groundfish. While Alternative 4B includes all of the nongroundfish trawl vessels identified under Alternative 4B plus 54 pink shrimp vessels. Many vessels that fish for pink shrimp are also registered to LE groundfish permits and therefore already have VMS requirements.

Alternative 5A includes the same vessels as Alternative 4A, but adds the VMS and declaration reporting requirements for approximately 590 vessels groundfish, 58 California halibut, and 10 HMS vessels using line gear to take and retain, possess or land groundfish (excludes salmon troll vessels). Alternative 5B includes slightly more vessels than 5A because the number of salmon troll vessels that would be added under this alternative is greater than the number of HMS and Dungeness crab vessels that would not be included. Though alternative 5B does not include vessels in fisheries that are projected to have minimal impacts on overfished species (10 HMS line and 2 longline, 21 Dungeness crab pot), it includes approximately 241 salmon troll vessels.

Alternative 6, which applies to any vessel engaged in commercial fishing to which a RCA restriction applies, includes the largest number of OA vessels. Therefore, Alternative 6A would have the greatest safety benefits because the greatest number of vessels will be required to carry VMS transceivers. Alternative 6B, affects approximately 79 fewer vessels annually than does Alternative 6A, all of which use salmon troll gear. Alternative 7, is almost the same as Alternative 6A because it applies to the same vessels except that vessels less than 12 feet in length would be excluded. Most, if not, all vessels under 12 feet in length are not expected to fish in Federal waters and would therefore not trigger the VMS requirement.

Alternative 8 excludes the low impact OA fisheries, those where the incidental catch of overfished species is projected to be minimal: Dungeness crab pot, spot prawn pot, sea cucumber trawl, ridgeback prawn trawl, HMS line, and California sheephead pot. Data available under this alternative includes 1,463 vessels includes data from: 349 vessels using longline gear (282 directed groundfish, 65 Pacific halibut, and 2 CA halibut); 145 vessels directed groundfish vessels using pot gear; 40 California halibut vessels using trawl gear, 47 vessels using CA halibut net gear, and; 882 vessels using line gear 590 groundfish directed, 58 California halibut, and 234 salmon troll vessels). Position reports from the seas cucumber, ridgeback prawn, and pink shrimp trawl vessels would not be included under Alternative 8.

Because alternative 9 excludes those vessels with minimal annual catch of groundfish, those that land more than 500 lb of groundfish in a calendar year, it includes fewer nongroundfish trawl vessels than Alterative 8. Under alternative 9 data from 1,123 vessels could be used to maintain the integrity of RCAs from longline, pot, trawl, line, net and other fishing gear impacts. Vessels included under Alternative 9 are: 349 vessels using longline gear (282 directed groundfish, 65 Pacific halibut, and 2 CA halibut); 150 vessels using pot gear (145 groundfish directed, 1 Dungeness crab,2 prawn and 2 sheephead); 9 California halibut 3 and pink shrimp vessels using trawl gear, 15 vessels using CA halibut net gear, and; 597 vessels using line gear 590 groundfish directed, 1 HMS and 6 salmon troll vessels). No OA vessels would be required to have VMS under Alternative 10.

4.3.5 Communities

Fishing communities, as defined in the MSA, include not only the people who catch the fish, but also those who share a common dependency on directly related fisheries-dependent services and industries. Commercial fishing communities may include boatyards, fish handlers, processors, and ice suppliers. People employed in fishery management and enforcement make up another component of fishing communities. 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. Although unique, communities share many similarities. For example, all face danger, safety issues, dwindling resources, and a multitude of state and federal regulations.

Since 2003, the Council has used a depth-based management strategy to would allow fishing to continue in areas and with gear that can harvest healthy stocks with little incidental catch of low abundance species (overfished species). Stock assessments for four overfished species, bocaccio, yelloweye, canary and darkblotched rockfish indicated that little surplus production is available for harvest. Therefore, measures must be taken to protect these stocks and rebuild them to sustainable biomass levels.

Regulations that lower fishing quotas have historically reduced the income generated by the fishing fleet. When fishing income is reduced, the coastal communities typically suffer in the short- term. Constraints on the groundfish fishery resulting from the need to rebuild overfished species could cause and economic instability of fishery participants and associated fishing communities. However, recovery of fish stocks will help coastal communities and the industry, in the long term. In the long-term, Alternatives 2-7 provide a means to ensure the integrity of the depth-based management areas and thereby mitigate undesirable or greater economic impacts associated with overfished species management. If the RCAs cannot be maintained, it is likely that management measures will need to revert back to simple closed areas and very restrictive limits, which have a greater effect on fishing communities in the short-term.

In the short-term, if the added cost results in large numbers of incidental OA groundfish vessels and vessel that have a low level of dependency on groundfish leaving the fishery, the necessary fishing supplies that would otherwise be purchased by them may result in less sales for supporting businesses. However, since these are primarily incidental OA groundfish vessels, it would be assumed that the gear and supplies they normally purchase for the target fishery would remain unchanged.

There is a risk to low volume processors (addressed in the previous section) if a substantial number of incidental OA groundfish and less dependent fishers exit the fishery to avoid the added cost of VMS. This may particularly be a problem under Alternatives 5A-7, in which most incidental fisheries are included. If fewer incidentally caught groundfish are available, prices to processors and buyers may increase, these increases would then be passed on to the businesses that purchase the fish and the consumer. Such increases may have a negative affect on business in coastal communities that depend on groundfish products for their business.

The level of fleet coverage, that portion of the overall OA fishing fleet that would be required to have VMS and provide declaration reports, is the only difference between the alternatives. The ability to maintain the integrity of the RCAs is directly related to the level of VMS coverage for OA vessels. In general, the higher the coverage level for vessels that interact with overfished species, the more likely that it is that the integrity of the RCAs can be maintained.

4.4 Cumulative Impacts

Cumulative effects must be considered when evaluating the alternatives to the issues considered in the EA. Cumulative impacts are those combined effects on quality of human environment that result from the incremental impact of the action when added to other past, present, and reasonably foreseeable future actions, regardless of what federal or non-federal agency undertake such actions (40 CFR 1508.7, 1508.25 (a), and 1508.25 (c))

[Section to be completed]

5.0 CONSISTENCY WITH THE FMP AND OTHER APPLICABLE LAWS

5.1 Consistency with the FMP

The socio-economic framework in the Pacific Coast Groundfish FMP requires that proposed management measures and viable alternatives be reviewed and consideration given to the following criteria: a) how the action is expected to promote achievement of the goals and objectives of the FMP; b) likely impacts on other management measures; c) biological impacts; d) and economic impacts, particularly the cost to the fishing industry; and e) accomplishment of one of a list of factors.

GOALS AND OBJECTIVES OF THE FMP

The Council is committed to developing long-range plans for managing the Pacific Coast groundfish fisheries that prevent overfishing and loss of habitat, yet provide the maximum net value of the resource, and achieve maximum biological yield. Alternatives 2- 7 are consistent with FMP goal 1-objective 1, and goal 3-objective 10.

> Goal 1- 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.
>
> Goal 3- Utilization: Objective 10 -- 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 information necessary to determine the extent to which it is practicable to reduce bycatch and bycatch mortality.

ACCOMPLISHMENT OF ONE OF THE FACTORS LISTED IN FMP SECTION 6.2.3.

Under the socio-economic framework, the proposed action must accomplish at least 1 of the criteria defined in Section 6.2.3 of the FMP. Alternatives 2-7 are likely to accomplish objective 2 by providing information to avoid exceeding a quota, harvest guideline or allocation, and objective 13 by maintaining a data collection and means for verification.

5.2 Magnuson-Stevens Conservation and Management Act

The Magnuson-Stevens Act provides parameters and guidance for federal fisheries management, requiring that the Councils and NMFS adhere to a broad array of policy ideals. Overarching principles for fisheries management are found in the Act's National Standards. In crafting fisheries management regimes, the Councils and NMFS must balance their recommendations to meet these different national standards.

National Standard 1 requires 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 proposed action is to expand a monitoring program to monitor the integrity of closed areas that were established to protect overfished species. Information provided under Alternatives 2- 7 reduce the risk of overfishing because they would provide information that could be used to reduce the likelihood of overfishing while allowing for the harvests of healthy stocks. Because Alternative 6A and 7 provides the most information, they would have the least risk, while Alternative 1 has the greatest risk.

National Standard 2 requires the use of the best available scientific information. The proposed action is to expand a VMS program to monitor the integrity of closed areas that were established to protect overfished species. Data collected under Alternatives 2-7 would be used to understand the level of fishing effort and how it was distributed. When combined with data from the existing federal observer program, it could be used to more accurately estimate total catch.

National Standard 3 requires, to the extent practicable, that an individual stock of fish be managed as a unit throughout its range, and interrelated stocks of fish shall be managed as a unit or in close coordination. This standard is not affected by the proposed action to expand a monitoring program to monitor the integrity of closed areas.

National Standard 4 requires that conservation and management measures not discriminate between residents of different States. None of the alternatives would discriminate between residents of different States.

National Standard 5 is not affected by the proposed actions because it does not affect efficiency in the utilization of fishery resources.

National Standard 6 requires that conservation and management measures take into account and allow for variations among, and contingencies in, fisheries, fishery resources, and catches." All alternatives meet this standard.

National Standard 7 requires that conservation and management measures minimize costs and avoid unnecessary duplication. Measures were taken to minimize the costs of a monitoring program by reducing the time burden and cost of declaration reports - they would only be required when vessel changes gears rather than on every trip.

National Standard 8 provides protection to fishing communities by requiring that conservation and management measures be 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. The proposed alternatives are consistent with this standard.

National Standard 9 requires that conservation and management measures minimize bycatch and minimize the mortality of bycatch. NMFS is required to "promote and support monitoring programs to improve estimates of total fishing-related mortality and bycatch, as well as those to improve information necessary to determine the extent to which it is practicable to reduce bycatch and bycatch mortality. The proposed action is consistent with this standard.

National Standard 10 Conservation and Management measures shall, to the extent practicable, promote the safety of human life at sea. Alternatives 2-7 have safety benefits. Thought VMS is not an emergency response system it has been used in search an rescue to determine a vessels last known position and the VMS systems provides for a distress signal that may also reduce response time in an emergency. Alternatives 6A and 7 have the greatest safety benefits because requires VMS for the largest portion of the OA fleet, followed by 5B and then 6B.

Essential Fish Habitat This action will affect fishing in areas designated as essential fish habitat (EFH). The proposed action is to expand a program to monitor the integrity of closed areas that were established to protect overfished species. The potential effects of the proposed actions are not expected to have either no adverse effect on EFH, to have a positive effect resulting from reduced fishing effort in critical areas, or to have a positive effect if used to support regulations to restrict fishing in areas to protect habitat. No EFH consultation is warranted for this action.

5.3 Endangered Species Act

NMFS issued Biological Opinions (B.O.) 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 11,000 fish chinook bycatch amount specified in the Pacific whiting fishery B.O. (December 19, 1999) incidental take statement, 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 B.O., NMFS determined 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. This proposed rule implements a data collection program and is within the scope of these consultations. Because the impacts of this action fall within the scope of the impacts considered in these B.O.s, additional consultations on these species are not required for this action.

5.4 Marine Mammal Protection Act

Under the MMPA, marine mammals whose abundance falls below the optimum sustainable population level (usually regarded as 60% of carrying capacity or maximum population size) can be listed as "depleted". Populations listed as threatened or endangered under the ESA are automatically depleted under the terms of the MMPA. Currently, the Stellar sea lion population off the West Coast is listed as threatened under the ESA and the fur seal population is listed as depleted under the MMPA. Incidental takes of these species in the Pacific Coast fisheries are well under their annual PBRs. None of the proposed management alternatives are likely to affect the incidental mortality levels of species protected under the MMPA. The West Coast groundfish fisheries are considered Category III fisheries, where the annual mortality and serious injury of a stock by the fishery is less than or equal to 1% of the PBR level. Implementation of Alternatives 2-7 are expected to benefit MMPA species because they would allow observer data and data from other sources to be joined to the VMS data to better understand the extent of potential fishing related impacts on various marine mammal species.

5.5 Coastal Zone Management Act

The proposed alternatives 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 Coastal Zone Management Act (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 that vary widely from one state to the next.

5.6 Paperwork Reduction Act

[Section to be completed]

5.7 Executive Order 12866

This action is not significant under E.O. 12866. This action will not have a cumulative effect on the economy of $100 million or more, nor will it result in a major increase in costs to consumers, industries, government agencies, or geographical regions. No significant adverse impacts are anticipated on competition, employment, investments, productivity, innovation, or competitiveness of U.S.-based enterprises.

5.8 Executive Order 13175

Executive Order 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 of Commerce 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 that 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' usual and accustomed (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. The proposed action is being developed in consultation with the affected tribe(s) and, insofar as possible, with tribal consensus.

5.9 Migratory Bird Treaty Act and Executive Order 13186

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. None of the proposed management alternatives, or the Council recommended action are likely to affect the incidental take of seabirds protected by the Migratory Bird Treaty Act. Executive Order 13186 (Responsibilities of Federal Agencies to Protect Migratory Birds) is intended to ensure that each Federal agency taking actions that have, or are likely to have, a measurable negative effect on migratory bird populations develops and implements a Memorandum of Understanding (MOU) with the U.S. Fish and Wildlife Service that shall promote the conservation of migratory bird populations. Currently, NMFS is developing an MOU with the U.S. Fish and Wildlife Service. None of the proposed management alternatives are likely to have a measurable effect on migratory bird populations.

5.10 Executive Order 12898 (Environmental Justice) and 13132 (Federalism)

There is no specific guidance on application of EO 12898 to fishery management actions. The EO states that environmental justice should be part of an agency's mission "by identifying and addressing disproportionately high and adverse human health or environmental effects of its programs, policies, and activities on minority or low-income populations." These recommendations would not have federalism implications subject to E.O. 13132. State representatives on the Council have been fully consulted in the development of this policy recommendation.

6.0 REGULATORY IMPACT REVIEW AND REGULATORY FLEXIBILITY ANALYSIS

The RIR and IRFA analyses have many aspects in common with each other and with EAs. Much of the information required for the RIR and IRFA analysis has been provided above in the EA. Table 6.0.1 identifies where previous discussions relevant to the EA and IRFA can be found in this document. In addition to the information provided in the EA, above, a basic economic profile of the fishery is provided annually in the Council's SAFE document.

Table 6.0 1 Regulatory Impact Review and Regulatory Flexibility Analysis

RIR Elements of Analysis	Corresponding Sections in EA	IRFA Elements of Analysis	Corresponding Sections in EA
Description of management objectives		Description of why actions are being considered	
Description of the Fishery		Statement of the objectives of, and legal basis for actions	
Statement of the Problem		Description of projected reporting, recordkeeping and other compliance requirements of the proposed action	
Description of each selected alternative		Identification of all relevant Federal rules	
An economic analysis of the expected effects of each selected alternative relative to status quo			

[Section to be completed]

6.1 Regulatory Impact Review

[Section to be completed]

The RIR is designed to determine whether the proposed action could be considered a "significant regulatory actions" according to E.O. 12866. E.O. 12866 test requirements used to assess whether or not an action would be a "significant regulatory action", and identifies the expected outcomes of the proposed management alternatives. 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;2) Create a serious inconsistency or otherwise interfere with action taken or planned by another agency; 3) Materially alter the budgetary impact of entitlement, grants, user fees, or loan programs or the rights and obligations of recipients thereof; or 4) Raise novel legal or policy issues arising out of legal mandates, the President's priorities, or the principles set forth in this executive Order. Based on results of the economic analysis contained in Section 4.3, this action is not expected to be significant under E.O. 12866.

6.2 Initial Regulatory Flexibility Analysis

When an agency proposes regulations, the RFA requires the agency to prepare and make available for public comment an Initial Regulatory Flexibility Analysis (IRFA) that describes the impact on small businesses, non-profit enterprises, local governments, and other small entities. The IRFA is to aid the agency in considering all reasonable regulatory alternatives that would minimize the economic impact on affected small entities (attachment 1). To ensure a broad consideration of impacts on small entities, NMFS has prepared this IRFA without first making the threshold determination whether this proposed action could be certified as not having a significant economic impact on a substantial number of small entities. NMFS, must determine such certification to be appropriate if established by information received in the public comment period.

1) <u>A description of the reasons why the action by the agency is being considered</u>.

2) <u>A succinct statement of the objectives of, and legal basis for, the proposed rule</u>.

3) <u>A description of and, where feasible, and estimate of the number of small entities to which the proposed rule will apply</u>;

Requirements of an IRFA

The Regulatory Flexibility Act (5 U.S.C. 603) states that:
(b) Each initial regulatory flexibility analysis required under this section shall contain--

(1) a description of the reasons why action by the agency is being considered:
(2) a succinct statement of the objectives of, and legal basis for, the proposed rule;
(3) a description of and, where feasible, and estimate of the number of small entities to which the proposed rule will apply;
(4) a description of the projected reporting, recordkeeping and other compliance requirements of the proposed rule, including an estimate of the classes of small entities which will be subject to the requirement and the type of professional skills necessary for preparation of the report or record;
(5) an identification, to the extent practicable, of all relevant Federal rules which may duplicate, overlap, or conflict with the proposed rule.

(c) Each initial regulatory flexibility analysis shall also contain a description of any significant alternatives to the prosed rule which accomplish the stated objectives of applicable statutes and which minimize any significant economic impact of the proposed rule on small entities. Consistent with the stated objectives of applicable statutes, the analysis shall discuss significant alternatives such as--

(1) the establishment of differing compliance or reporting requirements or timetables that take into account the resources available to small entities;
(2) the clarification, consolidation, or simplification of compliance and reporting requirements under the rule for such small entities;
(3) the use of performance rather than design standards; and
(4) an exemption from coverage of the rule, or any part thereof, for such small entities.

4) A description of the projected reporting, recordkeeping and other compliance requirements of the proposed rule, including an estimate of the classes of small entities which will be subject to the requirement and the type of professional skills necessary for preparation of the report or record.

5) An identification, to the extent practicable, of all relevant Federal rules which may duplicate, overlap, or conflict with the proposed rule.

6) A summary of economic impacts.

7) A description of any alternatives to the proposed rule which accomplish the stated objectives of applicable statutes and which minimizes and significant economic impacts of the proposed rule on small entities.

7.0 List of Preparers

This document was prepared by the Northwest Regional Office of the NMFS. 8.0 References

[Section to be completed]

8.0 References

XXX INCOMPLETE - ADD NEW XXX

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Agenda Item H.10.b
Supplemental NMFS Presentation
November 2005

Expanded Coverage of the Program to Monitor Time-Area Closures in the Pacific Coast Groundfish Fishery

October 2005

VMS Pilot Program

- Implemented January 1, 2004.
- All LE vessels that fish off the west coast
- Type-approved transceiver unit required
- Declaration reports required
- EA for pilot program examined:
    - 1) the monitoring system,
    - 2) coverage levels, and
    - 3) the payment structure.
- Current EA examines coverage for OA fisheries

Purpose of This Action

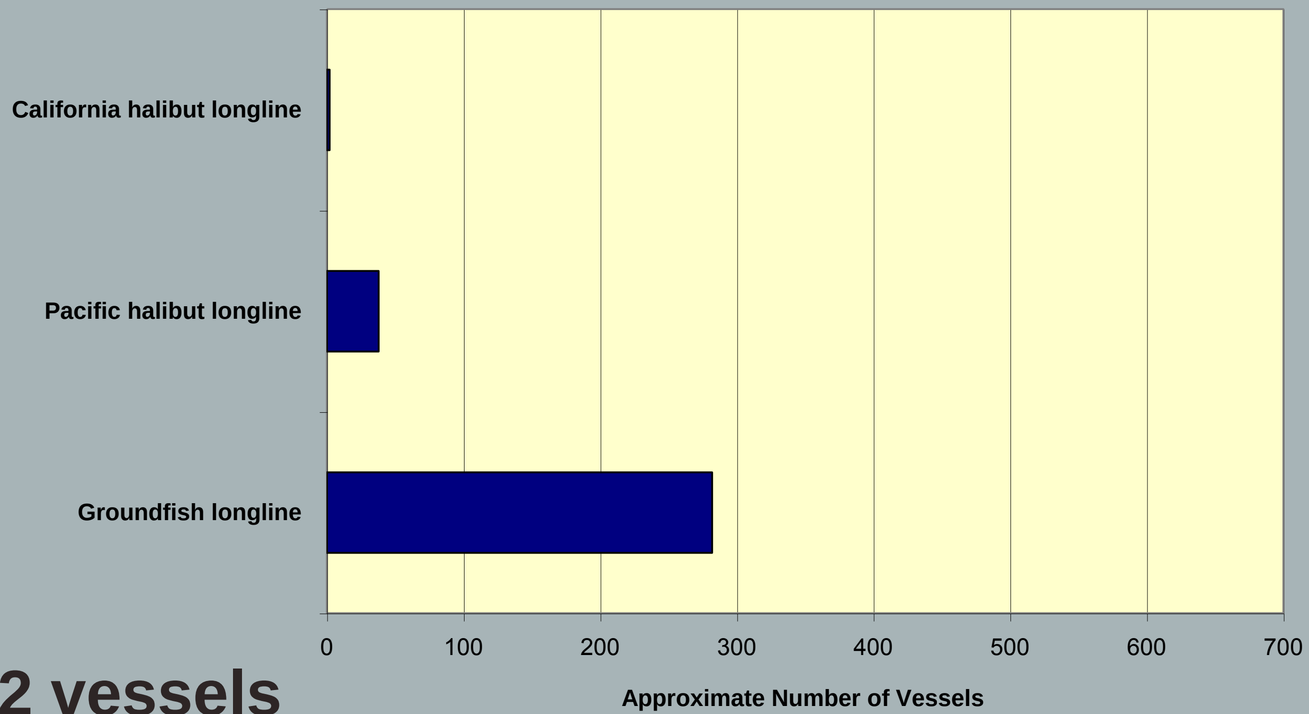
- To consider expansion of the VMS program into the OA fisheries

- When the closed areas are large-scale and defined by irregular lines, traditional enforcement methods are difficult to use

- VMS is a tool that aids enforcement in maintaining the integrity of conservation areas

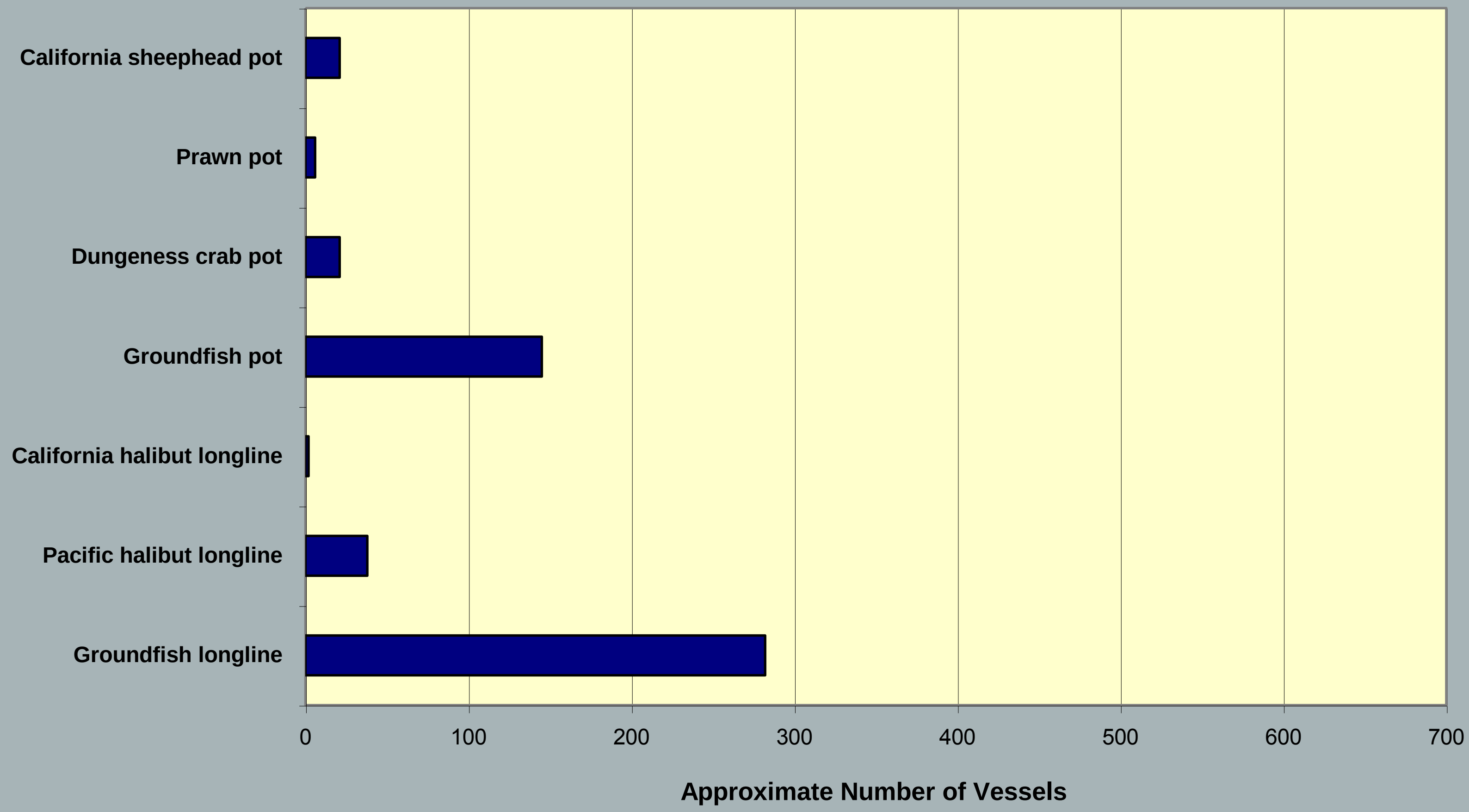
Alternative 1 (Status quo) – No VMS, continue declaration reports for OA non-groundfish trawl vessels that fish within any trawl RCA

Alternative 2 – OA Vessels fishing with longline gear



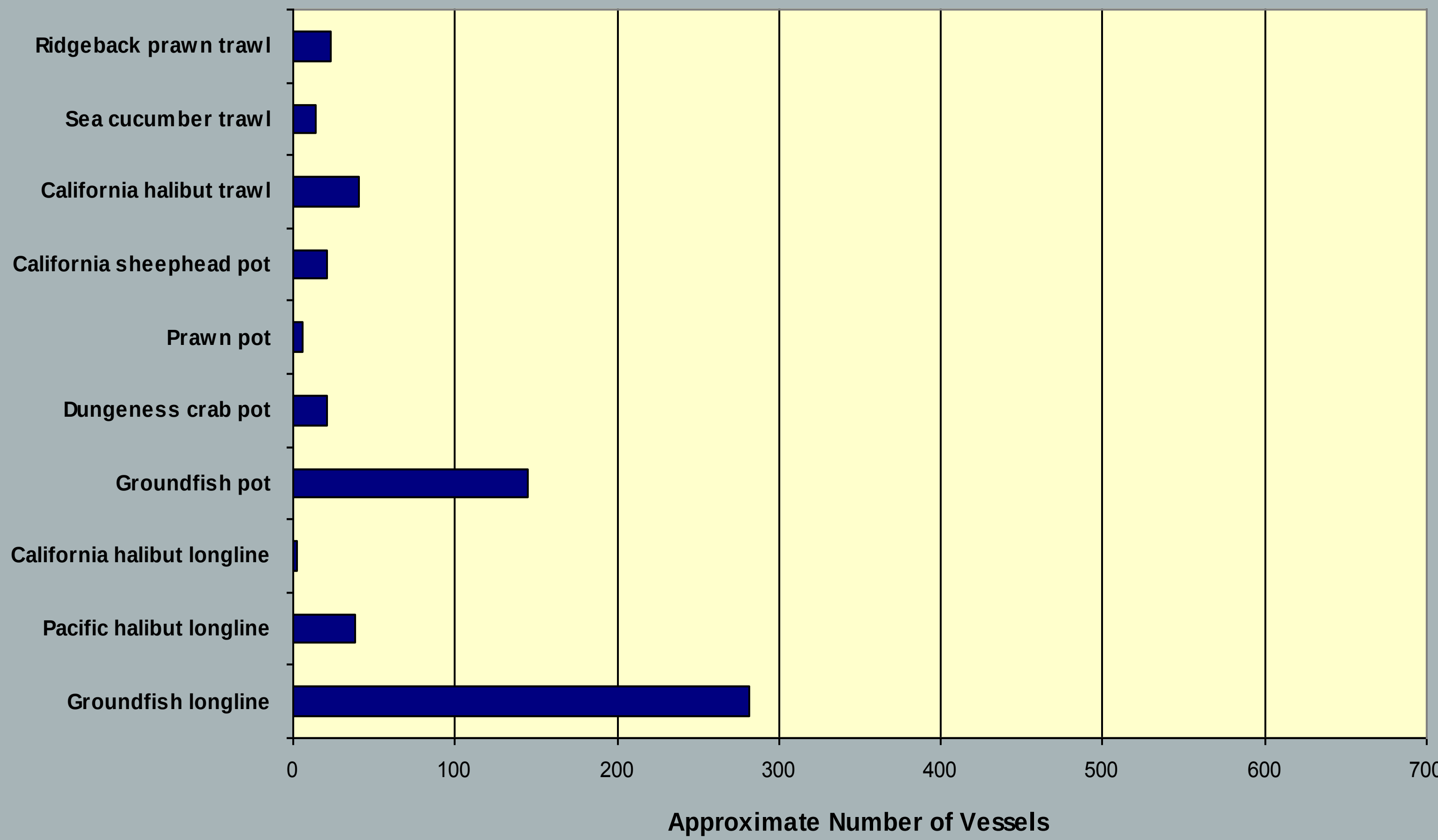
322 vessels

Alternative 3 -- longline and pot vessels



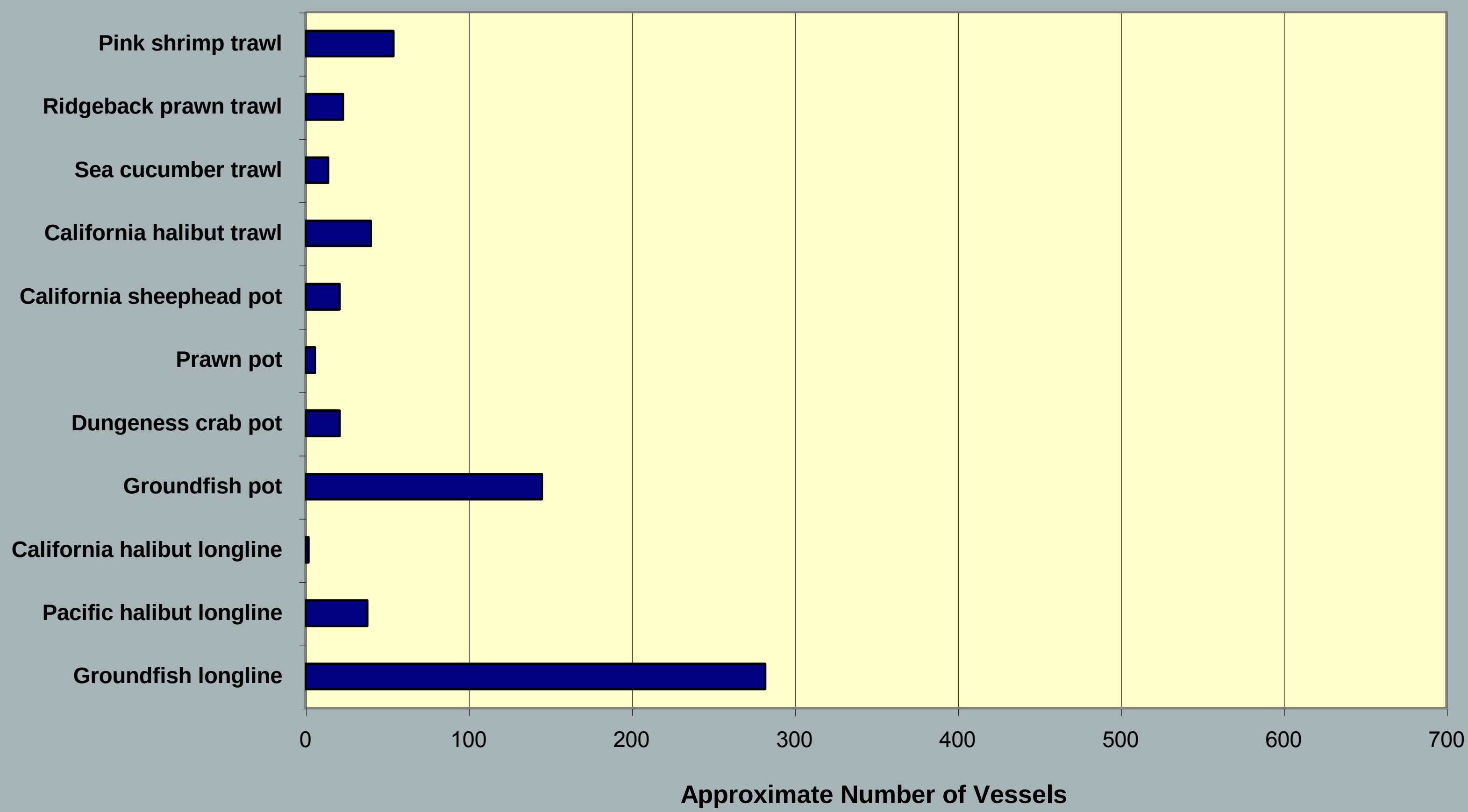
515 vessels

Alternative 4A -- longline, pot, and trawl vessels; excluding pink shrimp trawl



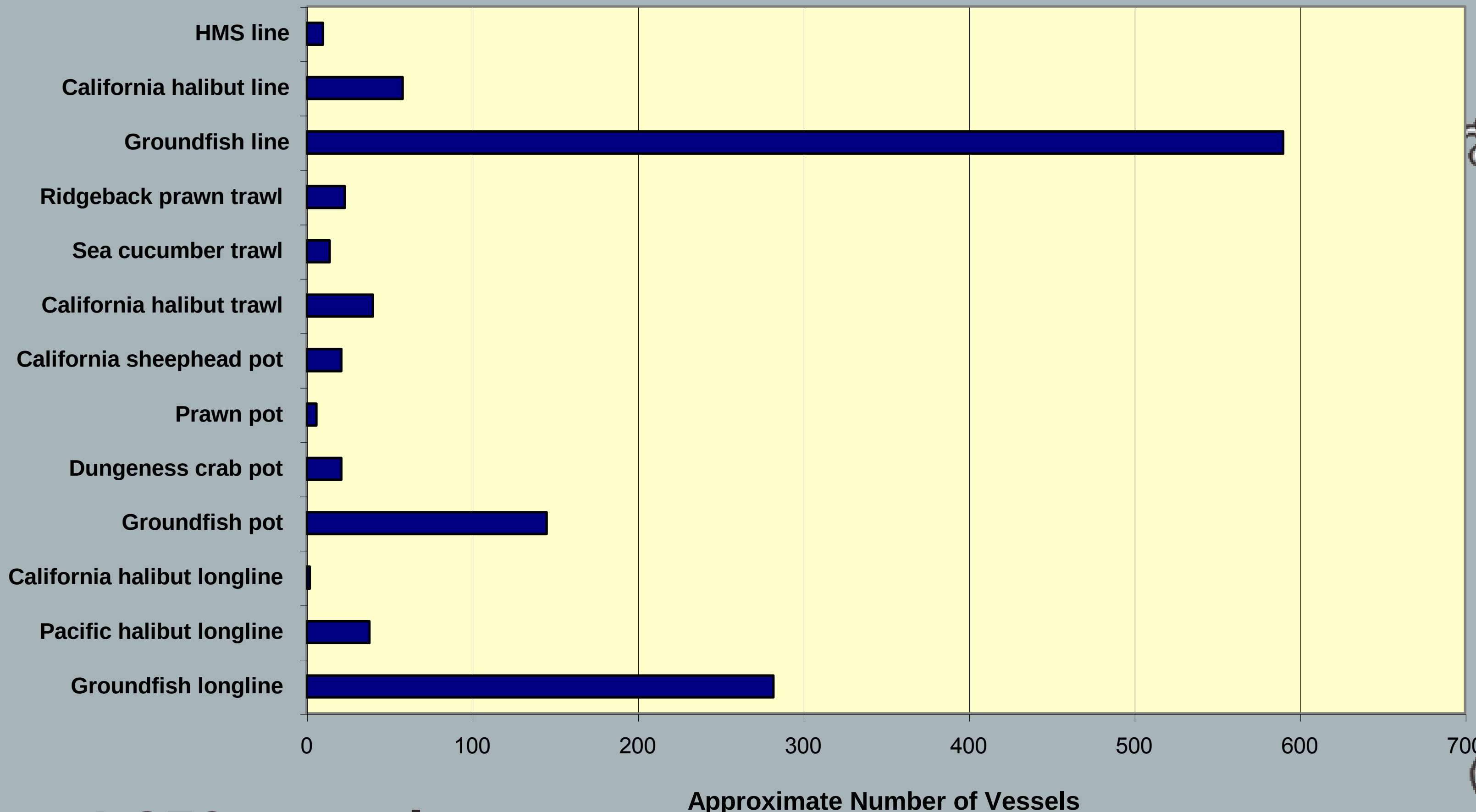
592 vessels

Alternative 4B -- longline, pot, and trawl vessels



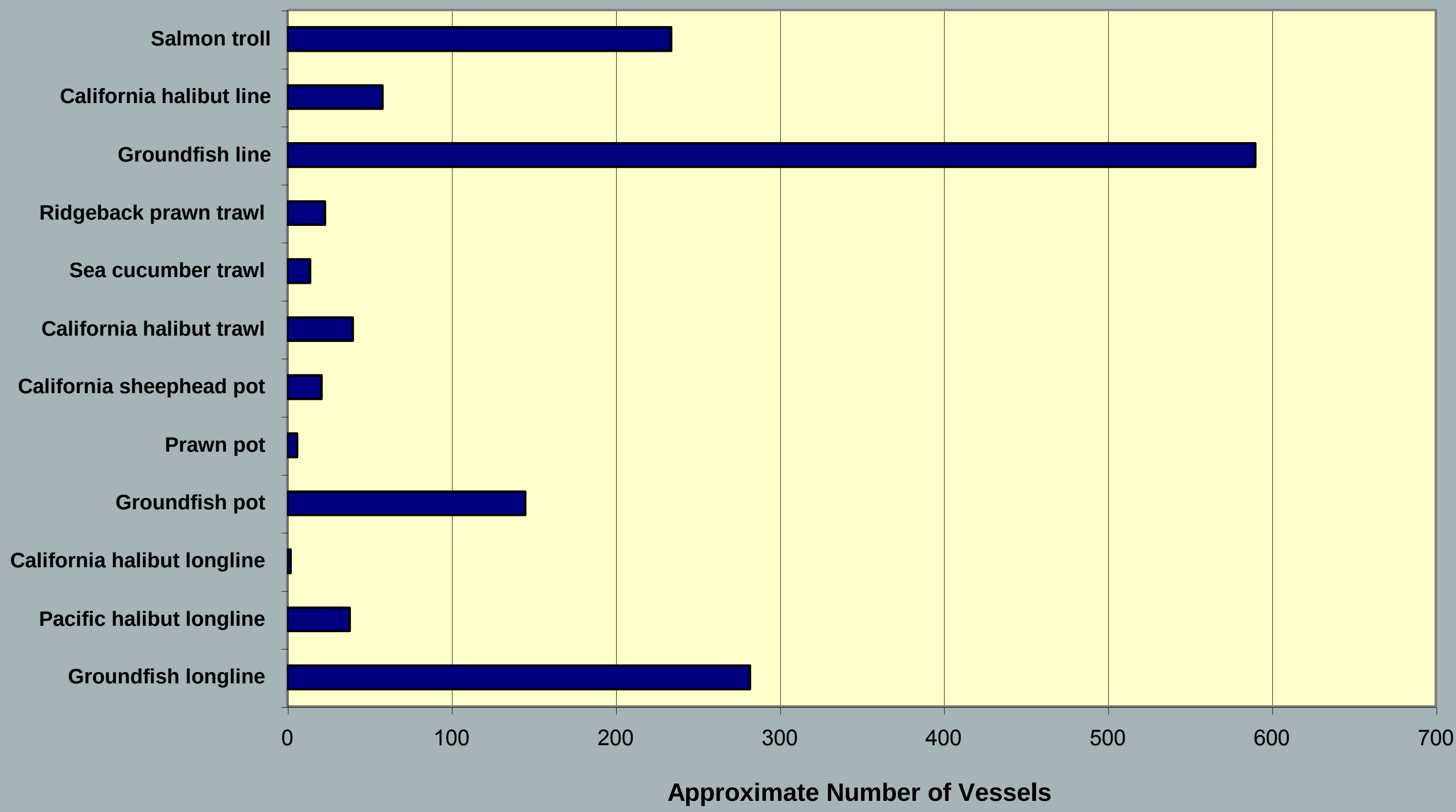
646 vessels

Alternative 5A -- longline, pot, trawl and line vessels; excluding pink shrimp trawl and salmon troll



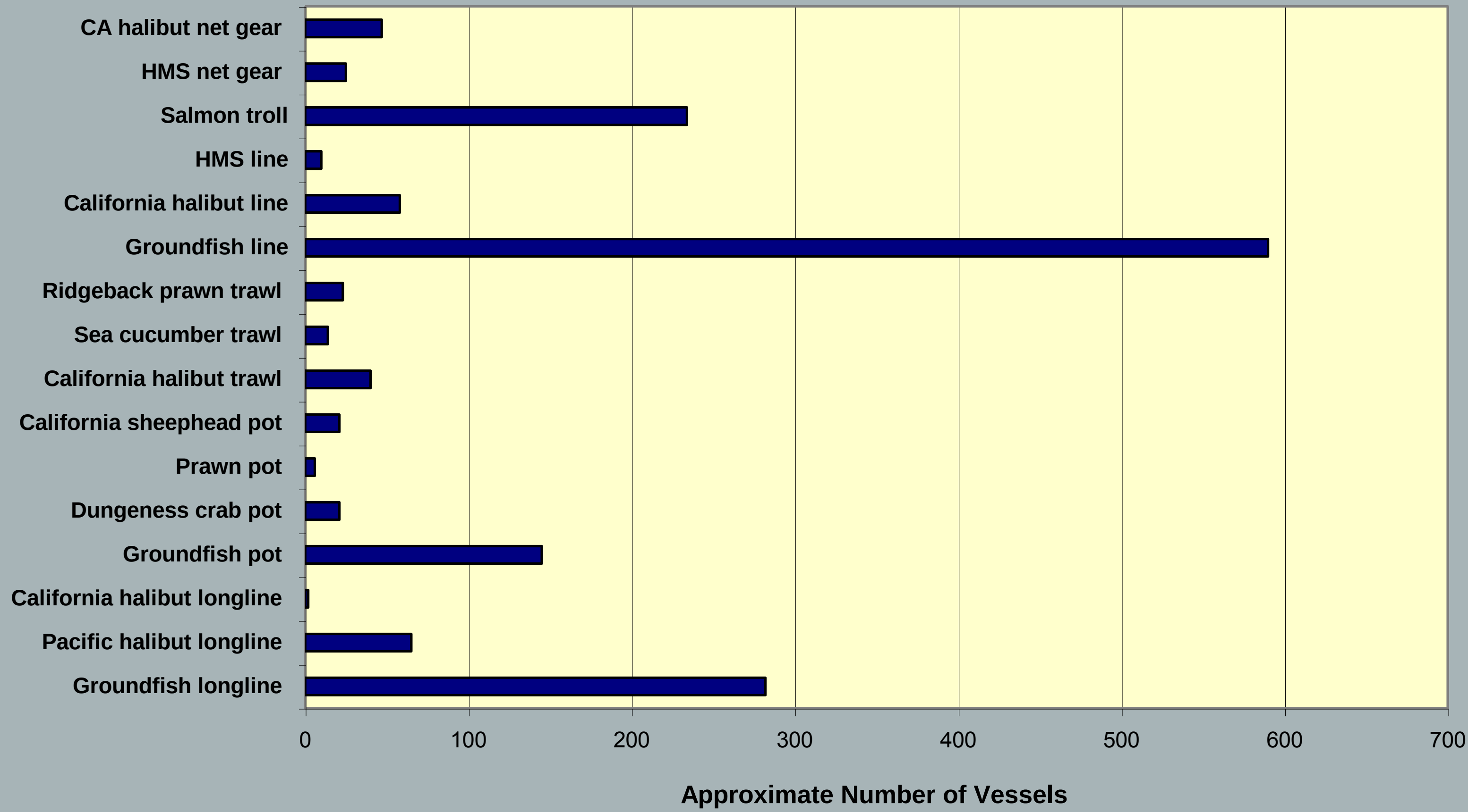
1,250 vessels

Alternative 5B – longline, pot, trawl and line vessels; excluding pink shrimp trawl, HMS line and longline, and Dungeness crab pot



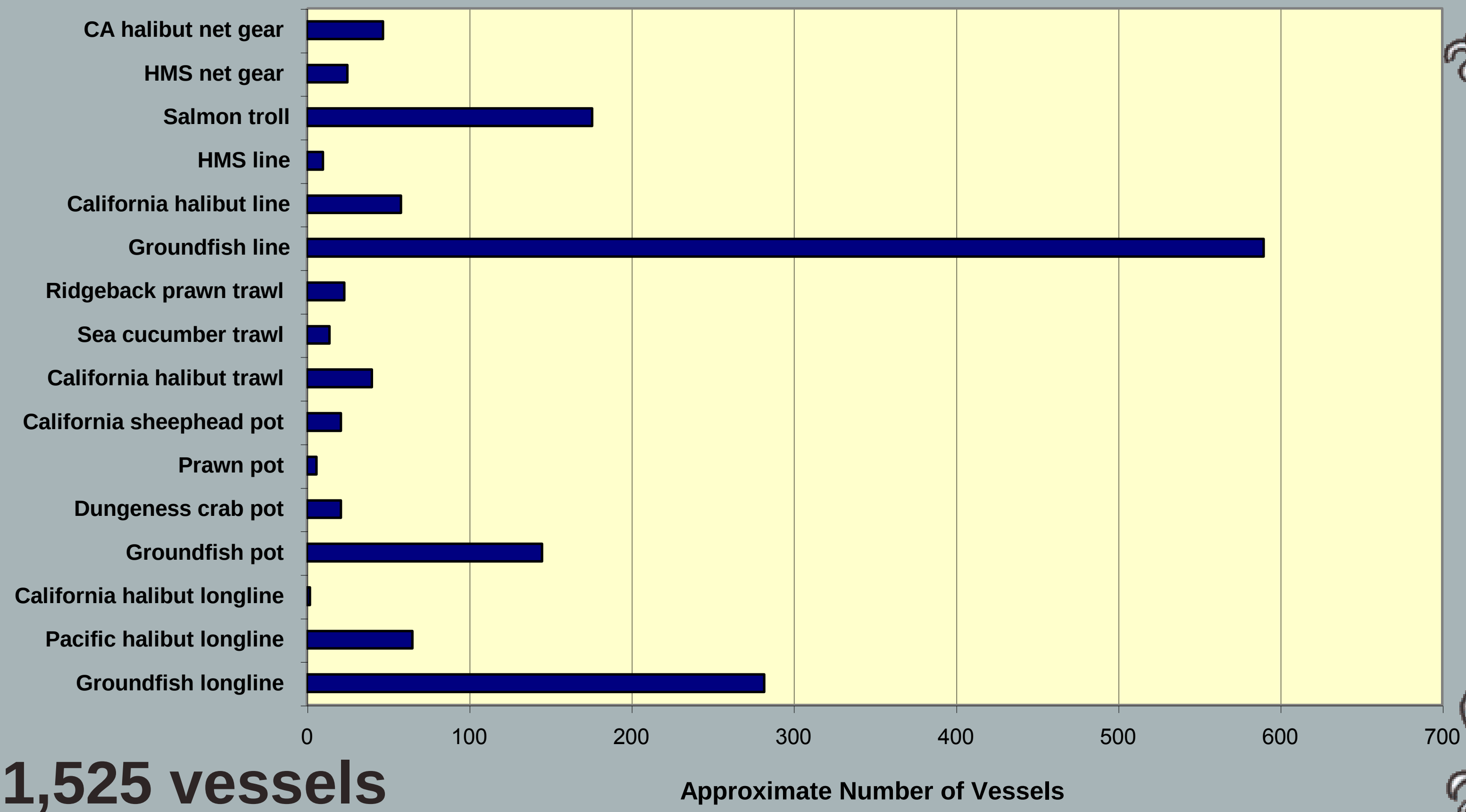
1,453 vessels

Alternative 6A – Vessels engaged in commercial fishing to which RCA restrictions apply – Pink shrimp trawl is excluded. Vessels using salmon troll Dungeness crab, CPS or HMS gear are excluded if they do not take and retain groundfish.



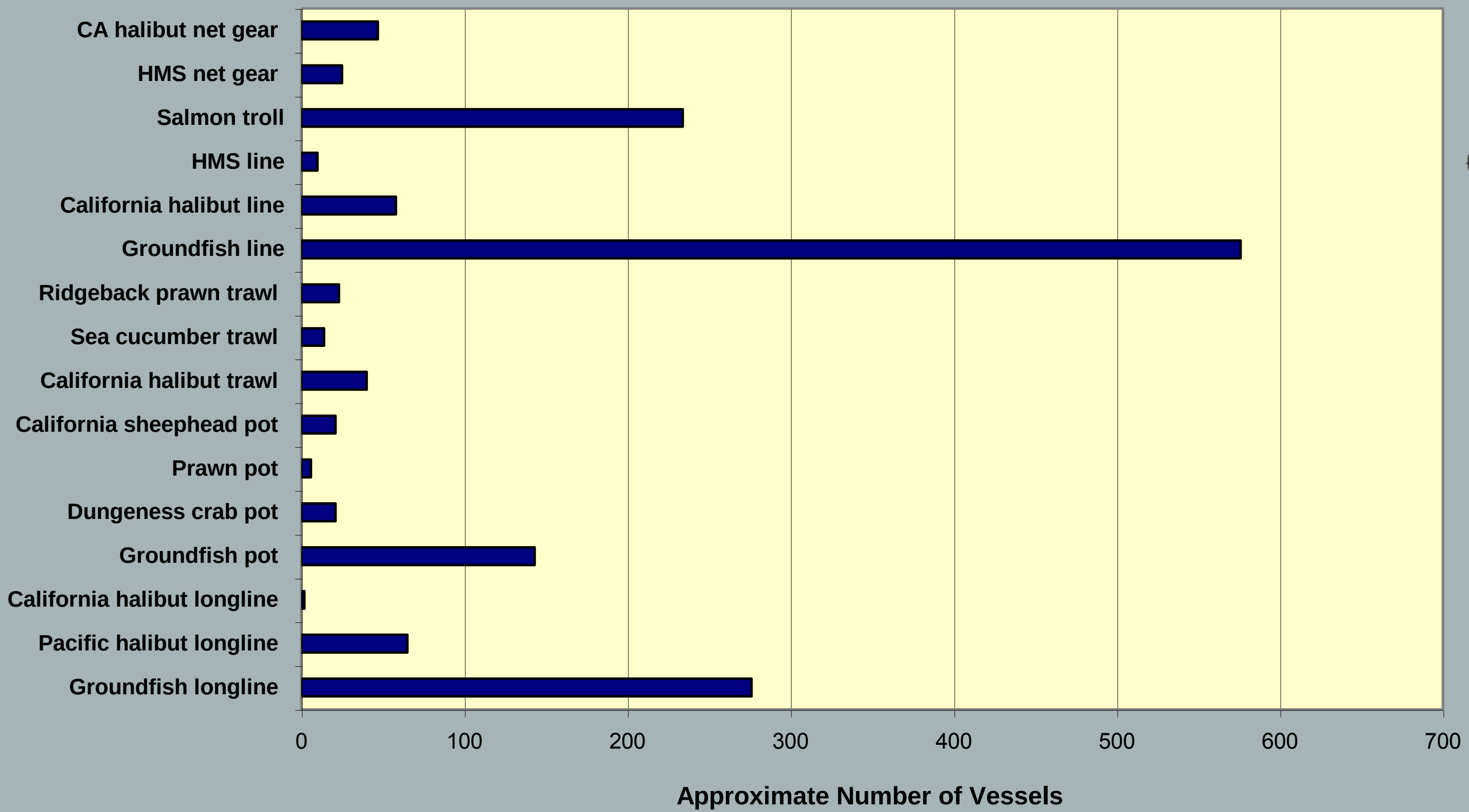
1,583 vessels

Alternative 6B -- **Vessel engaged in commercial fishing to which RCA restrictions apply, excluding salmon troll vessels in the north that retain only yellowtail rockfish --** Pink shrimp trawl is excluded. If an RCA requirement is discontinued during the year, mandatory VMS coverage would be discontinued for the affected vessels.



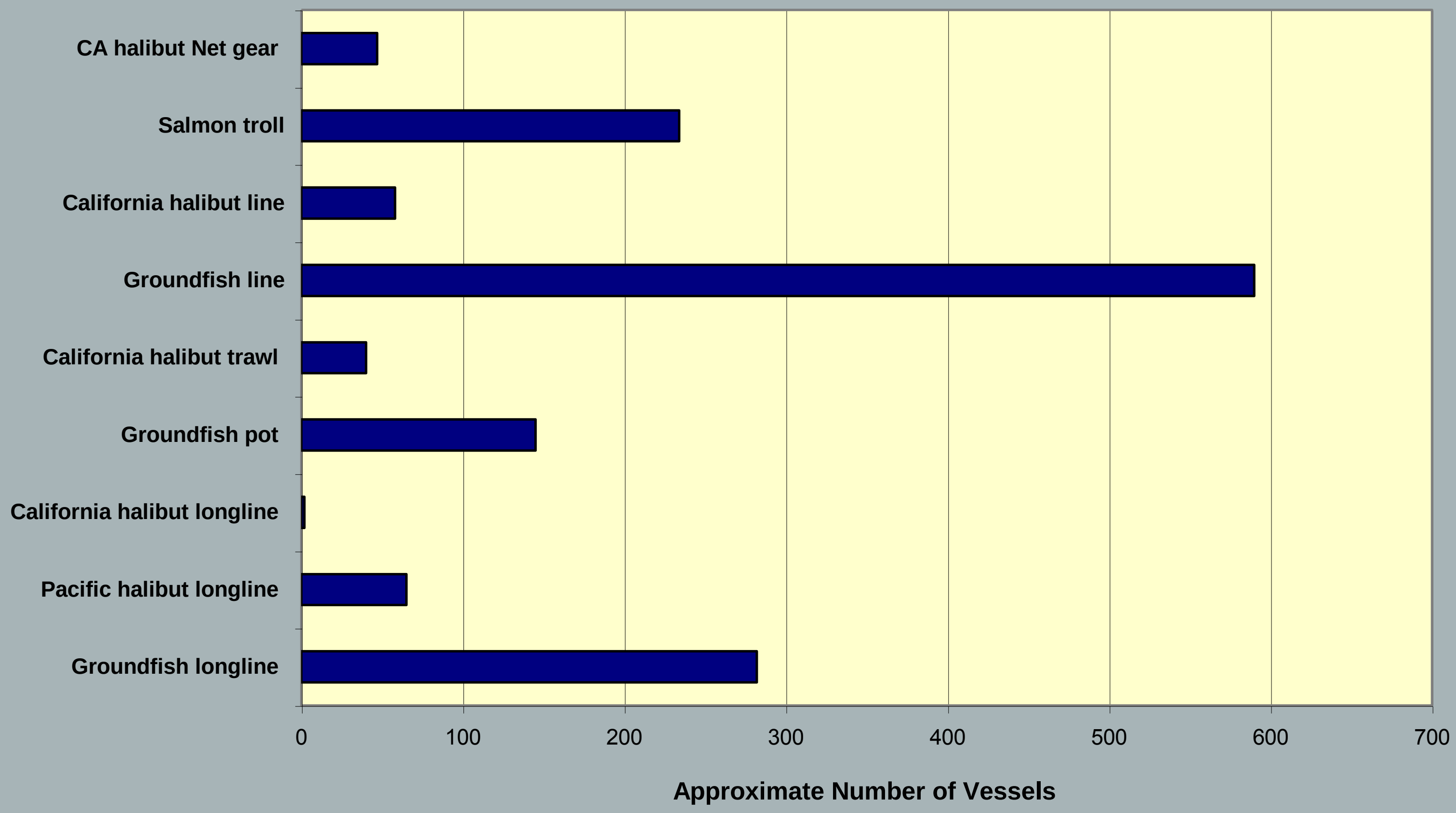
1,525 vessels

Alternative 7 – Vessel engaged in commercial fishing to which RCA restrictions apply, except vessels less than 12 feet in length. Pink shrimp trawl are excluded.



1,561 vessels

Alternative 8 - Low impact OA fisheries exempt – Dungeness crab pot, spot prawn pot, sea cucumber trawl, ridgeback prawn trawl, HMS line, HMS net, California sheephead pot gear and pink shrimp vessels would be excluded.



1,463 vessels

Low impact fisheries -- If illegal fishing occurred in the RCA, the risk to overfished species would be low

Generally these are fisheries where:

- Minimal historical landings of overfished species
- Little co-occurrence of target and overfished species
- Overfished species are less vulnerable to the gear
- Observer data indicates low incidental catch

Historical landings of overfished species prior to depth-based management

	North of Mendocino			South of Mendocino		
Fishery (all gears)	1998	2000	2002	1998	2000	2002
California halibut	~	~	+	+++	+	+++
California gillnet				+++	+	+
California sheephead				+	+	+
Dungeness crab	+	+	+	+	~	~
HMS	+	+	~	+	+	+
Pacific halibut	+++	+++	+++	+	~	~
Pink shrimp	+++	+++	+++	+++	+	~
Prawn	~	~	~	+++	++	+
Salmon troll	+++	+++	+++	++	++	+++
Sea cucumber				+	~	+

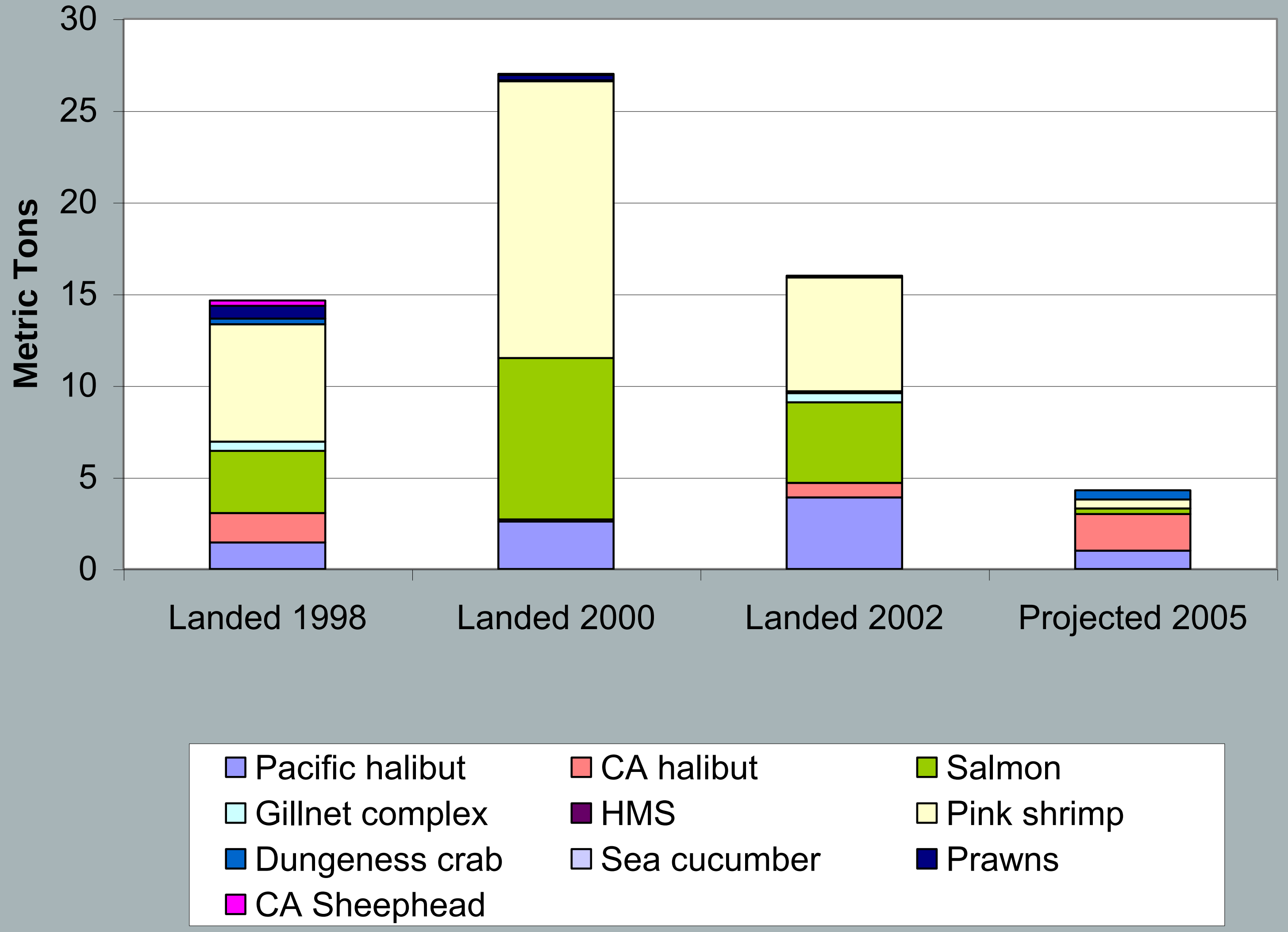
+++ More than 0.5 mt of a single overfished species

++ More than 0.5 mt of all overfished species combined

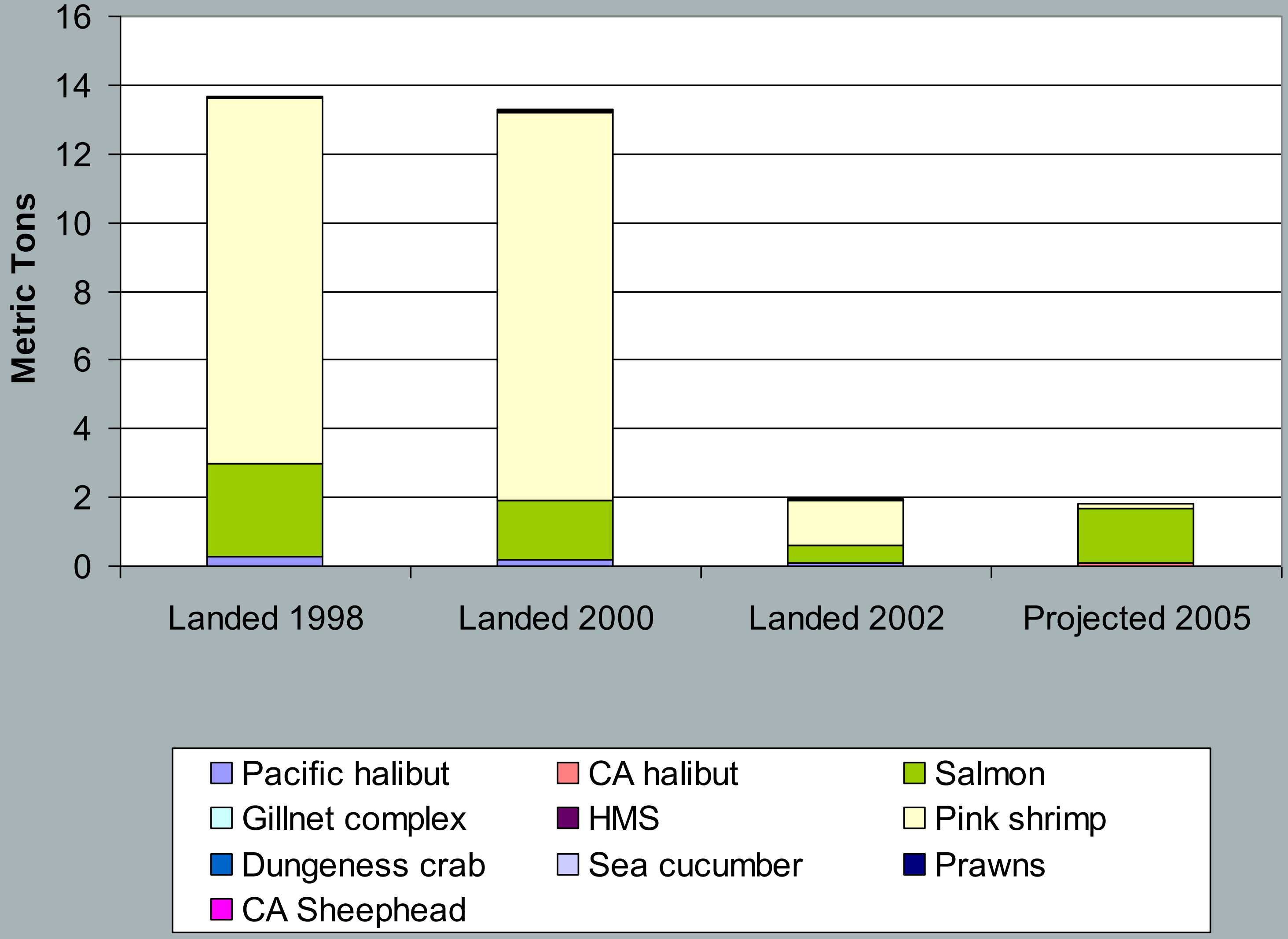
+ Less than 0.5 mt of all overfished species combined

~ No overfished species landings data

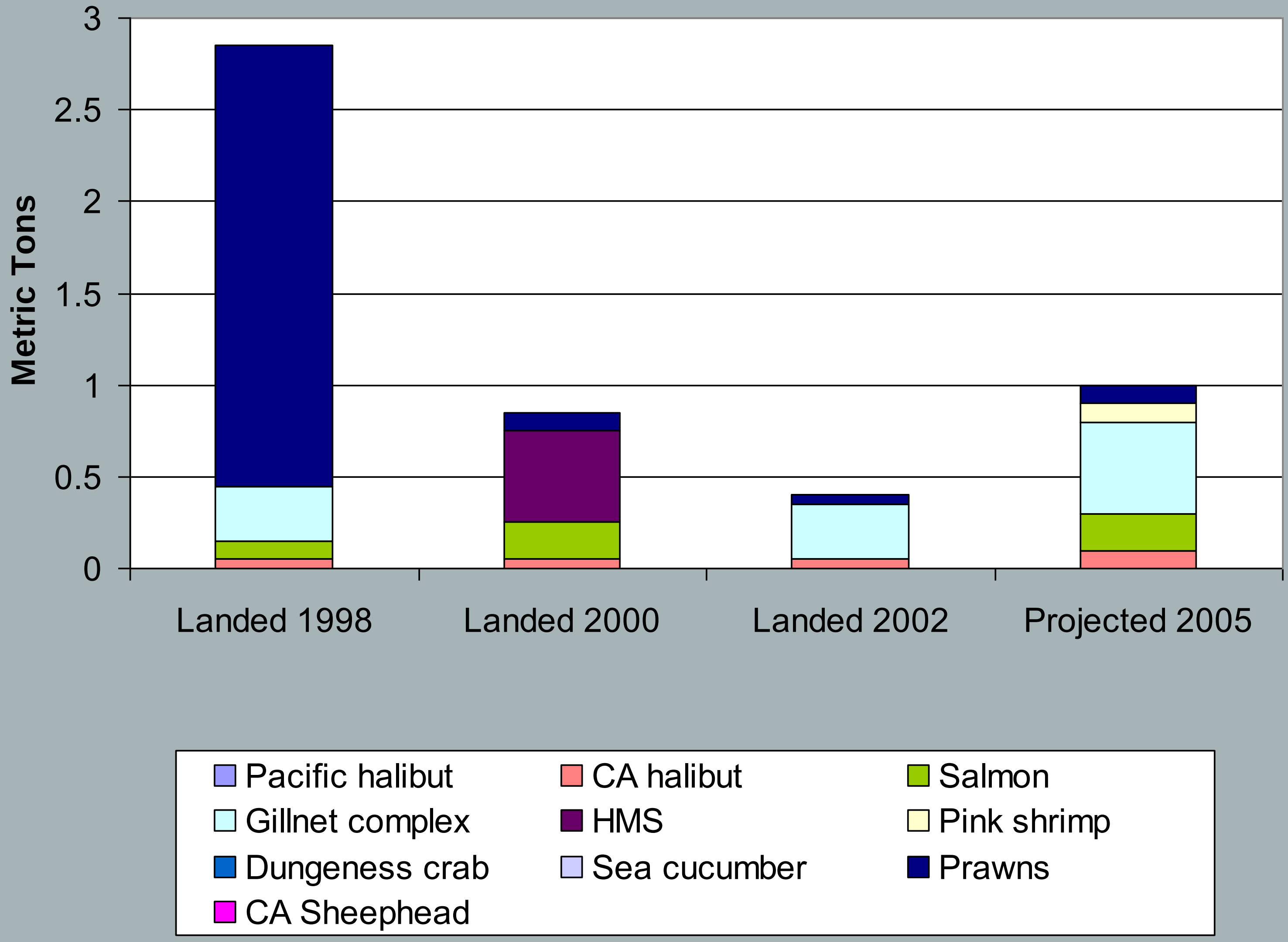
Lingcod Impacts



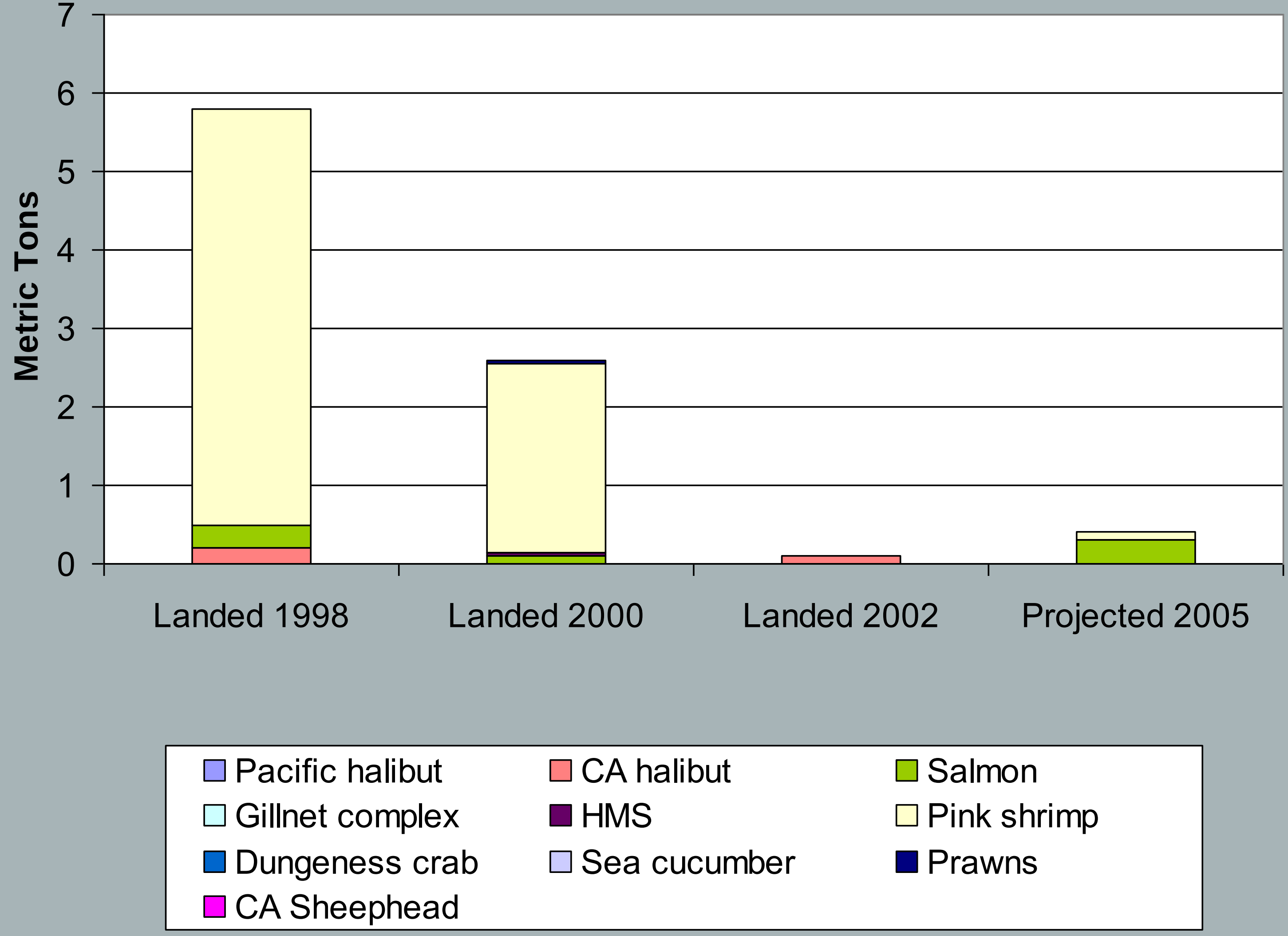
Canary Impacts



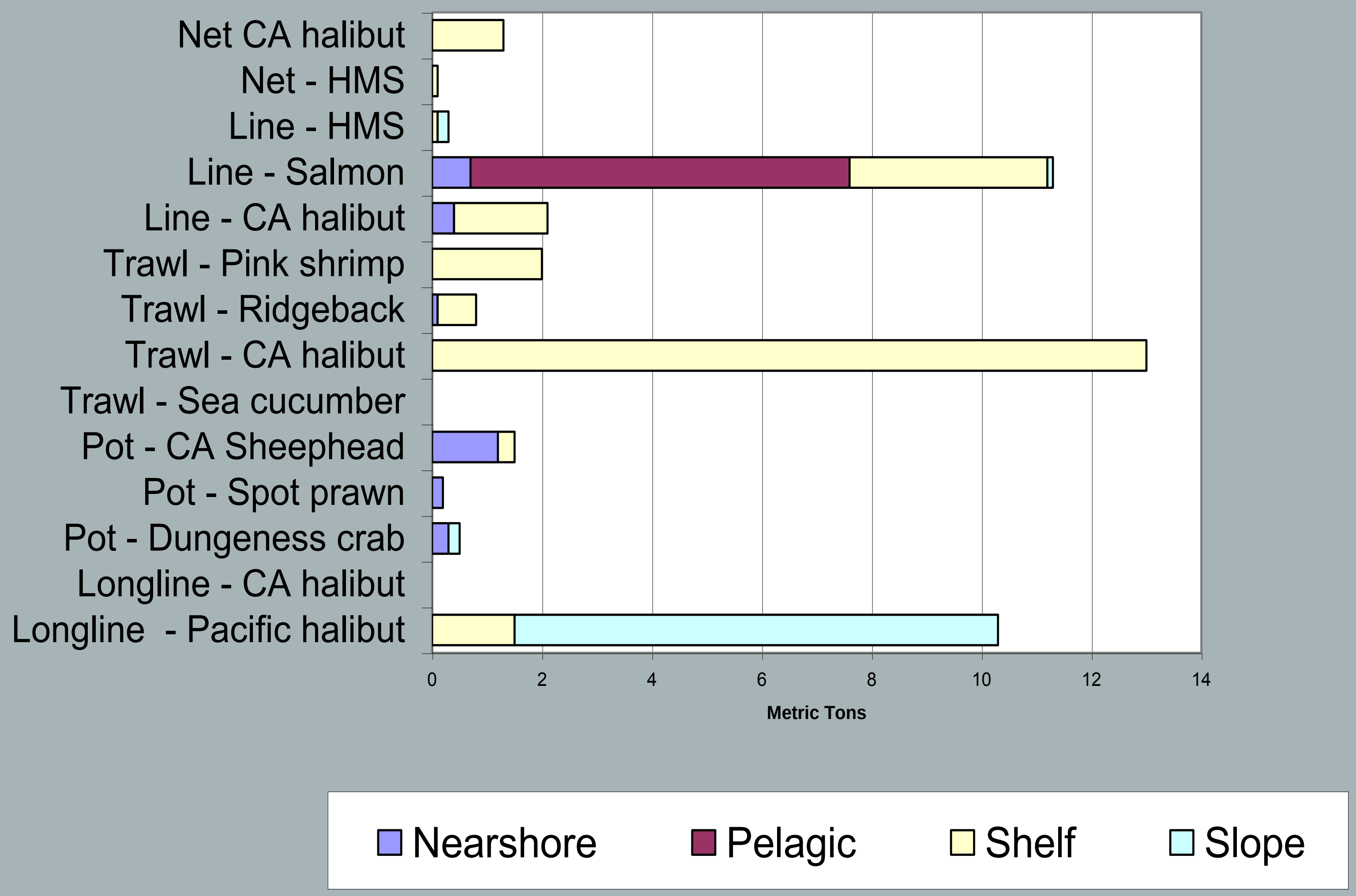
Bocaccio Impacts



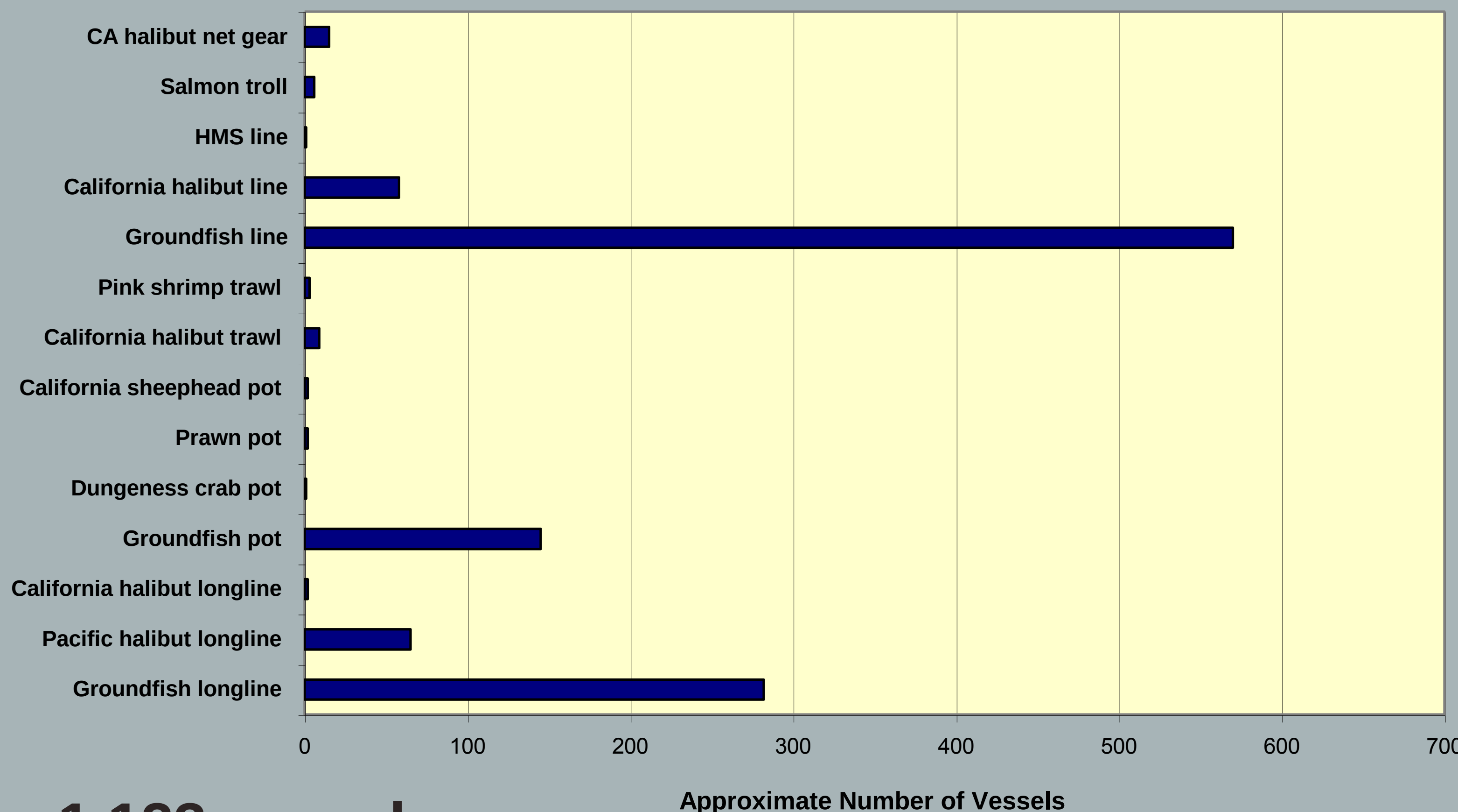
Widow Impacts



Landed catch by species depth group, Incidental OA fisheries, 2004

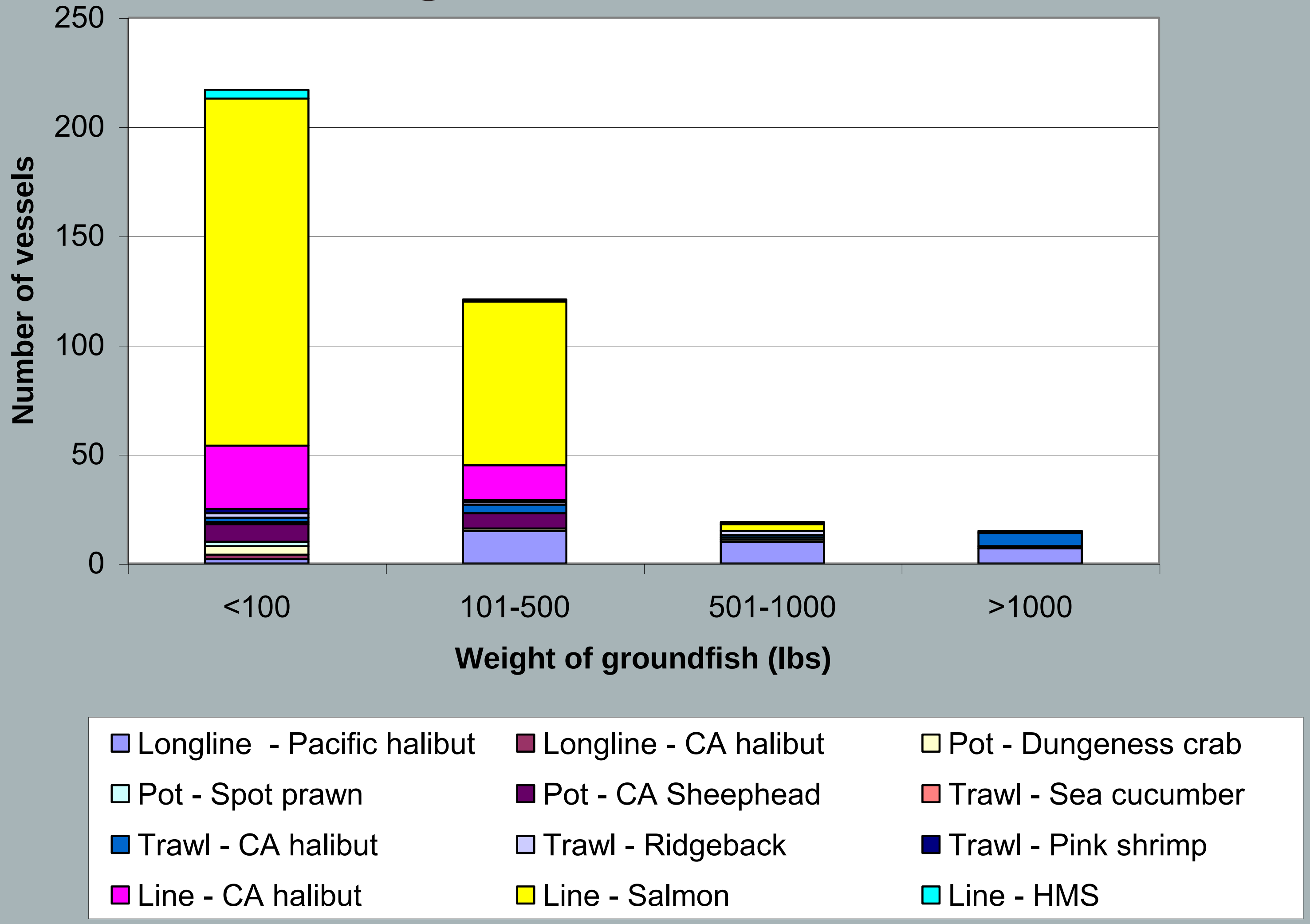


Alternative 9 - Directed OA fisheries & vessels landing more than a minimal amount of groundfish - all incidental vessels landing more than 500 lb of groundfish in a year



1,123 vessels

Incidental OA fisheries, number of vessels grouped by annual landed weight of groundfish, 2004



Alternative 10 - No Action Alternative -- No VMS requirements. Discontinue use of RCA management. Adjust trip limits and seasons accordingly.

Example trip limit tables In EA:

- Reduce opportunity for shelf species with no opportunity for shelf rockfish
- Shelf species allowed to be landed only with selective gears
- Nearshore species limits similar to 2005
- Lingcod limits reduced to prevent targeting in shelf areas
- DTS limits similar to 2005 except that sablefish limits would be reduced to prevent targeting in shelf areas
- Closures may be necessary if trip limits alone are not enough

Recommendation to require VMS on Trawl Vessels

•The Council may choose to include trawl with any one alternatives when it makes its final recommendations.

• If the preferred alternative is different from those analyzed here, the new alternative would be included in the EA prior to NMFS' final decision on the action.

Estimated per vessel cost forVMS

Expense	Per Vessel Costs - Year 1 Low	Per Vessel Costs - Year 1 High	
VMS unit	$1,000	$2,500	($3,800 with PC)
Installation	$120	$200	
Installation reports	$3	$3	
Transmission	$192	$730	
Declaration reports	$0	$0	
	$1,315	**$3,433**	
Expense	**Per Vessel Costs - Subsequent Years Low**	**Per Vessel Costs - Subsequent Years High**	
Annual maintenance	$60 (self)	$160	
Replacement	$250	$625	
Transmission	$192	$730	
Declaration reports	$0	$0	
	$502	**$1,515**	

Projected VMS Costs to the fleet, by fishery and gear

Gear	Fishery	Vessels	Costs to the Fleet (Thousands of dollars): Year 1 VMS unit \$1000, installation \$200, transmission \$192	Costs to the Fleet (Thousands of dollars): Subsequent years, maintenance \$60, replacement \$250, transmissions \$192	2004 exvessel value of groundfish (Thousands of dollars)
Longline	Groundfish	282	393	142	1,411
	Pacific halibut	65	90	33	29
	CA Halibut	2	3	1	--
Pot	Groundfish	145	202	73	988
	Dungeness crab	21	29	11	1
	Prawn/shrimp	6	8	3	--
	Sheephead	21	29	11	7
Trawl	CA Halibut g/	40	56	20	36
	Sea cucumber	14	19	7	--
	Ridgeback prawn	23	32	12	1
	Pink shrimp	54	75	27	0
Line	Groundfish	590	821	296	2,504
	CA halibut	58	81	29	6
	HMS	10	14	5	0
	Salmon troll (coastwide)	234	326	117	20
	Salmon troll (excludes yellowtail o	176	245	88	13
Net	HMS	25	35	13	3
	CA halibut	47	65	24	7

Each of the alternatives identifies and estimated number of vessels that are likely to be affected by the VMS requirement. These values are based on the average level of participation from 2000 to 2004, except for pink shrimp which was based on 2003-2004. It is important to point out that these values may not be the actual number of vessels that would continue to use a particular gear type if VMS requirements were adopted.

Approximate number of vessels that would continue to land groundfish if a VMS system is required

Gear	Fishery	Number of Vessels Remaining With VMS						5-year average without VMS a/
		2000	2001	2002	2003	2004	5- year Average	
Longline	Groundfish	78 - 165	71 - 158	64 - 146	80 - 177	60 - 126	71 - 154	282
	Pacific Halibut	9	5	6	14	20	11	38
Pot	Groundfish	52 - 83	49 - 82	50 - 80	56 - 96	48 - 70	51 - 82	145
	Dungeness Crab	0	0	1	1	1	1	21
	Prawn	2	4	4	2	1	3	6
	California Sheephead	5	9	7	2	8	6	21
Trawl	California Halibut	10	10	9	1	6	7	23
	Pink Shrimp	45	38	28	1	1	23	33
	Ridgeback Prawn	6	5	3	2	1	3	13
Line	Groundfish	85 - 272	107 - 254	97 - 252	77 - 223	106 - 239	94 - 248	590
	HMS	0	0	0	0	0	0	10
	Salmon	1	4	3	0	2	2	234
	California Halibut (Line and Longline)	1	3	0	3	4	2	60
Net	CPS - Net	0	0	0	0	0	0	

a/ Vessel numbers represent those that landed groundfish

COASTAL PELAGIC SPECIES ADVISORY SUBPANEL REPORT ON EXPANSION OF VESSEL MONITORING SYSTEM (VMS)

The Coastal Pelagic Species Advisory Subpanel (CPSAS) met October 6, 2005 in La Jolla, California and reviewed the potential expansion of the VMS program. The CPSAS understands that CPS gear is not legal gear for landing groundfish and is not being considered under the proposed action to expand the VMS program. The CPSAS believes that VMS requirements are unnecessary for CPS vessels.

PFMC
10/14/05

HIGHLY MIGRATORY SPECIES MANAGEMENT TEAM REPORT ON EXPANSION OF VESSEL MONITORING SYSTEM (VMS)

The HMS Management Team (HMSMT) had a brief discussion regarding the vessel monitoring system (VMS) alternatives being considered by the Council as a management tool for groundfish fisheries, and offers the following comments:

The HMSMT has reviewed historical and recent landings data for HMS fisheries, and at-sea observer data for the drift gillnet and high seas longline fisheries, and concludes that the incidental catch of groundfish in these fisheries is fairly minimal. This is confirmed by Table 3.3.3.8. in the Draft Environmental Assessment on the Expanded Coverage of the Program to Monitor Time-Area Closures in the Pacific Coast Groundfish Fishery (Informational Report 8, September 2005). Table 3.3.3.8. indicates, over the past five years, an average of 0.1 mt of shelf groundfish, and 0.1 mt of slope groundfish species, have been landed by all HMS vessels (line and net gears) combined.

Table 4.3.3.6. identifies the number of incidental open access vessels by exvessel revenue group. For HMS line gears, the number of open access vessels with incidental groundfish has declined from 18 in the year 2000 to 6 in the year 2004. Of the five vessels in 2003, three were in the less than $500 group, and two were in the $501-$1,000 group and, of the six vessels in 2004, five were in the less than $500 group, and one was in the $501-$1,000 group. There were no data provided for the HMS net gears.

The HMSMT also notes that HMS vessels do not need to adhere to the groundfish Rockfish Conservation Area (RCA) closures while fishing for HMS. Therefore, based on the landings and observer data, and because HMS vessels are permitted to fish within the groundfish RCAs, the HMSMT recommends that the Council not require VMS for vessels that only target HMS for the purposes of groundfish conservation. The HMSMT notes that some vessels participating in the albacore troll fishery, for example, may also participate in the directed groundfish open access fishery and may be required to have VMS as a result of their groundfish fishing activity; our recommendation is not intended to exclude these vessels from VMS.

For the purposes of HMS management, however, the HMS high seas longline fishery currently has VMS. There are also area closures for the drift gillnet fishery, but VMS is currently not required for that sector. The HMSMT notes that, in the future, we may recommend requiring VMS for one or more HMS fisheries as an enforcement tool to monitor the locations of fishing activity. VMS requirements for the HMS fishery are provided for through the framework procedures and would not require an amendment to the HMS fishery management plan.

PFMC
10/14/05

Agenda Item H.10.c
Supplemental EC Report
November 2005

ENFORCEMENT CONSULTANTS REPORT ON EXPANSION OF VESSEL MONITORING SYSTEM

The Enforcement Consultants (EC) endorses the vessel monitoring system (VMS) expansion recommendations presented in Agenda Item H.10.c, Ad Hoc Vessel Monitoring System Committee Report, November 2005, and offers the following comments and clarifications.

The original Alternative 5B, which is the core of the Ad Hoc VMS Committee's recommendation, was first developed by the EC based on its understanding of the fisheries, the gear used within those fisheries. In general, longline, pot, trawl, and line gear, when used to target groundfish are effective, and when deployed in rockfish habitat represent a significant threat to the Council's rockfish conservation goals. Conversely, when these gear types are used properly to target species such as anadromous, shellfish, pelagic, and highly migratory species, their deployment is of little consequence to rockfish conservation goals. Given this second parameter, exempting highly migratory species (HMS) line, Dungeness crab pot, and salmon troll seems appropriate.

VMS is a tool, which tells enforcement where vessels are fishing, not whether the gear being deployed is legal. This is an important element to remember when evaluating who should be required to carry VMS and who should be exempt. In general, VMS should be required of vessels using otherwise legal gear in areas closed to harvest by those gear types. HMS pelagic longline gear is currently prohibited within the Exclusive Economic Zone (EEZ), so we did not consider requiring VMS for this gear type under our proposed alternative. The same logic follows coastal pelagic species (CPS) purse seine gear, which is not legal Federal groundfish gear.

"Net" gears are not included in the EC proposal. California gill net is used in state waters to harvest species such as sea bass and highly migratory species. While they do harvest minimal groundfish, they do not target groundfish; nor does HMS net gear. HMS net gear is defined in Federal regulations as gill, set, drift, and trammel nets. While a "set net" is legal Federal groundfish gear, "drift nets" are not. A surface "drift net" must be anchored to the bottom to meet the Federal legal requirements of groundfish set net gear. Much of the fishing done with these net gear types is done exclusively within State waters and therefore, outside the jurisdiction of this Federal regulation proposal. The limited amount of otherwise legal fishing occurring in Federal waters using these gear types generates minimal if any take of groundfish (i.e. shark drift net with 14-inch mesh). Common sense would indicate that these gear types should not be included in the VMS expansion deliberations pursuant to Rockfish Conservation Area (RCA) management goals.

Sheephead pot gear should also be exempted. The score card projects no overfished species fishing mortality for this fishery. Historic landings of groundfish taken from the shelf and slope with this gear area are very low (0.2 and 0.1 ton per year respectively).

The use of spot prawn trawl gear is prohibited in all three coastal states, therefore, as with other illegal groundfish gear, not considered under this proposal. The EC did not spend significant time evaluating the numerous small trawl fisheries' (California halibut, sea cucumber, and ridgeback prawn) primarily operating under State permits in California under this directed groundfish open access expansion proposal. As with shrimp trawl, when deployed properly, including the use of by-catch reduction devices (BRDs), these gear types do not represent significant threats to the Council's rockfish conservation goals. However, given the concern for potential damage of the sea bed caused by bottom contact gear, particularly trawl gear, we do endorse the Council's proposed action of requiring VMS on all non-groundfish trawl vessels as a primary enforcement tool for protecting the integrity of essential fish habitat (EFH) area restrictions and closures.

The Council's 2003 deliberations over VMS deployment identified the directed groundfish open access fishery as the fleet having the highest risk factors regarding the Council's rockfish conservation goals and objectives. These same deliberations identified VMS as "the primary enforcement tool for ensuring the integrity of the RCAs." Rather than implementing a new VMS program using a fleet with numerous unknowns regarding its participants, the Council chose to initiate the VMS program beginning with the limited entry fleet.

During the period September through December 2003, when the RCA restrictions were in place without a VMS requirement, District 13 United States Coast Guard (USCG) at-sea assets discovered 17 incursions (11 by aircraft and six by cutters). Virtually every one of these 17 incursions was investigated as a violation of the RCA fishing restrictions, with four resulting in penalties being assessed and/or catch seizures. Several of these cases are still pending. Since implementation of the limited entry VMS requirement in January 1, 2004, USCG at-sea assets patrolling at a level consistent with pre-VMS patrol efforts have found only two incursions. During that same time period, over 80 incursions have been detected through VMS monitoring. In investigating these 80 plus incursions, 35 case investigations have been initiated with dozens more still under review. Of these 35 cases, 12 have been closed or dismissed, three have resulted in some type of formal charge, with the remaining cases still under investigation. We believe the number of incursion discovered by VMS, versus those discovered by at-sea assets demonstrates the efficiency of VMS as an enforcement-monitoring tool. We also believe the relatively low number of incursions discovered by VMS since January 2004, verses the number discovered by at-sea assets, during the few short months prior to VMS implementation, demonstrates the positive behavior modification we all deem necessary and desirable if our compliance objectives are to be met. The EC believes strongly that this highly desired behavior modification demonstrated within the limited entry fleet is the direct result of VMS monitoring. The limited entry fleet demonstrates daily that as a fleet, they know where they can fish and where they can't fish. The system is working for the limited entry fleet in providing additional fishing opportunity, and the system is working for fisheries management, assuring the integrity of the RCAs.

As you heard from Captain Cenci earlier this week, 36% of his marine division's commercial groundfish activity involved open access violations. Oregon has only six commercial fisheries officers coast wide. NMFS has no ocean going enforcement assets. Southern California is overwhelmed by open access activity. California Department of Fish and Game is understaffed and over committed. USCG District 11 assets have limited availability for fishery patrols in Southern California due to other high priority missions such as drug interdiction. Limited entry fixed gear fishers have repeatedly told the Council that they are being victimized, with their markets being infiltrated by fish illegally caught by open access vessels. Status quo is not an option for enforcement. The sheer volume of open access activity, with few if any assets to employ, is overwhelming us. We need the Council's help.

The West Coast VMS Pilot Program implemented in January of 2004 has been successful. Given ongoing risks of illegal incursions into the RCAs associated with the directed groundfish open access fishing regime, the EC believes it is imperative that the highly effective enforcement tool, VMS, be expanded to a significant portion of the directed groundfish open access fleet.

EC Recommendations

(1) Per consideration of RCA conservation goals and objectives, expand VMS and declaration requirements to include:

> Alternative 5B: longline, pot, trawl, and line gear vessels; excluding pink shrimp trawl, HMS line gear and Dungeness crab pot gear.
>
> As modified: (1) exclude salmon troll
> (2) exclude all non-groundfish trawl
> (3) exclude sheephead pot
>
> Clarification: 1. No Federal Nexus. Open access vessels that do not fish in Federal water and/or do not retain or possess groundfish are exempt.
>
> 2. This recommendation does not include HMS net gear, defined in Federal regulations as gill, set, drift, and trammel nets, nor does it include HMS pelagic longline gear, or CPS purse seine gear.

(2) Per consideration of EFH conservation goals and objectives, expand VMS and declaration requirements to include:

> Alternative 4B as modified: Require VMS and declaration reports of all non-groundfish trawl vessels (to include pink shrimp, California halibut, sea cucumber, and ridgeback prawn) as a primary enforcement tool for protecting the integrity of EFH area restrictions and closures.

(3) Implementation date of recommendations 1 and 2: May 1, 2006.

GROUNDFISH ADVISORY SUBPANEL REPORT ON EXPANSION OF VESSEL MONITORING SYSTEM (VMS)

The Groundfish Advisory Subpanel (GAP) heard a presentation from Mr. Dayna Mathews, Encorcement Consultants, on the current VMS program and proposed expansion into open access fisheries and has the following comments.

The majority of the GAP supports the expansion of the VMS program into open access fisheries. The majority of the GAP supports the three recommendations provided by the Enforcement Consultants (Agenda Item H.10.c, Supplemental EC Report).

A minority of the GAP would like the Council to explore an option that allows VMS units to be turned off for the remainder of a calender year once their interaction with groundfish in Federal waters is completed for that year.

The GAP supports the VMS Committee recommendation that the Council and National Marine Fisheries Service continue to investigate the issue of drifting in the Rockfish Conseration Area. The GAP recommends the Council direct NMFS to investigate a declaration system for drifting as defined in the VMS Committee recommendation and report back to the Council in 2006.

The GAP supports the VMS Committee position supporting Federal funding for all VMS requirements and encourages the Council to seek Federal funding to both expand the current program and reimburse members of the limited entry fleets who have already purchased and are currently carrying VMS units.

PFMC
11/03/05

GROUNDFISH MANAGEMENT TEAM REPORT ON EXPANSION OF VESSEL MONITORING SYSTEM

The Groundfish Management Team (GMT) reviewed the alternatives in the draft Environmental Assessment to expand the vessel monitoring system (VMS) coverage in the groundfish fishery, and the recommendations presented in the Ad Hoc VMS Committee Report. The GMT endorses the recommendations of the Enforcement Consultants (EC), as presented in Agenda Item H.10.c, Supplemental EC Report. It is the GMT's understanding that, under the EC proposal, the following open access sectors will be required to have a VMS and declaration requirement:

Longline
Pot
Line gear (except those excluded below)
Non-groundfish trawl (includes pink shrimp, California halibut, sea cucumber, and ridgeback prawn)

The following open access sectors would be excluded from a VMS and declaration requirement:

Salmon troll
Highly migratory species (HMS) line gear
Dungeness crab pot gear
Sheephead pot
HMS net gear (gill, set, drift, and trammel nets)
HMS pelagic longline gear
Coastal pelagic species purse seine gear

It is the GMT's understanding that with the exceptions noted above, any vessel using longline, pot, or line gear to take and retain groundfish in federal waters in any part of the year under open access limits would be subject to VMS and declaration requirements for the remainder of the year, regardless of other fisheries they may participate in during that year.

GMT RECOMMENDATIONS:

Adopt the recommendations of the EC as presented in Agenda Item H.10.c, Supplemental EC Report.

PFMC
11/03/05

HIGHLY MIGRATORY SPECIES ADVISORY SUBPANEL REPORT ON EXPANSION OF THE VESSEL MONITORING SYSTEM

The Highly Migratory Species Advisory Subpanel (HMSAS) supports Alternative 6A in Agenda Item H.10.b, NMFS Report as displayed in Table 2.0.1, which states that vessels using HMS gear that do not take and retain groundfish are excluded from the requirement to install VMS.

PFMC
11/03/05

SALMON ADVISORY SUBPANEL REPORT ON EXPANSION OF THE VESSEL MONITORING SYSTEM

The Salmon Advisory Subpanel (SAS) supports any option that exempts vessels fishing with salmon troll gear from a vessel monitoring system (VMS) requirement, such as Alternative 1 or the VMSC modified Alternative 5b.

Regarding the VMSC discussion of the canary rockfish catch estimate in the salmon troll fishery, the SAS believes the current impacts would be substantially reduced for a number of reasons:

1. The estimate of 1.6 mt annually is based on the upper end of the range from 2000 and 2001, years when retention of canary rockfish was allowed. The actual estimates were 1.53 mt in 2000 and 0.84 mt in 2001.
2. Landings of other groundfish species using troll gear have declined since 2000 and 2001, and it is reasonable to assume impacts to canary rockfish have declined as well. For example lingcod landings decreased from 10.3 mt in 2000 to 6.9 mt in 2004, and black rockfish landings decreased from 1.1 mt in 2000 to 0.9 mt in 2004 (note, these values include non-salmon target trips and should be considered as index values only, not as estimated harvest or impact levels of the salmon troll fishery).
3. Salmon troll fisheries have moved offshore in recent years which should reduce rockfish impacts. Oregon fleet has moved off shore as the chinook size limit has increased by adopted regulations over time and area.

PFMC
10/31/05

DRAFT Summary Meeting Minutes

Ad Hoc Vessel Monitoring Committee

Pacific Fishery Management Council
Sheraton Portland Airport Hotel
Columbian A
8235 NE Airport Way
Portland, Oregon, 97220-1353
503-281-2500
September 29, 2005

Members Present:
Mr. Joseph Albert, National Marine Fisheries Service, Law Enforcement
Mr. Mark Cedergreen, Pacific Fishery Management Council, Washington Charter Boat Operator
Mr. Brian Corrigan, United States Coast Guard
CAPT Mike Cenci, Enforcement Consultants, Washington Department of Fish and Wildlife
Ms. Kathy Fosmark, Groundfish Advisory Subpanel, Southern Open Access Representative
Mr. Tom Ghio, Acting Chair of Groundfish Advisory Subpanel, Fixed Gear Representative
Ms. Heather Mann, Groundfish Advisory Subpanel, Coastal Pelagic Species Advisory Subpanel
Dr. Don McIsaac, Executive Director, Pacific Fishery Management Council, alternate for
Mr. Don Hansen, Chair, PFMC Chairman, California Charter Boat Operator
Mr. Dayna Matthews, Vice Chair, Enforcement Consultants, National Marine Fisheries Service
Mr. Marion Larkin, Groundfish Advisory Subpanel, Washington Trawl Representative
Mr. Ray Monroe, Alternate for Mr. Kenyon Hensel, Northern Open Access Representative
Ms. Becky Renko, National Marine Fisheries Service, Northwest Region

Members Absent:
Mr. John Crowley, Groundfish Advisory Subpanel, Fixed Gear Representative

Others present:
Mr. Mike Burner, Staff Officer, Pacific Fishery Management Council
Mr. Otha Easley, National Marine Fisheries Service, Office of Law Enforcement
Mr. Doug Fricke, Washington Trollers Association, SAS, HMSAS
Mr. Rod Moore, West Coast Seafood Processors Association
Ms. Lucia Morici, Newport Beach Dory Fleet
Mr. Aaron Newman, Humboldt Fishermen's Marketing Association
Mr. Don Stevens, Salmon Advisory Subpanel Chair

Update on the Existing VMS Program

Mr. Matthews and Mr. Albert report the current VMS program includes 344 vessels that have been monitored since program implementation, and over 4 million position reports have been recorded. Initial implementation of the program had some glitches, primarily due to improper equipment installation, that have been largely overcome, The declaration portion of the monitoring system has proven itself as a valuable mechanism for identifying vessels using gear types allowed in the RCA. The system has approximately 1,595 declarations recorded to date. However, it is important to note several declarations can come from one vessel as fishing strategies change throughout the year. The declaration system has been integrated into the VMS system allowing system technicians to see declaration reports and the VMS track data side by side.

Compliance with RCA boundaries has been good with observations of vessels fishing up to and along management lines with few incursions into closed areas. The majority of investigations into VMS violations involve equipment malfunctions, not incursions into the RCA. Limited entry fixed gear and trawl vessels are generally maximizing the extent of the open areas and have demonstrated the ability to fish up to management lines without crossing into closed areas.

The current program has one technician whose responsibilities include maintaining the system and tracking 300-400 vessels. This represents the accepted maximum ratio of vessels tracked per technician. The system is capable of incorporating more vessels but, if the program expands, additional technicians would be needed.

The group discussed the issue of federal funding of VMS requirements. Mr. Matthews reported the Hawaiian longline VMS program was the first VMS program implemented, has been in operation for 10 years, and is fully covered by federal funds. In Alaska, industry was provided federal funding in the form of vouchers after the program was implemented coving only hardware costs. There are VMS programs in all Council regions with many of the more recent VMS requirements being unfunded. No federal funding of the existing West Coast VMS program or its expansion is known at this time. On the West Coast, only funds for land based equipment and personnel to monitor the system have been paid for by federal sources. NMFS costs associated with equipping and staffing program expansion has been anticipated in the last two NMFS budget cycles.

Council staff and NMFS personnel have responded to congressional inquiries about federal costs associated with VMS requirements. U.S. Senator Ron Wyden (D-OR) has requested information on VMS costs and has been working on an appropriation for VMS programs. However, recent drafts of future federal budgets do not include funds for West Coast VMS requirements. Council recommendations have consistently favored federal funding. The group discussed the many OA vessels participate in many different fisheries and will not be able to pay for VMS units with proceeds from groundfish landings.

Mr. Matthews informed the group that the current VMS program is capable of determining if a vessel is fishing in or transiting through a closed area but, the system is still incapable or differentiating fishing and drifting. Several VMSC members expressed some frustration with the lack of progress on exploring ways to allow drifting within RCAs while ensuring no illegal fishing activity was occurring. The group discussed increasing the ping, or signaling rate from the current standard of once per hour. Higher ping rates increase costs due to the increased use of airtime. There were unanswered questions regarding who would pay the extra costs of increased ping rate to detect drifting. Industry representatives questioned whether a ping rate of one per hour will be adequate for smaller OA vessels whose position can change faster than most LE vessels. Ping rate is preprogrammed into the unit and cannot be manipulated by the vessel owner. Enforcement personnel can temporarily increase a ping rate to investigate a situation with those additional communication costs paid by NMFS.

The group discussed the issue of safety in the existing system. NMFS and USCG representatives stated that added safety is a secondary benefit of a VMS program and not the main reason for implementation. The USCG does not use VMS as a primary safety system, they used EPRIB and others communication and search tools first. VMS has proven useful as supplemental information in emergency situations. Panic buttons may be installed on all type approved VMS units supplied by approved vendors. Industry representatives reported an incident where a VMS equipped vessel was lost off Eureka and it took 8 hours to get the VMS track to data regarding the vessels last position. Although the system is not directly monitored 24 hours a day, the system is set up to send alerts to enforcement personnel at any time.

Access to the system by state enforcement personnel could increase the level of system monitoring. There are many enforcement concerns in Washington with OA vessels, particularly in the high value fisheries such as sablefish, and state enforcement representatives felt having VMS on OA vessels would be very helpful. However, VMS cannot by used under any circumstance to prosecute state law, it is solely for federal law enforcement at this time. State entities can get VMS data on a case by case basis through a NOAA agent but the data is not real-time information and data sharing is limited to state investigations of a federal regulations. Confidentiality issues are perhaps the biggest hurdle for widespread use of VMS data. VMS data can be requested and is available only in aggregated form which limits the usefulness of the data for management. Magnuson-Stevens Fishery Conservation and Management Act partners, including the Council, could make a request to NMFS in writing and sign a disclosure statement to receive VMS data in an aggregated form.

Review Council Recommendations

Mr. Burner reviewed Council history beginning with the implantation of the RCA's in 2002 and the immediate need to maintain the integrity of the RCAs through enforcement. Items discussed included the development of the pilot program for the Limited Access sectors, the development of alternatives for expansion of the program, previous positions of the Ad Hoc Vessel Monitoring Committee, Council requests for additional analyses and public input, NMFS public hearings on VMS, and advisory body review schedule and required GMT input. The VMSC discussed the schedule of the GMT between this meeting and Council deliberations on VMS expansion at the November 2005 Council meeting. The GMT will meet in October and is expected to take up VMS but a number of issues including the identification of triggers for vessel exemptions to VMS due to minimal groundfish landings and minimal allowable groundfish landings without VMS requirements.

Definition of Open Access Vessels Subject to RCAs

The VMSC reviewed what vessels are considered as open access groundfish vessels and established the following points:

- A vessel which takes and retains, possesses or lands federally-managed groundfish is considered an open access groundfish vessel.
- Non-groundfish trawl vessels are considered open access vessels whether they land groundfish or not.

There is no link (federal nexus) for the implementation of VMS on non-federally permitted vessels fishing in state waters. Vessels which meet one of the requirements above but only fish in state waters are considered open access vessels but are not required to have VMS. If the vessel possesses groundfish caught in state water and transits federal water, that vessel would be required to have VMS.

Net gear used by vessels targeting coastal pelagic species (CPS) is not defined in the groundfish regulations as legal groundfish gear making it illegal to land groundfish species with these gear types. Therefore, vessels strictly fishing for CPS species are not considered open access groundfish vessels and are not considered for VMS requirements under the current alternatives.

Review of the Draft Environmental Assessment (EA) and the Alternatives

Mr. Matthews and Ms. Renko reviewed the alternatives presented in the EA. The group reviewed the previous alternatives before moving into the three new alternatives that have been added since April 2005. Alternative 4B is a new alternative in response to the Council recommended action under groundfish EFH protection from June 2005. Under that action the Council recommended consideration of including VMS requirements for all bottom trawl vessels.

The estimated impacts to canary rockfish in salmon fisheries were the subject of brief discussion. The VMSC requested the GMT review the estimated impact of 1.6 mt of canary rockfish in the salmon troll fishery. Additionally, for many of the OA vessels which target non-groundfish species, it is important to note what groundfish species were caught to determine impacts to overfished groundfish stocks.

<u>Alternative 8, low impact OA fisheries</u>. - Revenue rather than poundage was used to determine low impact OA fisheries. High value versus low value catch is not necessarily informative on impacts to overfished species. The principal criteria is what is the risk to overfished species. The threshold for identifying low impact fisheries was >50% of the vessel's revenue from groundfish on a per trip level.

<u>Alternative 9</u> - It is difficult to determine a landing threshold at a monthly level for vessels that incidentally land OA groundfish. Any threshold could have the effect of creating a directed groundfish fishery up to the threshold to avoid VMS requirements. This may create an inequity for vessels that land groundfish at levels just above the threshold. The VMSC noted that this alternative would create an accounting burden and it is unclear as to what point the vessel is in violation. If the limit was 500 pounds, would the 500 pounds landed previously be now illegal catch if the vessel continues to land beyond 500 pounds without VMS?

<u>Alternative 10</u> - VMS requirements and the RCAs would go away. Trip limits would be adjusted down to maintain a consistent level of impacts to overfished species. This alternative is designed to address the issue of the economic benefit of the higher limits under RCA and against the costs of VMS requirements.

Economic effects of VMS requirements are incomplete at this time and is planned for the November meeting. Vessels that may decide to leave the OA groundfish fishery due to VMS requirements and costs. The VMSC felt that this is a key piece of information for identification of a preferred alternative.

Missing Information and Analyses

The VMSC noted their impaired ability to fully consider all of the alternatives due to the incomplete nature of the draft Environmental Assessment (EA) that had been distributed at the September Council meeting. The VMSC identified a need for the following information before fully endorsing any recommendation on a preferred alternative.

- Complete the EA. There are many missing values and incomplete sections of the current document.

- A review of impacts to overfished species across fishing sectors is needed. Particularly, estimated canary rockfish impacts in the salmon troll sector. The current salmon troll estimate is based on data from 2000-2001 when canary rockfish retention was allowed in the salmon troll fishery and RCAs were not in place. Additionally, the 2005 salmon troll season was drastically reduced relative to the 2000 and 2001 seasons.

- The VMSC requested NMFS complete the socioeconomic analyses in support of Alternative 8 and Alternative 10. The VMSC believes a cost/benefit type of analysis is essential in determining which fishery sectors should carry VMS units. NMFS reported that input from the Groundfish Management Team could improve the analysis and that these issues are to be discussed at the GMT's October meeting. NMFS intends to complete these analyses in advance of the November Council meeting. The VMSC was unable to fully consider the socioeconomic impacts of VMS requirements on open access vessels at this meeting.

- The VMSC noted the thresholds, either in landed weight or exvessel revenue, for determining which fishery sectors have "minimal" impacts to overfished groundfish are not clearly established. The VMSC noted any threshold value, such as the 500 pound limit in Alternative 9, has the potential to modify fishing practices rather than provide a clear definition of vessels with minimal impacts to overfished groundfish species.

G. Discuss VMSC Recommendations for November Council Meeting

The VMSC affirmed that expansion of the existing Vessel Monitoring System (VMS) program to open access groundfish fisheries would enhance state and federal enforcement's ability to monitor vessel compliance with depth-based management and areas where fishing activity is restricted or prohibited. However, industry representatives stated that VMS is not the only way to enforce closed areas and the VMSC should not assume that Rockfish Conservation Areas (RCAs) would be compromised in the absence of VMS. The VMSC discussed the importance of RCAs as a management tool for rebuilding overfished groundfish species while providing harvest opportunities for healthy stocks.

The VMSC discussed focusing on those OA sectors with the largest impacts to overfished species because preserving the integrity of the RCA and thereby protecting overfished species is a major goal of the VMS program. Much like the original pilot program, the VMSC discussed starting with the core OA vessels with the greatest amount of groundfish landings before expanding in to OA vessels targeting other species.

The group briefly discussed RCA enforcement without VMS. The discussion included USCG reports that investigations into RCA incursions were significantly greater in 2003 prior to VMS implementation, as compared with 2004 after VMS implementation. Mr. Corrigan reported that during the period September through December 2003 when the RCA restrictions were in place without a VMS requirement, USCG at-sea assets discovered 17 incursions (11 by aircraft and 6 by cutters). Virtually every one of these 17 incursions was investigated as a violation of the RCA fishing restrictions, with 4 resulting in penalties being assessed and/or catch seizures and several of the cases are still pending. Since implementation of the limited entry VMS requirements on January 1, 2004, at-sea assets patrolling at a level consistent with pre-VMS patrol efforts have found only 2 incursions.

VMS is critical from an enforcement perspective. The Council is likely to remain in favor of RCA management with a corresponding reliance on VMS. The Council appeared to the VMSC to be focused on directed OA sectors and is looking for mechanisms to identify fisheries that do not pose a threat to overfished species.

Industry representatives felt VMS requirements and associated costs should not be used as a capacity reduction program.

The VMSC did not support a mandatory removal of VMS requirements if the RCAs are rescinded in the future. The group felt the costs of on/off VMS requirements would be too great and it is likely the RCAs will be in place at least through 2008.

VMSC Recommendations

1) The VMSC discussed recommendations for Council consideration with the understanding that the analyses of the alternatives was has not been completed. The VMSC generally recommends that VMS expansion be taken up in phases, much like the original pilot program for the limited entry sectors. The VMSC was interested in identifying those "core" vessels that target groundfish in the open access sector. The VMSC started discussions with Alternative 5B as presented in the draft EA (Informational Report 8, Supplemental NMFS Vessel Monitoring System Report, September 2005).

The VMSC recommended modifying Alternative 5B such that salmon troll and HMS net gear vessels are also excluded from VMS requirements. The majority of the VMSC endorsed this modified alternative as the groups preferred alternative. Mr. Ghio did not support this position and favored excluding groundfish directed longline and pot gear fisheries between Point Conception, California and Cape Blanco, Oregon (Monterey and Eureka catch areas). Mr. Ghio stated that, like other excluded fishery sectors under this alternative, longline and pot fisheries targeting groundfish in this area have very low impacts on overfished groundfish species.

Relative to the Council's request to consider VMS requirements on all non-groundfish trawl vessels under its June action to protect groundfish essential fish habitat, the VMSC recommended the alternative also be modified to require VMS on pink shrimp vessels (all other non-groundfish trawl vessels are already included in the VMS requirements under this alternative). The VMSC recommends that pink shrimp vessels be included if it is determined that enforcement of closed areas to protect essential fish habitat falls within the stated need for the proposed action.

Alternative 5B as modified by the VMSC preliminary recommendation for VMS expansion. Text to be removed in strikeout, and new text in brackets [].

> ***Alternative 5B: longline, pot, trawl and line gear vessels; excluding ~~pink shrimp trawl~~, HMS longline, [net] and line gear, [salmon troll] and Dungeness crab pot gear***. *In addition to those vessels identified under Alternatives 2-4A, require all vessels that use line gear ~~(including salmon troll)~~ to fish pursuant to the harvest guidelines, quotas, and other management measures governing the OA fishery, to carry and use VMS transceiver units and provide declaration reports. ~~Vessels using pink shrimp trawl gear are excluded under this alternative~~. In addition, vessels using HMS line [and net] gear, [salmon troll], and Dungeness crab pot gear, where the incidental catch of overfished species is projected to be minimal, are excluded. Prior to leaving port on a trip in which a vessel identified under this alternative is used to take and retain, possess, or land federally managed groundfish in federal waters, the vessel would be required to activate a VMS transceiver unit and to continuously operate the unit (24 hours a day) throughout the remainder of the calendar year. A declaration report would be required prior to leaving port on a trip in which the vessel is used to fish in a GCA in a manner that is consistent with the requirements of the conservation area. VMS requirements defined at 660.312 and prohibitions defined at 660.306 would apply to these vessels, as would the* reporting requirements defined at 660.303 for vessels fishing in conservation areas.

2) The VMSC requested that NMFS and the Council continue to investigate the issue of drifting within the RCA. The VMSC reiterated concerns about vessel safety and reviewed their request to NMFS from October 2004 on this matter. The VMSC expressed frustration with the lack of progress on this issue. Currently drifting within an RCA is not allowed as enforcement personnel cannot currently differentiate fishing activity and drifting from the VMS track data. The VMSC requests NMFS investigate a declaration system for drifting and the required pinging or signaling rates that may allow differentiation of fishing and drifting. The VMSC requests that the investigation consider what additional equipment and transmission costs would be incurred under such a system.

3) The VMSC discussed an Inter-American Tropical Tuna Commission Resolution on VMS that requires VMS on HMS vessels 24 meters in length and greater. The VMSC recommends this issue be referred to the Council's HMS advisory bodies. Although the intended purpose of the resolution was not understood by the VMSC, it is unlikely that the intent of the resolution falls within the stated need for action under this VMS expansion consideration.

4) The VMSC continues to support federal funding of all VMS requirements and recommends the Council pursue federal funding of any expansion of the VMS program along with reimbursement of costs incurred by vessels under the existing VMS program. NMFS representatives on the VMSC abstained from this recommendations.

ADJOURN
PFMC
10/24/05

AD HOC VESSEL MONITORING SYSTEM COMMITTEE REPORT ON EXPANSION OF VESSEL MONITORING SYSTEM (VMS)

The Ad Hoc Vessel Monitoring System Committee (VMSC) met on September 29, 2005 in Portland, Oregon. The VMSC reviewed the history of VMS implementation on the West Coast and discussed the current monitoring program for limited entry groundfish before focusing the bulk of the meeting on the issue of expanding the program. This statement summarizes VMSC comments and recommendations to the Council. Full summary minutes of the meeting will be included the supplemental materials for the November 2005 Council meeting.

Members Present:
Mr. Joseph Albert, National Marine Fisheries Service, Law Enforcement
Mr. Mark Cedergreen, Pacific Fishery Management Council, Washington Charter Boat Operator
Mr. Brian Corrigan, United States Coast Guard
CAPT Mike Cenci, Enforcement Consultants, Washington Department of Fish and Wildlife
Ms. Kathy Fosmark, Groundfish Advisory Subpanel, Southern Open Access Representative
Mr. Tom Ghio, Acting Chair of Groundfish Advisory Subpanel, Fixed Gear Representative
Ms. Heather Mann, Groundfish Advisory Subpanel, Coastal Pelagic Species Advisory Subpanel
Dr. Don McIsaac, Executive Director, Pacific Fishery Management Council, alternate for
Mr. Don Hansen, Chair, PFMC Chairman, California Charter Boat Operator
Mr. Dayna Matthews, Vice Chair, Enforcement Consultants, National Marine Fisheries Service
Mr. Marion Larkin, Groundfish Advisory Subpanel, Washington Trawl Representative
Mr. Ray Monroe, Alternate for Mr. Kenyon Hensel, Northern Open Access Representative
Ms. Becky Renko, National Marine Fisheries Service, Northwest Region

Members Absent:
Mr. John Crowley, Groundfish Advisory Subpanel, Fixed Gear Representative

Others present:
Mr. Mike Burner, Staff Officer, Pacific Fishery Management Council
Mr. Otha Easley, National Marine Fisheries Service, Office of Law Enforcement
Mr. Doug Fricke, Washington Trollers Association, SAS, HMSAS
Mr. Rod Moore, West Coast Seafood Processors Association
Ms. Lucia Morici, Newport Beach Dory Fleet
Mr. Aaron Newman, Humboldt Fishermen's Marketing Association
Mr. Don Stevens, Salmon Advisory Subpanel Chair

Goals of the VMS Program

The VMSC affirmed that expansion of the existing Vessel Monitoring System (VMS) program to open access groundfish fisheries would enhance state and federal enforcement's ability to monitor vessel compliance with depth-based management and areas where fishing activity is restricted or prohibited. However, industry representatives stated that VMS is not the only way to enforce closed areas and the VMSC should not assume that Rockfish Conservation Areas (RCAs) would be compromised in the absence of VMS. The VMSC discussed the importance of

RCAs as a management tool for rebuilding overfished groundfish species while providing harvest opportunities for healthy stocks.

Definition of Open Access Vessels

The VMSC reviewed what vessels are considered as open access groundfish vessels and established the following points:

- A vessel which takes and retains, possesses or lands federally-managed groundfish is considered an open access groundfish vessel.
- Non-groundfish trawl vessels are considered open access vessels whether they land groundfish or not.

There is no link (federal nexus) for the implementation of VMS on non-federally permitted vessels fishing in state waters. Vessels which meet one of the requirements above but only fish in state waters are considered open access vessels but are not required to have VMS. If the vessel possesses groundfish caught in state water and transits federal water, that vessel would be required to have VMS.

Net gear used by vessels targeting coastal pelagic species (CPS) is not defined in the groundfish regulations as legal groundfish gear making it illegal to land groundfish species with these gear types. Therefore, vessels strictly fishing for CPS species are not considered open access groundfish vessels and are not considered for VMS requirements under the current alternatives.

Missing Information and Analyses

The VMSC noted their impaired ability to fully consider all of the alternatives due to the incomplete nature of the draft Environmental Assessment (EA) that had been distributed at the September Council meeting. The VMSC identified a need for the following information before fully endorsing any recommendation on a preferred alternative.

- Complete the EA. There are many missing values and incomplete sections of the current document.

- A review of impacts to overfished species across fishing sectors is needed. Particularly, estimated canary rockfish impacts in the salmon troll sector. The current salmon troll estimate is based on data from 2000-2001 when canary rockfish retention was allowed in the salmon troll fishery and RCAs were not in place. Additionally, the 2005 salmon troll season was drastically reduced relative to the 2000 and 2001 seasons.

- The VMSC requested National Marine Fisheries Service (NMFS) complete the socioeconomic analyses in support of Alternative 8 and Alternative 10. The VMSC believes a cost/benefit type of analysis is essential in determining which fishery sectors should carry VMS units. NMFS reported that input from the Groundfish Management Team (GMT) could improve the analysis and that these issues are to be discussed at the GMT's October meeting. NMFS intends to complete these analyses in advance of the November Council meeting. The VMSC was unable to fully consider the socioeconomic impacts of VMS requirements on open access vessels at this meeting.

- The VMSC noted the thresholds, either in landed weight or exvessel revenue, for determining which fishery sectors have "minimal" impacts to overfished groundfish are not clearly established. The VMSC noted any threshold value, such as the 500-pound limit in Alternative 9, has the potential to modify fishing practices rather than provide a clear definition of vessels with minimal impacts to overfished groundfish species.

VMSC Recommendations

1) The VMSC discussed recommendations for Council consideration with the understanding that the analyses of the alternatives was has not been completed. The VMSC generally recommends that VMS expansion be taken up in phases, much like the original pilot program for the limited entry sectors. The VMSC was interested in identifying those "core" vessels that target groundfish in the open access sector. The VMSC started discussions with Alternative 5B as presented in the draft EA (Informational Report 8, Supplemental NMFS Vessel Monitoring System Report, September 2005).

The VMSC recommended modifying Alternative 5B such that salmon troll and HMS net gear vessels are also excluded from VMS requirements. The majority of the VMSC endorsed this modified alternative as the groups preferred alternative. Mr. Ghio did not support this position and favored excluding groundfish directed longline and pot gear fisheries between Point Conception, California and Cape Blanco, Oregon (Monterey and Eureka catch areas). Mr. Ghio stated that, like other excluded fishery sectors under this alternative, longline and pot fisheries targeting groundfish in this area have very low impacts on overfished groundfish species.

Relative to the Council's request to consider VMS requirements on all non-groundfish trawl vessels under its June action to protect groundfish essential fish habitat, the VMSC recommended the alternative also be modified to require VMS on pink shrimp vessels (all other bottom-trawl vessels are already included in the VMS requirements under this alternative). The VMSC recommends that pink shrimp vessels be included if it is determined that enforcement of closed areas to protect essential fish habitat falls within the stated need for the proposed action.

Alternative 5B as modified by the VMSC preliminary recommendation for VMS expansion. Text to be removed in strikeout, and new text in brackets [].

> ***Alternative 5B: longline, pot, trawl and line gear vessels; excluding ~~pink shrimp trawl~~, HMS longline, [net] and line gear, [salmon troll] and Dungeness crab pot gear***. *In addition to those vessels identified under Alternatives 2-4A, require all vessels that use line gear ~~(including salmon troll)~~ to fish pursuant to the harvest guidelines, quotas, and other management measures governing the OA fishery, to carry and use VMS transceiver units and provide declaration reports. ~~Vessels using pink shrimp trawl gear are excluded under this alternative~~. In addition, vessels using HMS line [and net] gear, salmon troll, and Dungeness crab pot gear, where the incidental catch of overfished species is projected to be minimal, are excluded. Prior to leaving port on a trip in which a vessel identified under this alternative is used to take and retain, possess, or land federally managed groundfish in federal waters, the vessel would be required to activate a VMS transceiver unit and to continuously operate the unit (24 hours a day) throughout the remainder of the calendar year. A declaration report would be required prior to leaving port on a*

trip in which the vessel is used to fish in a GCA in a manner that is consistent with the requirements of the conservation area. VMS requirements defined at 660.312 and prohibitions defined at 660.306 would apply to these vessels, as would the reporting requirements defined at 660.303 for vessels fishing in conservation areas.

2) The VMSC requested that NMFS and the Council continue to investigate the issue of drifting within the RCA. The VMSC reiterated concerns about vessel safety and reviewed their request to NMFS from October 2004 on this matter. The VMSC expressed frustration with the lack of progress on this issue. Currently drifting within an RCA is not allowed as enforcement personnel cannot currently differentiate fishing activity and drifting from the VMS track data. The VMSC requests NMFS investigate a declaration system for drifting and the required pinging or signaling rates that may allow differentiation of fishing and drifting. The VMSC requests that the investigation consider what additional equipment and transmission costs would be incurred under such a system.

3) The VMSC discussed an Inter-American Tropical Tuna Commission Resolution on VMS that requires VMS on HMS vessels 24 meters in length and greater. The VMSC recommends this issue be referred to the Council's HMS advisory bodies. Although the intended purpose of the resolution was not understood by the VMSC, it is unlikely that the intent of the resolution falls within the stated need for action under this VMS expansion consideration.

4) The VMSC continues to support federal funding of all VMS requirements and recommends the Council pursue federal funding of any expansion of the VMS program along with reimbursement of costs incurred by vessels under the existing VMS program. NMFS representatives on the VMSC abstained from this recommendations.

PFMC
10/14/05

Agenda Item H.10.d
Public Comment
November 2005

RECEIVED

OCT 11 2005

PFMC

447 NW 16th Street
Corvallis, OR. 97330
Oct. 9, 2005

Re: VMS Expansion

To the Council:

I wish to comment on the proposal to expand VMS to salmon trollers. My comments deal with the Newport area.

I understand the issue to expand VMS is rooted in suspicions of cheating or illegal deliveries of canary rock and/or lingcod by trollers. It is illegal for trollers to deliver canary rock, so this is an incidental catch, not an enforcement issues. Lingcod appear to be at the heart of the "cheating" problem.

There is a long history of unintended consequences of management actions. The unintended consequence of the present troll regulation on lingcod will constitute "management induced illegal fishing." The regulation is inside 30 F and outside 100 F—WHOLE TRIP. There are no troll whole trips outside 100 F and few inside 30F. This rule has validity in the overall context of groundfish management, but it is utterly irrational to fishermen accustomed to salmon management. Some fishermen are still unaware of the whole trip aspect, and the rest are resentful enough to inspire some to cheat.

Having created a flawed, unenforceable regulation, management's solution is an expensive, Star Wars-style measure, VMS. I suggest these alternatives to this approach.

A) Change the regulation to ALL WATERS approach. This could be a linkage of lingcod to the number of Chinook onboard.
B) Eliminate lingcod retention. The cost of Star Wars management is far more than the income from the small lingcod catch.
C) Retain the existing regulations; make it clear that anyone delivering lingcod is required to backup their delivery with the existing plotter track on their vessel. The dazzle of Star Wars seems to have blinded everyone to the reality that almost every vessel has at least a bare bones $250 GPS plotter onboard, which contains a record of where the vessel has been during its last few days of operation.
D) As a last resort, create the option of opting out of groundfish deliveries, rather than paying the added cost of this regulation.

I am not interested in fishing "open access," (i.e. targeting groundfish). It is not worth my time without VMS, much less with that additional cost.

I request that NMFS provide an analysis of the cost and benefits of VMS. As a troller, I am very conscious of the costs to fishermen. What exactly are the benefits of this extension of Star Wars to trollers? What are the supposed benefits? This analysis should include alternative solutions to the problem, including my suggestions.

There is a federal law, the Small Business Regulation Act, which applies to this issue. We are due an analysis from the point of view of this law. This regulation is all the more onerous in light of the current and increasing price of fuel.

Sincerely,

Carl M. Finley

P.O. Box 983
Lincoln City, OR 97367

Ph/Fax: (541) 994-2647

OREGON
TROLL SALMON
QUALITY IS KING

OREGON SALMON COMMISSION

October 3, 2005

RECEIVED
OCT 0 4 2005
PFMC

Pacific Fishery Management Council
7700 NE Ambassador Place, Suite 200
Portland, OR 97220-1384

RE: Vessel Monitoring System (VMS) for Salmon Trollers

The Oregon Salmon Commission wants to express its strong opposition to the proposed requirement that salmon trollers have VMS on their vessels.

The Oregon Salmon Troll Fleet has taken the lead in gear restrictions to avoid impacts on other species. Since 1991, salmon trollers have fished with only 4 spreads per line resulting in reduced impacts on Oregon Coast Natural Coho (OCNs). Initial analysis shows that the 4-spread rule produces a reduction in encounters with specific rockfish in the RCA as well. This allows a salmon fishery with the retention of some rockfish for the Salmon Fleet inside the RCA.

VMS expansion to the Salmon Troll Fleet would be a significant financial burden to a fleet that has had tremendous cutbacks in salmon fishing opportunity this year.

The Oregon Salmon Commission and the entire Salmon Troll Fleet that it represents asks the Council Members to please vote "No" on the expansion of VMS to our salmon vessels.

Thank you for your consideration.

Nancy Fitzpatrick

Nancy Fitzpatrick, Administrator
Oregon Salmon Commission

NO VMS EXPANSION FOR SALMON TROLLERS OR NEARSHORE GROUNDFISH

The Pacific City Dory Fleet are Oregon Salmon fishermen that also target Black Rockfish and Lingcod to maintain our small family operations. Our open boats are 22 to 26 feet in length that must be launched into the surf to reach the fishing grounds. We target Black Rockfish and lingcod near shore of the RCA, in state waters, on the only reef we have. Then when are meager quotas of 750 pounds of Black Rock every two months and 300 pounds of lingcod are attained and delivered, we venture off to fish Salmon.

The Oregon Salmon Fleet has taken the lead in gear restrictions (the 4 spread rule) that keep our impacts on OCN'S (Oregon Coast Naturals) low. The rule also reduces our impacts on specific rockfish in the RCA. This allows a salmon fishery with the retention of Yellow tail for the Salmon Fleet inside the RCA.

With the impending cutbacks in the Salmon fishery and a further reduction for Black Rockfish for 2006 most of our fishing vessels will be at the dock. VMS expansion at this time would virtually track nothing.

The West coast Salmon Fleet and the near shore Ground fishery have little or no negative impacts on the rebuilding of specific stocks. The near shore ground fishery harvest stocks that are healthy, highly regulated and inside of state waters.

The salmon vessels in the state of Oregon have been reduced from a high near 4,700 to only 1,200. Through attrition and regulation requiring a significant financial investment that number has nearly wiped out vessel between 22 and 30 feet. I believe there are only 120 left.

Please Council members vote no on the expansion of VMS to our Salmon and near shore Ground fisheries.

Thank you for your Consideration,

Ray Monroe
Oregon Salmon Commissioner/Pacific City Doryman
Box 98
Pacific City, Oregon 97135

VMS (H.10.C)

Dear Council Members

This letter is regarding expansion of mandatory VMS. I fish a 22' dory out of Pacific City. There are a number of concerns for dory fishermen concerning VMS.

COST - Over recent years we have seen our black rock fishery go from wide-open fishery to severely restricted by quotas and closures. Our fishery is further limited by access to the ocean due to weather and surf conditions as our boats launch directly into the surf. By fishing hard last year, during available breaks in the weather and staying within our quotas, I was able to gross just over $5,000 on black rock. With the recent introduction of black rock as a limited entry fishery, another fee was added. Our available monthly quotas were also cut in half this year starting at only 1,000# in a two-month period. **Any additional cost to the fishery will make it a non-profitable.**

BENEFIT – The purpose stated for VMS is to prevent boats from fishing rockfish in the RCA. None of our rock fishing takes place in the RCA since our entire reef lies inside of 27 fathoms. **There is no benefit in placing a VMS in a boat that does not fish black rock in the RCA.**

MAINTAINING – An open style boat that crashes through the surf tends to get things wet. My radios need to be replaced on a regular basis because of the moisture. In times of bad weather or no fishing my boat is taken down for repairs and sometimes stored for months with the batteries pulled. Keeping a VMS running 24-7-365 would mean taking it into the house and hooking it up to a converter. **Maintaining a VMS on a dory in Oregon's weather and fishing conditions is near impossible.**

DECLARING FISHERY – having to declare what fishery you will participate in on a given day will remove the flexibility that allows a small boat to be profitable. Allowing for seasons and quotas, I can launch in the morning with the ability to participate in up to 5 different fisheries. It depends on the weather, what's biting, what's needed in the markets and can even change several times during the day. **It is impossible for a dory to declare and stay profitable.**

Black rock fishing is marginally profitable as it stands and any other fee or reduction in quota will, for all practical matters, end a 100-year tradition.

Thank-you for your time and attention to this matter,

Craig Wenrick
Pacific City, Oregon

RECEIVED
OCT 12 2005
PFMC

Subject: Re: VMS
From: "william james" <halibutbill@msn.com>
Date: Wed, 12 Oct 2005 15:50:48 -0700
To: "Mike Burner" <Mike.Burner@noaa.gov>
CC: <halibutbill@msn.com>

To: PFMC Dear Mr. Chairman members of the Council my name is Bill James. I am a California Nearshore Commercial Fishermen. I do not support the use of Vessel Monitoring Systems for California state permitted nearshore commercial fishermen north of 34 27 (Pt. Conception) for the following reasons: 1.Nearshore fishermen sell their fish alive for a much higher price therefore there is a economic incentive to keep the fish alive for the "live" markets. In order to do this we fish as shallow as possible to keep fish mortality as close to zero as possible. This is a automatic constraint on depth for the nearshore live fish fleet making VMS redundant since our "live" fish fishery already dictate depth based management for us. 2. There are some areas that we fish that are outside of state waters but inside (shoreward) of the RCA. 3. Low Bi-monthly trip limits make live fish fishing (shallow) the only economically viable option strongly motivating us to keep fish alive to obtain the highest price possible therefore we fish as shallow as needed (usually under 15 fathoms) to eliminate air bladder trauma 4. The added expense of a VMS unit added to our high cost of state nearshore permits permit could bring undue hardship to the nearshore live fish fleet in California. Thank for your time. Sincerely, Bill James

RECEIVED
OCT 11 2005
PFMC

10/8/05

IN REGARDS TO POSSIBLE EXPANSION OF VMS (Vessel Monitoring Systems) TO INCLUDE SALMON TROLLERS

PFMC and Council Members
7700 NE Ambassador PL, Suite 200
Portland, OR 97220-1384

Dear Council Members,

I own and operate the salmon troller, "Metta Marie." Recently I received word that PFMC is or will be discussing the possibility of expanding the VMS to include salmon trollers. I understand the possible need for VMS is to monitor groundfish stocks. As a second year boat owner and twelve year deckhand I am willing to bet that salmon trollers are responsible for less than 1/1,000,000 (one millionth) of all harvested groundfish. I see no need for trollers to be required to have VMS. I oppose this possible expansion to include salmon trollers. Please vote no to this expansion.

Thank you, Paul Alexander

RECEIVED
OCT 11 2005
PFMC

Dear Council Members,

I am totally opposed to the VMS expansion to include salmon trollers. Salmon trollers do not need VMS. In the years that I have trolled I've had Very limited groundfish caught! Most seasons none at all.

Thank you for your time in reading this.

Sincerely,
Dean Frost

Dean Frost
242 Winchester Ave.
Reedsport, OR 97467

RECE

OCT 1 1 2005

Dear Sir:

I oppose VMS expansion to include salmon trollers.

1. We do not catch enough bottom fish to be a concern.

2. Our fishing time is very limited anymore to a couple months in the spring and also in the fall. no fishing time really lessens the impact on bottom fish.

Thank you for your attention.

Joe Zelfer
F/V Royal.
PO Box 2267
Newport, Oregon 97365

Mr. Hank Bryson
548 NE 60th Ct.
Newport, OR 97365

RECEIVED
OCT 11 2005
PFMC

TO: PACFIC FISHERY MANAGEMENT COUNCIL : DATED 10/8/05: FROM F.V CHRISTY BELLE,SALMON TROLLER,HENRY BRYSON OWNER. YESTERDAY I SAW A NOTICE THAT THE PFMC IS CONSIDERING TO HAVE SALMON TROLLERS PUT THE VMS SYSTEM ON THEIR BOATS FOR THE 2006 SEASON AND THAT IF WE THE TROLLERS HAD ANYTHING TO INPUT IT WOULD HAVE TO BE DONE AS USUAL WITH EXTREMELY SHORT NOTICE AND RECEIVED BY OCT 10TH ! WHAT AND WHY IS THE PFMC CONSIDERING SUCH A EXPENSIVE SYSTEM TO BURDEN THE SALMON TROLLER INDUSTRY WITH? IN THE THREE SHORT YEARS THAT I HAVE BEEN A COMMERCIAL FISHERMAN THERE HAS BEEN ONLY ONE REASON ASSOCIATED WITH A RULING THAT HAS BEEN APPROVED BY PFMC AND THAT IS ON THE FOUR SPREAD RULE THAT ODF&W HAVE SHOWN THE FISHERMAN WHY IT WAS JUSTIFIED OUTLINING THE TEST BOATS, FISH CAUGHT AND NOT CAUGHT AT WHAT DEPTHS AND WHY WE NEED TO FISH WITH FOUR SPREADS TO PROTECT THE COHO SPECIES, I FOR ONE BACK THAT ONE HUNDRED PERCENT BUT WITH NO REASON AND TIME FOR RESPONSE FOR YOUR RULINGS AND THINKING ON WHAT IS ARE LIVELYHOOD IS IRRESPONSIBLE ON THE PFMC PART. TO SUMMURIZE THE ABOVE I AM DEFINETLY OPPOSED TO EXPANDING THE VMS IN THE SALMON TROLLER FLEET! ONE OTHER IMPORTANT FACT PERTAINING TO THE VMS AND SALMON TROLLERS IS THAT THE PFMS HAS SEVERLY LIMITED THE SALMON SEASON TAKING AWAY TWO OF OUR BEST FISHING MONTHS AND MOST OF US COULD NOT AFFORD SUCH A EXPENSIVE SYSTEM , HOWEVER IF YOU ARE ADAMANT ABOUT THIS SYSTEM MAY I SUGGEST THAT THE PFMC PAY FOR AND CONTRACT WITH A OUTSIDE AGENCY TO INSTALL AND MAINTAIN THE SYSTEM ON ALL OUR BOATS WITHOUT ANY MORE EXPENSE TO THE SALMON TROLLER FLEET, I SUGGEST THIS TO YOU THE PFMC IN GOOD FAITH BECAUSE IT IS THE ONLY WAY WE COULD AFFORD TO DO IT. THANK YOU FOR YOUR CONSIDERATIONS!

Sincerely;

Hank Bryson

541-840-6257

PFMC
Portland, OR

RECEIVED
OCT 11 2005
PFMC

Jeff Werner
F/V Deanna Marie
P.O. Box 6023
Pistol River, OR 97444

PFMC Members,

Your consideration of VMS for salmon trollers is the reason for this communication. I oppose the expansion of VMS to salmon trollers. It is an unnecessary burden on vessel owners, based on limited impact of groundfish stocks.

I fish my vessel alone, so I see every fish hooked. The number of groundfish I land is very low and the vast majority swim away unharmed. You move your gear to avoid interaction and keep hooks open to salmon.

Thankyou for your consideration of this matter,

Jeff Werner

Oregon Trollers Association Inc.
P.O. Box 5846
Charleston, Oregon 97420-0647
541-888-6612/fax 541-888-0638
oregontrollers@aol.com

Hook & Line

Pacific Fishery Management Council
7700 Ambassador Place, Suite 200
Portland Or. 97220-1384

October 11, 2005

RECEIVED
OCT 12 2005
PFMC

RE: Vessel Monitoring System

To whom it may concern,

The VMS (vessel monitoring system) to include Salmon Trollers is just more proof that unchecked Federal agency's are out of control.

(Salmon Troller's can fish the RCA's.)
(Rockfish Conservation Area)

The Salmon Troll Fleet has been financially devastated by this year's Salmon Season imposed by NMFS over the Klamath Four (4) year olds low predictions. With the high cost of fuel, no season to speak of and families that need to be housed, clothed and fed, how can the government continue to impose more economic Hard Ship upon it's people, that are already dealing with a Federally Imposed and Artificially Sustained Salmon Shortage on the Klamath River that has cost the coastal communities Hundreds of Millions of dollars in lost income.

Salmon Trollers have such strict Regulations and limits on Rockfish that other than an incidental take, a targeted rockfish fishery with the the price of fuel, plus the price of rockfish species, is financially a non-profit venture.

The reduction of the Trawl Fleet, improved nets and the areas the Trawl Fleet can fish, is in itself a massive recovery effort for rockfish stocks. So how can Salmon Trollers with a hook and line, dragging only four spreads per wire Even be a threat? Comparing a 7/0 hook to a mid-water net doesn't look very imposing, does it?

1: We want to see in Documented Form by the Federal Agency Imposing the (VMS) a Complete Economic Impact Study of the VMS on Salmon Trollers.

2: We want an Independent Environmental Impact Study showing the impact of the Salmon Troll Fleet on Rockfish stocks in the (RCA) that would WARRANT (VMS).

3: We want a Current Environmental Impact Study on Salmon and all Rockfish Species by the Whiting Fleet of both shore side and factory Trawl.

Open Access was and is being abused by NMFS by allowing the Whiting Fleet to fill all of the quota without giving the hook and line and trollers their own quota.

The abuse by some members of the Whiting Trawl Fleet led to arrests and fines along with some processors. Abuse of the quota system is still evident today when the Whiting Trawl Fleet filled their Salmon quota and went back to NMFS and got an additional incidental take of Salmon when the entire Oregon Salmon Fleet sat idle to protect the Klamath River Stocks. How about the four spread rule to protect the COHO. They wouldn't end up in those nets too, would they??

The documented excessive take of rockfish by the Whiting Trawl Fleet became the Decisive Nail in the Coffin that ended our Fisheries. NOW NMFS wants us to have a VMS?

The VMS is nothing more than a self incriminating leg bracelet. This issue will be brought before our State and Federal Officials. More Federal Failures Encroaching into our lives after Hurricane Katrina, FEMA, Homeland Security and the War in Iraq has left the American people with a bad taste in their mouths.

National Standards Magnuson-Stevens
Conservation and Management Act.

Violations of the National Standards;

Number 1: Title 111 Sec. 301 16USC. 1851. Page 44. Conservation and Management measures shall prevent over fishing while achieving, on a continuing basis, the optimum yield from each fishery for the United States Fishing Industry.

Number 4: Title 111 Sec..301 16USC. 1851. Page 45. Conservation and Management, may not discriminate between residents of different states.

If it becomes necessary to allocate or assign fishery 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.

NO Vessel Monitoring System (VMS)
for the Salmon Fleet and if Imposed the Oregon Trollers Association Inc. will see you in Federal Court and that's no B.S.

Rayburn W. Guerin
President O.T.A.

Oregon Trollers Association Inc.
P.O. Box 5846
Charleston, Oregon 97420-0647
541-888-6612/fax 541-888-0638
oregontrollers@aol.com

October 11, 2005

IN SUPPORT ON O.T.A.'s
LETTER TO PACIFIC FISHERY MANAGEMENT COUNCIL
IN PROTEST OF THE VMS

Fishermen name: Lorin Dixson
Home port: Charleston
Vessel name: Faith II
Comments: No more Unecasary Regulations or expenses

Fishermen name: MICHAEL BALDWIN
Home port: WESTPORT, WA
Vessel name: NELLIE M
Comments: This is JusT another unnecessary expense imposed by a "BIG BROTHER" GovernmenT.

Fishermen name: Mildred Whitley
Home port: Charleston
Vessel name: Aquares
Comments: Don't need any more expenses as we aren't making it now. Why do we need this?

Fishermen name: Louis M. Whitley
Home port: COOS BAY
Vessel name: GUPPY
Comments:
WE DON'T NEED IT

Fishermen name: EARL L. (Butch) HENRY
Home port: WESTPORT WA
Vessel name: EVENING
Comments: Very much aginst this. BOARD MEMBER OTA.

Fishermen name: Marvin Forester
Home port: Coos Bay Oreg.
Vessel name: Miss B Haven — Retired
Comments: BUNCH OF B.S.

Fishermen name: J. Gagn
Home port: BANDON OREGON
Vessel name: NELMA II
Comments: I JUST CAN'T AFFORD ANY MORE EXPENCES. (VMS) IS NOT JUSTIFIEABLE FOR SALMON TROLLERS

Fishermen name: James W. Peterson
Home port: Coos Bay Or.
Vessel name: F.V. "Alice M."
Comments: I'm not going for This B.S.

Fishermen name: Frankie Joe Boyer.
Home port: Winchester BAY
Vessel name: F/V SEA STAR / F/V Dixie Lee
Comments: you suck!

Fishermen name: J.D. Evarow
Home port: charleston Or.
Vessel name: F/V Sea crest
Comments: This is a violation of our rights as Free american's it is a selfincriminateing polvceing toot i am not puting this pice of Junk on my Boat

Fishermen name: Chris Silburn
Home port: Bandon Or.
Vessel name: Harbor Belle.
Comments: Right on.

Fishermen name: Tom Muse
Home port: Charleston OR
Vessel name: F/V GARNET
Comments: NO WAY

Fishermen name: DAVID T. EARLE
Home port: CHARLESTON, OR
Vessel name: World FAMOUS
Comments: Get A clue

Fishermen name: Lonnie MARRington
Home port: BROOKINGS ORE.
Vessel name: Helen MARIE
Comments:

Fishermen name: Lyle mornington
Home port: Brookings
Vessel name: TAMMY RAN
Comments:

Fishermen name: RUSS OTT
Home port: CHARLESTON OR.
Vessel name: BESS CHET
Comments:
Did the STAR'S & STRIPES fall off our FLAG? IS "HITLER" BACK?

Fishermen name: Buz Taylor
Home port: Charleston
Vessel name: San Pietro
Comments:

Fishermen name: JAMES L. Moore
Home port: Charleston, Ore.
Vessel name: Leta - I
Comments: Will Serve no purpose oather than Cause more Expence and unnessary Reg.

Fishermen name: Tom Hockema
Home port: CHARLESTON OR
Vessel name: RAMBLER
Comments:

Fishermen name: RICK Holmes
Home port: CHARLESTON, OR
Vessel name: BRANDY WINE
Comments: NO WAY

Fishermen name: Grant Baldwin
Home port: Westport Wa
Vessel name: Ginger
Comments: I'm tired of being accused of being a criminal. This would make it worse

Fishermen name: Lance C. Porteur Lance Porter
Home port: Charleston, Ore 97420
Vessel name: Avenger
Comments: I vehemently oppose this VMS sceheme! and the ~~[illegible]~~ sick thinking behind it. NUTS!

Fishermen name: KELVIN DECKER [signature]
Home port: CHARLESTON, OR
Vessel name: HAVALIA
Comments: "BIG BROTHER" COULD SURELY FIND SOMETHING BETTER TO SPEND MY MONEY ON!!

Fishermen name: Seth Smith
Home port: Charleston, OR
Vessel name: Golden Glo
Comments: I don't see any diffuence from an ankle braclet to this. Why should I be treated like a criminal. Please allow me to conduct business without a braclet.

Fishermen name: Curtis German
Home port: Coos Bay ORE.
Vessel name: LADY HELEN
Comments: We have PLENTY OF RULES + Regulations.

Fishermen name: Paul Heikkila
Home port: Charleston
Vessel name: Andante
Comments:

Fishermen name: Bill Stanley
Home port: Morro Bay, CA
Vessel name: F/V Windwalker
Comments: no, no, no,!!

Fishermen name: John Gillespie
Home port: MORRO BAY
Vessel name: WINDWALKER
Comments: The government CAN'T BE TRUSTED

Fishermen name: Mark Petterson
Home port: Charleston, OR
Vessel name: Jessica ANN
Comments: NOT NECESSARY FOR salmon or crab or TUNA Fishermen

Fishermen name: PAAVO CARROLL
Home port: Charleston OR
Vessel name: TITAN
Comments: PRESERVE ALL OPEN ACCESS POSSIBLE THIS IS A PUBLIC RESOURCE

Fishermen name: Bruce Burbee
Home port: Charelston OR
Vessel name: F.V. Rainbow
Comments:
Please Leave us alone
To make a Loving.

Fishermen name: DAVID YOUNG
Home port: CHARLESTON
Vessel name: (2) CHARMINGPOLLY, PACIFIC BELLE
Comments: DON'T NEED NO STICKING V.M.S.'s

Fishermen name: Garee L. mcginess
Home port: Charlston Or
Vessel name: Silver Egale
Comments: no VMS what about or rights (5th amendment)

Fishermen name: SANdRA R Miles
Home port: CharlesTon Ore.
Vessel name: HI-HO
Comments: enough is enough.

Fishermen name: Rayburn W. Guerin
Home port: CharLeston Oregon
Vessel name: FRANKIE
Comments: (VMS) is A SeLF inCrimiNATing And INVASIVE ElecTRONIC RAT. That in my Opinion Violate's the 5th Amendment of Self Incrimination. If The Council Doesn't Like The Comment, Remember the 1st Amendment. Freedom of speech. This is How We Really Feel.

From Kenyon Hensel

The council is on the verge of making a large misstep in the application of their Vessel Monitoring System (VMS). By trying to apply this system to the open access fishery without first addressing the unlimited capacity of the open access fleet, the council will create a number of unintended consequences.

Most of the boats now landing fish in the open access fishery are fishing in the near shore for shallow water species. These fishermen have only a very small catch limit of shelf species. The two hundred pounds of shelf fish now allowed can easily be caught inside of the inter boundary of the RCA in most northern areas. It is too small of a catch to pay for any one to target without income from other species groups inside or outside of the RCA to support the upkeep of a boat. Without a higher catch of shelf species, there is no incentive to fish inside the RCA. Only a few boats which are big enough, or who work in areas where state laws and market conditions dictate, are forced to fish for this small shelf limit at the edge of the RCA.

If the council continues through with its adoption of VMS for the open access fleet, very few units will be put on boats. Instead the few boats who fish the inner margins of federal waters will simply be forced to stay on the state side of the line. By exempting Salmon fishermen and Tuna boats, there will be many boats continuing their fishing activities in the RCA without VMS signals which will have to be investigated as to what they are doing and landing.

Since Salmon fishermen are allowed to land rock cod in open access with their landed catch of salmon, no one will be able to say their did not catch those fish in the RCA. At this time these fishermen are asking for more lingcod for their incidental catch. This is not unexpected, nor is it unjustified. It simply shows that these open access boats like all of the rest of us want access to any increases in the landed fish allowance, and plan to fish for and catch them. Without VMS on their boats, enforcement will still have to patrol the RCA to enforce the no fishing prohibition.

If the council would first work out a dedicated ground fish permit for the open access fishery, and then take up the issue of the need for VMS in that sector, we would all be in a much better position to work on solutions that fulfill the needs of management.

Dear Chuck,

Hi! My name is Paul Alexander; I own and operate the Salmon troller "Metta Marie" and have been a commercial fisherman for fourteen years. I wanted to comment on the proposed "Vessel Monitoring System" VMS for Salmon trollers, and explain as simply as possible my opposition to what I consider an unnecessary regulation.

After spending years in the crabbing, dragging, longlining, and seining industries, I decided to purchase a salmon troller. Go figure? At any rate, I find myself as a second year boat owner, and looking at the possibility of yet another expensive and redundant regulation. I see absolutely no reason for salmon fisherman to shoulder the burden and expense of a vessel monitoring system. Who's going to make all the money off this system? Will the impact of this system imposed on salmon trollers have a justifiable impact on the future of groundfish, or is it BIG Brother intruding into our private lives just a little bit more? Does the end justify the means or is the noose ever-tightening on our freedoms and rights to privacy?

I believe this system is yet another example of bureaucratic buffoonery or a total waste of the working man's hard earned money. Again I ask, "Who's going to cash in on this cow, because after all, it's a dead one in regards to making sense?" Salmon trollers harvest a minuscule part of less than one percent of total groundfish harvested on the West Coast. There is absolutely no need to waste energy and money in expecting them to be equipped with this system. Will the end be justified or is it just another paper trail? I suggest you throw this one out the door!

I oppose this expansion and ask that you stand up for my freedom in this case. If eliminating incidental catch for salmon trollers would be a better solution, than "HERE, HERE!" I'd be willing to release every last codfish I catch. I really do not want to foot the expense of having the government breathe down my neck via this VMS. Lastly, if it is a must that we trollers carry these systems, then I ask that you make it manditory for the state to pay for them and their maintenance, but remember we will all be taxed a little bit more for a little more regulation.

Lastly, I again state that this would be a total waste of our hard earned dollars, and we could much better serve the fisheries by using our resources in other venues.

Thank you for your time,

Sincerely,

Paul Alexander

PACIFIC COAST FEDERATION of FISHERMEN'S ASSOCIATIONS

Please Respond to:
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By Electronic Mail, Hand Delivery

28 October 2005

Mr. Donald Hanson, Chair
Pacific Fishery Management Council
7700 NE Ambassador Drive
Portland, OR 97220-1384

RE: Expansion of Vessel Monitoring System (VMS)
Oppose Inclusion of Troll Salmon Fishery

Dear Chairman Hanson:

The Pacific Coast Federation of Fishermen's Associations (PCFFA) represents working fishing men and women in the U.S. west coast fishing fleet. Through its member organizations, it represents the vast majority of California's organized commercial salmon fishermen and it has many members in Oregon and Washington as well. PCFFA opposes the expansion of vessel monitoring system f(VMS) for the west coast groundfish fleet to salmon trollers.

The reasons for PCFFA's opposition to inclusion of the salmon fleet under VMS are these:

1) The take of groundfish by salmon trollers is insignificant at best and does not warrant mandating VMS for this fleet as the council has found necessary for those vessels in directed groundfish fisheries.

2) There has been no evidence presented whatsoever for a need for VMS coverage of the salmon fleet. Had such a need arisen it would have been taken up under the PFMC's management of salmon.

3) Requiring VMS coverage of the salmon fleet would place a significant and unnecessary economic hardship on a fleet that suffered extensive restrictions this past year and will likely again next year due to constraints imposed on the fishery because of Klamath River fall chinook.

Requiring VMS on the salmon fleet because of fear of an occasional take of a species of groundfish is overkill, akin to requiring all drivers to posses hunting licenses because of occasional roadkill on highways. PCFFA respectfully asks the PFMC to not expand VMS coverage to the salmon troll fleet.

Sincerely,

Chuck Wise
President

Agenda Item H.10.d
Expansion of Vessel Monitoring System
Public Comment
November 2005

Comments of Scott McMullen
Retired Shrimp Fisherman

Members of the Council,

I would like to address two issues before the Council with regard to Vessel Monitoring Systems (VMS).

Issue 1. Expanding VMS carriage requirements to the Pink Shrimp trawl fleet

1. The Summary Meeting Minutes of the VMS committee recommended a focus on the core Open Access fleet that targets groundfish. The shrimp fleet, now using mandatory fish excluders, does not target groundfish. This is an unnecessary burden on Shrimpers.
2. The pink shrimp fishery has highly variable production, both spatially and temporally. Adding VMS will increase the cost of doing business for Shrimpers, and in some years could be a great additional burden for smaller fishing operations by adding additional fixed costs.
3. IF the goal of adding the shrimp fleet to those carrying VMS is mainly to protect EFH, it isn't necessary. EFH lines are drawn for convenience—if the lines followed the exact shape of hard bottom such as at the "Shalepile" site, the lines would have so many points that they would be unwieldy. Shrimpers are not going to fish the hard bottom anyway, so the goal is already met with status quo—the least costly option.
4. The shrimp fleet was proactive in reducing discards by adopting a By-catch Reduction Device before it was mandatory. Should this be their reward—to require an expensive piece of equipment with on-going operational costs for very little practical benefit?
5. The shrimp fishery is done in the daylight. Not requiring VMS does not jeopardize EFH areas. The lines will still be honored because of the high cost of a violation and the fact that an airborne patrol could appear at any time.
6. The limited benefits of having VMS on Shrimpers are disproportional with respect to the additional cost to the fleet.

Issue 2. Drifting in RCA and EFH areas

1. Vessel safety is outside the scope of this rulemaking process, but since it has been discussed by the VMS Committee I will comment. In my 25 year career fishing, I was aware of far more fishing vessel accidents and near misses by vessels underway with a helmsman than by vessels drifting.

Fatigued crewmen at the helm motoring to stay out of a RCA area could easily cause more collisions than allowing them to drift.

2. Consider enforcement of the RCA under a policy allowing drifting vessels to go into an RCA. These vessels would show up on VMS monitoring equipment. Is it logical that a trawler would tow into the RCA thinking that he would get away with it by believing that VMS monitors would assume he was drifting? Violation of the boundary would, as I understand it, send an automatic alert to enforcement personnel. Why would a fisherman risk his catch and a penalty, knowing that he was being watched and that any airborne enforcement asset could fly over at any time to confirm whether the vessel was fishing or drifting?
3. It cannot be that difficult to determine most of the drifting vessels based on speed and direction. In my years of fishing ~95% of the time I drifted at less than 1 knot.
4. Enforcement of RCAs is assumed to be hugely improved by VMS with the VMS Committee meeting minutes noting the decrease in incursions following VMS implementation. The reality is that vessels changed behavior at the time they realized the consequences of enforcement, which not surprisingly, occurred about the time VMS was put into place. Catches were confiscated and fines imposed. This resulted in changed behavior. Imagine complete VMS carriage on all boats from day 1 of the RCAs but no citations, no consequences. Would there have been any compliance? NO. Compliance was good once the fleet saw that it would very expensive to be found on the wrong side of the line.

EXPANSION OF VESSEL MONITORING SYSTEM (VMS)

The Council is considering an expansion of the existing Vessel Monitoring System (VMS) program to open access groundfish fisheries to enhance state and federal enforcement's ability to monitor vessel compliance with depth-based conservation areas. Depth-based management areas were established so that healthy fisheries could continue in areas and with gears where little incidental catch of overfished species occurs.

The Council and the National Marine Fisheries Service (NMFS) first implemented VMS requirements for the limited entry sectors of the groundfish fishery in 2004. The Council and NMFS have been considering the expansion of this monitoring program and have convened several meetings and Council sessions on the matter.

- **October 7, 2003** - The Ad Hoc Vessel Monitoring System Committee (VMSC) met and discussed criteria and priorities for potential expansion of the VMS program to groundfish fishery sectors other than the limited entry trawl and limited entry fixed gear sectors.
- **November 2003 Council meeting** - The Council opted to postpone a decision on expanding the monitoring program until the pilot program in 2004 was implemented and evaluated.
- **September 2004 Council meeting -** NMFS presented a draft Environmental Assessment (EA) that contained a range of five VMS coverage alternatives for the open access fishery based on the VMSC's October 2003 recommendations to the Council. The Council recommended a range of eight alternatives for further analysis. The Council also recommended a delay in Council final action to provide more time for public and advisory body input.
- **October 7, 2004** - The VMSC met and recommended Alternative 6B requiring VMS for any vessel engaged in commercial fishing to which a RCA restriction applies, except salmon troll vessels north of 40° 10' N. latitude that only land yellowtail rockfish.
- **January and February 2005** - NMFS held seven public meetings covering all three West Coast states to provide interested public with information regarding the expansion of the VMS program.
- **April 2005 Council meeting -** The Council reviewed a revised EA and recommended further analysis to examine thresholds for identifying vessels that land insignificant amounts of groundfish and low impact fisheries that could be considered as exceptions to the VMS requirement. In addition, concerns about the cost of a VMS system being borne by industry to maintain the integrity of the Rockfish Conservation Area (RCA) management regime for the open access (OA) fisheries were expressed by the Council.
- **June 2005 Council meeting** - The Council adopted measures to protect groundfish essential fish habitat. As part of the habitat protection measures, the Council requested that VMS requirements for bottom-trawl vessels be included in the OA VMS analysis. At this meeting, the Council also decided to move its final decision on this action from September 2005 to November 2005.
- **September 2005 Council meeting** - As a result of Council discussion at the April 2005 meeting, NMFS developed three additional alternatives and broadened the analysis and distributed a revised EA for review.

- **September 29, 2005 -** The VMSC met to review the latest EA and developed preliminary recommendations to the Council. The VMSC noted several important sections of the EA were incomplete but developed tentative recommendations to the Council including a preferred alternative focused on groundfish directed fisheries and the Council's June 2005 action on groundfish essential fish habitat (Agenda Item H.10.c, Ad Hoc VMS Committee Report).

The Council is to hear reports from NMFS, as well as receive advice from the Council advisory bodies and the public on the expansion alternatives for VMS and adopt a Council preferred alternative.

Council Action:

Adopt a preferred expansion alternative.

Reference Materials:

1. Agenda Item H.10.b, NMFS Report: Draft Environmental Assessment, Regulatory Impact Review & Regulatory Flexibility Analysis, Expanded Coverage of the Program to Monitor Time-Area Closures in the Pacific Coast Groundfish Fishery.
2. Agenda Item H.10.c, Ad Hoc VMS Committee Report.
3. Agenda Item H.10.c, HMSMT Report.
4. Agenda Item H.10.c, CPSAS Report.
5. Agenda Item H.10.c, Supplemental Ad Hoc VMS Committee Summary Minutes.
6. Agenda Item H.10.d, Public Comment.

Agenda Order:

a. Agenda Item Overview — Mike Burner
b. NMFS Report
c. Reports and Comments of Advisory Bodies
d. Public Comment
e. **Council Action:** Adopt Final Preferred VMS Expansion Alternative

PFMC
10/14/05

Groundfish Trawl Individual Quotas for the Pacific Coast July 2005 Informational Report

The Pacific Fishery Management Council is in the process of considering a mulitspecies individual fishing quota program for its limited entry trawl groundfish fishery. At its June 2005 meeting, the Council voted unanimously to send forward a set of alternatives for analysis in an environmental impact statement. Funds are now available to initiate the analysis but additional funds will be required to be take it to completion.

Fishery Context

The groundfish trawl fishery is a multispecies fishery managed under the West Coast Groundfish Fishery Management Plan, which covers more than 80 species, including rockfish, flatfish, sharks, and skates, as well as roundfish such as Pacific whiting, sablefish, lingcod, kelp greenling, and cabezone. A variety of trawl targeting strategies and types of groundfish trawl gear are used resulting in wide variation in the mix of species caught in a particular trawl tow. This situation creates significant challenges in managing the fishery. Recently, 92 permits out of 284 limited entry trawl permits were bought back through a largely, industry-funded buyback program, reducing the number of permits to 182 (including 10 catcher-processors). Since then two additional permits have been retired through permit combination, leaving 180 permits.

The limited entry trawl fishery is the largest component of the groundfish fishery generating about $42 million in exvessel revenue in 2003 and $62 million in exprocessor revenue. It is estimated that there were about $82 million in community income impacts associated with this fishery.

2003[1] Commercial Fisheries	Groundfish			Other West Coast Fisheries	Total All West Coast EEZ Fisheries
	Limited Entry Trawl	All Other	Total Groundfish		
Exvessel Revenue	$42 million	$18 million	$60 million	$279 million	$339 million
Percent of Groundfish	69%	31%	100%	-	-
Percent of All EEZ Fisheries	12%	5%	18%	82%	100%

[1] Groundfish are also harvested by the recreational fishery.

Policy Context

The Council has been interested in considering individual quota programs since the early 1990s. A simple, single-species individual quota program was developed for the limited entry fixed gear fishery in the early 1990s, was delayed due to a moratorium, then finally implemented in the form of a tiered permit stacking program in 2001. In 2000, the Council adopted a groundfish strategic plan calling for the consideration of IFQs and permit stacking for the trawl fishery. At that time consideration of IFQs was delayed due to a Magnuson Stevens Act moratorium on such programs. In the fall of 2004, the Council adopted a bycatch mitigation environmental impact statement (EIS) which called for the future use of individual fishing quotas (IFQs) to control bycatch.

Efforts to Date

The Council decided to initiate scoping for a trawl individual quota program at its September 2003 meeting. At its June 2005 meeting, having received the results from public scoping and comments from Council advisory bodies, the Council voted unanimously to send forward for analysis in a draft EIS a number of trawl individual quota (TIQ) alternatives covering harvest of West Coast groundfish, including Pacific whiting. This action was also unanimously recommended by the Council's Ad Hoc Trawl Individual Quota Committee which includes representation of whiting and nonwhiting sectors, shoreside and at-sea processors, communities, and environmentalists. The alternatives include IFQs but not individual processing quotas. The timeline for progressing on the draft EIS will depend on available funding.

The Council's June 2005 decision culminated a scoping process that spanned more than one-and-a-half years and included substantial work by a variety of Council committees. The Council's Ad Hoc TIQ Committee met five times, the Ad Hoc TIQ Enforcement Group met twice, the Ad Hoc TIQ Independent Experts Panel met twice, the Ad Hoc TIQ Analytical Team met four times, and three special public hearings were held. The result is a series of alternatives that present an integrated approach for managing the entire trawl fishery, take into account the complexities of the interactions among segments of the trawl fishery, and take into account interactions between the trawl fishery and other segments of the groundfish fishery.

Problem Statement

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 by discord between fishermen and managers and discord between different sectors of the fishery, similar to those cited in the U.S. Commission on Ocean Policy's 2004 report. The trawl fishery is viewed by many 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 programmatic bycatch mitigation EIS. Through the bycatch mitigation program final EIS and draft Amendment 18, the Council has indicated its support for future use of IFQ programs to manage the non-tribal, commercial groundfish fisheries so that individual fishery participants have both more flexibility in how they choose to participate in the fishery and more accountability for how their individual actions affect the bycatch of overfished species in the groundfish fishery. The problem statement is as follows:

As a result of the legal requirement to minimize bycatch of overfished species, considerable harvest opportunity is being forgone in an economically stressed fishery. The trawl groundfish fishery is a multispecies fishery in which fishermen 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 co-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, there is discord between fishing fleets and mangers when there is disagreement about decisions on estimates of bycatch. Thus , in the current system there are uncertainties about the accuracy of bycatch estimation, few incentives for the individual to reduce personal bycatch rates, and an associated loss of economic opportunity related to the harvest of target species.

The current management regime is not responsive to a 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 fishermen 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 physically safe for the participants operating in the ocean environment.

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: minimizing 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.

Goals and Objectives

Goals

1. Increase regional and national net benefits including improvements in attainment of economic, social, and environmental objectives and attainment of fishery management objectives.
2. Achieve capacity rationalization through market forces and create an environment for decision making that can rapidly and efficiently adjust to changing conditions.

Objectives

1. Provide for a viable, profitable, and efficient groundfish fishery.
2. Minimize negative ecological impact while taking the available harvest.
3. Reduce bycatch and discard mortality.
4. Promote individual accountability and responsibility for catch (landed catch and discards).
5. Increase stability for business planning.
6. Increase operational flexibility.
7. Minimize adverse effects from IFQs on fishing communities.
8. Promote measurable economic and employment benefits through the seafood catching, processing, distribution elements, and support sectors of the industry.
9. Provide quality product for the consumer.
10. Increase safety in the fishery.

Constraints and Guiding Principles

1. Take into account the biological structure of the stocks including such factors as populations and genetics.
2. Take into account the need to ensure that the total OYs and ABC for the trawl and all other sectors are not exceeded.
3. Account for total groundfish mortality.
4. Avoid provisions where the primary intent is a change in marketing power balance between harvesting and processing sectors.
5. Avoid excessive quota concentration.
6. Provide efficient and effective monitoring and enforcement.
7. Design a responsive review evaluation and modification mechanism.
8. Take into account the management and administrative costs of implementing and overseeing the IFQ program and complementary catch monitoring programs and the limited state and federal resources available.

Alternatives

The following are the management regime alternatives that will be analyzed in an EIS:

Alternative 1: Status Quo
Alternative 2: IFQs for Trawl Target Species and Species for Which Allocations Exist
Alternative 3: IFQs for All Groundfish Except the "Other Fish" Category of Groundfish **With** Adjustments at Low Harvest Levels
Alternative 4: IFQs for All Groundfish Except the "Other Fish" Category of Groundfish **Without** Adjustments at Low Harvest Levels

Alternative 5: IFQs for All Groundfish
Alternative 6: IFQs for Overfished Species Only
Alternative 7: Permit Stacking (one cumulative limit for each permit associated with a vessel)

These management regime alternatives are described in Table 1. As part of the development of an IFQ program the Council will also need to resolve a number of allocation issues between segments of the trawl fishery and between the trawl and other groundfish fisheries. Within trawl allocation will be addressed as part of the IFQ EIS and allocation between the trawl and other fisheries will be addressed as part of an intersector allocation EIS. This intersector allocation EIS is needed to support the Council's bycatch mitigation policies and resolving intersector allocations will be of assistance in the biennial specifications process.

There are a great variety of provisions that might be included in any IFQ program. Three unique IFQ programs have been developed for Council consideration (noted in the first and last rows of Table 1 as Programs A, B, and C) and are described in Table 2. At the time of the Council's final decision provisions can be mixed and matched between alternatives as long as the alternatives remain internally consistent and within the scope of the analysis.

The following is a general description of the IFQ program elements which are contained in Appendix B of the Scoping Results Summary and illustrated in Figure 1.

Appendix B, Section B.1.0, Initial IFQ Allocation

Section B.1.1, Eligible Groups and Group Shares
IFQ would be allocated to the following groups in the following proportions: . . . **[e.g., groundfish trawl permit owners (xx%), groundfish trawl vessel owners (xx%), processors (xx%)**]. Processors would be defined as... [FMP definition/alternative definition].

Section B.1.2, Recent Participation
In order to qualify for an initial allocation the applicant would . . . **[have to/not have to] . . .** demonstrate recent participation. If recent participation is required, the recent participation requirement for each group would be as follows: make/receive at least . . . **[X deliveries – number of deliveries to be determined]** . . . of trawl caught groundfish from . . . **[1998-2003, or 2000-2003]**.

Section B.1.3, Allocation Formula
Those eligible for an initial allocation will be allocated quota shares based on the following formula:
[0-100%] of the quota share issued for the group would be issued based on history of catch/landings/processing;
[0-100%] of the quota share issued for the group would be issued based on equal sharing; and
[0-100%] of the quota share issued for the group would be allocated through an auction.
(Formula's may vary among groups)

Section B.1.4 and Section B.1.5, History: Species Groups and Periods
For IFQ allocated based on delivery history, the applicant's . . . **[total groundfish; total for each IFQ species or species group; or total for each species, species group, or proxy species]** . . . **[caught; landed; or processed]** . . . will be calculated for . . **[1994-2003; 1994-1999; 2000-2003; 1998-2003; or 1999-2004]** . . . , less . . . **[0; 1; 2; or 3]** . . . of the applicant's worst years. The calculation will be based on the applicant's . . . **[pounds; percent of total]** . . . for the relevant species/species group in each year.

Section B.1.6, History: Special Situations
Permit history for combined permits would include the history . . . **[for all the permits that have been combined; for the permit originally associated with the permit number of the combined permit]**. Illegal deliveries would not count toward history. Catch in excess of trip limits, as authorized under an EFP and compensation fish . . . **[would/would not]** . . . count toward history.

Section B.1.7, Appeals
There would be no appeals process on the initial issuance of IFQ, other than that provided by NMFS and consistent with the Administrative Procedures Act. Any proposed revisions to fishtickets would undergo review by state enforcement personnel prior to finalization of the revisions.

Section B.1.8, Creating New IFQ Species After Initial Implementation
When a management unit is subdivided, quota shares for that unit will be subdivided by issuing quota share holders' amounts of shares for the subdivisions equivalent to their holdings of the shares being subdivided. If a new management unit is established that is not a subset of an existing unit managed with IFQ, the Council will need to take action at that time to develop criteria for quota share allocation.

Appendix B, Section B.2.0, Holding Requirements, Annual Issuance, Transfer

Section B.2.1, IFQ and Limited Entry (LE) Permit Holding Requirements
In order to be used, IFQ representing quota pounds would need to be registered for use with a particular vessel (deposited to the vessel's quota pound account). Only LE trawl vessels would be allowed to participate in the IFQ fishery. A vessel would need to acquire quota pounds to cover the catch for a particular trip. . . **[by the time of landing; no more than 24 hours after landing; no more than 30 days after landing].** A vessel . . . **[would not need to hold quota pounds; would need to hold at least xxx quota pounds]** . . . before leaving port on a fishing trip. An LE permit may not be transferred from any vessel for which there is deficit in the vessel's quota pound account for any species or species group (i.e., if the vessel has caught IFQ species not covered by quota pounds). A vessel with a deficit in its quota pound account could not leave port.

Subsection B.2.2.2, Rollover (Carryover) of Quota Pounds to a Following Year
Each year quota pounds would be issued to quota share holders based on the amounts of quota shares they hold. For species that are not overfished, a vessel . . . **[would/would not]**. . . be able to roll-over . . . **[up to . . . 5%;10%; 20%; 30% . . . of its]** . . . unused quota pounds or cover an overage . . . **[of . . . 5%; 10%; 20%; 30%]** . . . with quota pounds from

the following year. For overfished species, . . . **[a full; a partial; no]** . . . rollover allowance would be provided.

Subsection B.2.2.3, Quota Share Use-or-Lose Provisions
Quota share use would be monitored as part of the TIQ program review process. **[Quota shares not used in at least one of three years would be revoked . . . OR . . . During program review processes, if it is determined that significant portions of the available quotas shares are not being used (catch is not being recorded against quota pounds issued for those shares), use-or-lose or other provisions will be considered to encourage more complete utilization]**.

Subsection B.2.2.4, Entry Level Opportunities for Acquiring Quota Shares and Low Interest Loan Options
There are many program features that would facilitate new entry and participation by small fishing operations (e.g., highly divisible access privileges as compared to limited entry licenses). Additional provisions for such purposes could include . . . **[none; a low interest loan program; provisions for new entrants to qualify for revoked shares being reissued (the latter two options are not mutually exclusive)]**.

Subsection B.2.2.5, Community Stabilization Quota
A percentage of the quota pounds each year . . . **[would/would not]** . . . be held back from that allocated to quota share holders **. . . [up to 25%; based on analysis].** The amount held back would be awarded to proposals from fishermen and processors working together to benefit the local community.

Section B.2.3, Transfer Rules
[Anyone eligible to own a US documented fishing vessel; Anyone eligible to own or operate a US documented fishing vessel; Stakeholders] . . . would be eligible to own or otherwise control IFQ (quota shares or quota pounds). Leasing . . . **[would/would not]** . . . be allowed. Quota pounds could be transferred any time during the year. Quota shares would be transferrable . . . **[any time during the year/only at the end of the year]**. There would be no limit on the divisibility of quota shares for purpose of transfer. Quota pounds could be transferred in as little as single pound units. Liens on IFQ are a matter of private contract and would not be specifically limited by this program. A central registry might be created as part of the program administration. There . . . **[would/would not]** . . . be accumulation limits on the amounts of quota shares or pounds owned, controlled, or used on a vessel. The definition of control may extend beyond ownership and leasing. The range of limits being considered **varies from 1% to 50% to no cap.** The limits may **vary by species, segment of the fleet, or type of entity (e.g., vessel owner, permit owner, processor).** Accumulation limits for groundfish in aggregate may also be different than limits for individual species or species group. There would be no direct limits on vertical integration.

Appendix B, Section B.3.0, Administration

Section B.3.1, Tracking, Monitoring, and Enforcement
Enforcement for the IFQ program may include one or more of the following elements:

- onboard compliance monitors;
- dockside compliance monitors (20%-100%);
- hailing requirements, small vessel exemptions for onboard compliance monitors;
- video monitoring systems;
- full retention requirements;
- a vessel-specific bycatch reporting system;
- electronic landings tracking system;
- limited delivery ports;
- limited delivery sites;
- electronic IFQ tracking systems; and
- vessel monitoring system.

These measures have been arrayed into the enforcement and monitoring programs provided in Table B.3-1 (Appendix B). While some likely specifics are identified to facilitate program design and impact analysis, the FMP amendment language on this issue may be general, specifying that the Secretary will promulgate regulations to establish an adequate monitoring and enforcement regime. Strong sanctions may be recommended along with provisions specifying that illegal overages be forfeited and debited against the vessel's account. A part of the program administration, a centralized publicly accessible registry for liens against quota shares would be requested with . . . **[all related ownership information/essential ownership information].**

Section B.3.2, Cost Recovery and Rent Sharing
Landings fees would be charged to cover program costs (up to Magnuson-Stevens Act (MSA) limits) and, over time, some elements of the program may be privatized, as appropriate.

Section B.3.3, Program Monitoring, Review and Revision
The IFQ program would not have a built-in sunset provision nor would quota shares be issued for fixed terms (i.e., IFQs would not expire after a certain number of years). The program would be revised as necessary through standard FMP and regulatory amendment processes. Information on certain aspects of program performance would be compiled annually and a program review would be conducted every 4 years.

Section B.3.4, Data Collection
The data collection program . . . **[would/would not]** . . . be augmented to include the . . . **[expanded and mandatory; expanded voluntary]** . . . provision of economic data from the harvesting and processing industry. All data collected would be maintained in a confidential manner. Aspects of these provisions would require modification of the MSA. A central registry of IFQ shareholders and transactions would be maintained and include market value information. Government costs would also be tracked.

Options indicated in this description have been arrayed into three IFQ programs (Table 2). Options not included in one of these programs will be discussed and analyzed to illustrate their merits relative to the options chosen. Table 3 isolates those program elements which distinguish the three IFQ programs from one another. Options for allocating catch among segments of the trawl fleet (e.g., shoreside and at-sea) will be based on the catch history of each segment of the fleet during the period used for the IFQ allocation.

Figure 1. Outline of the IFQ program design elements from Appendix B of the scoping results document.

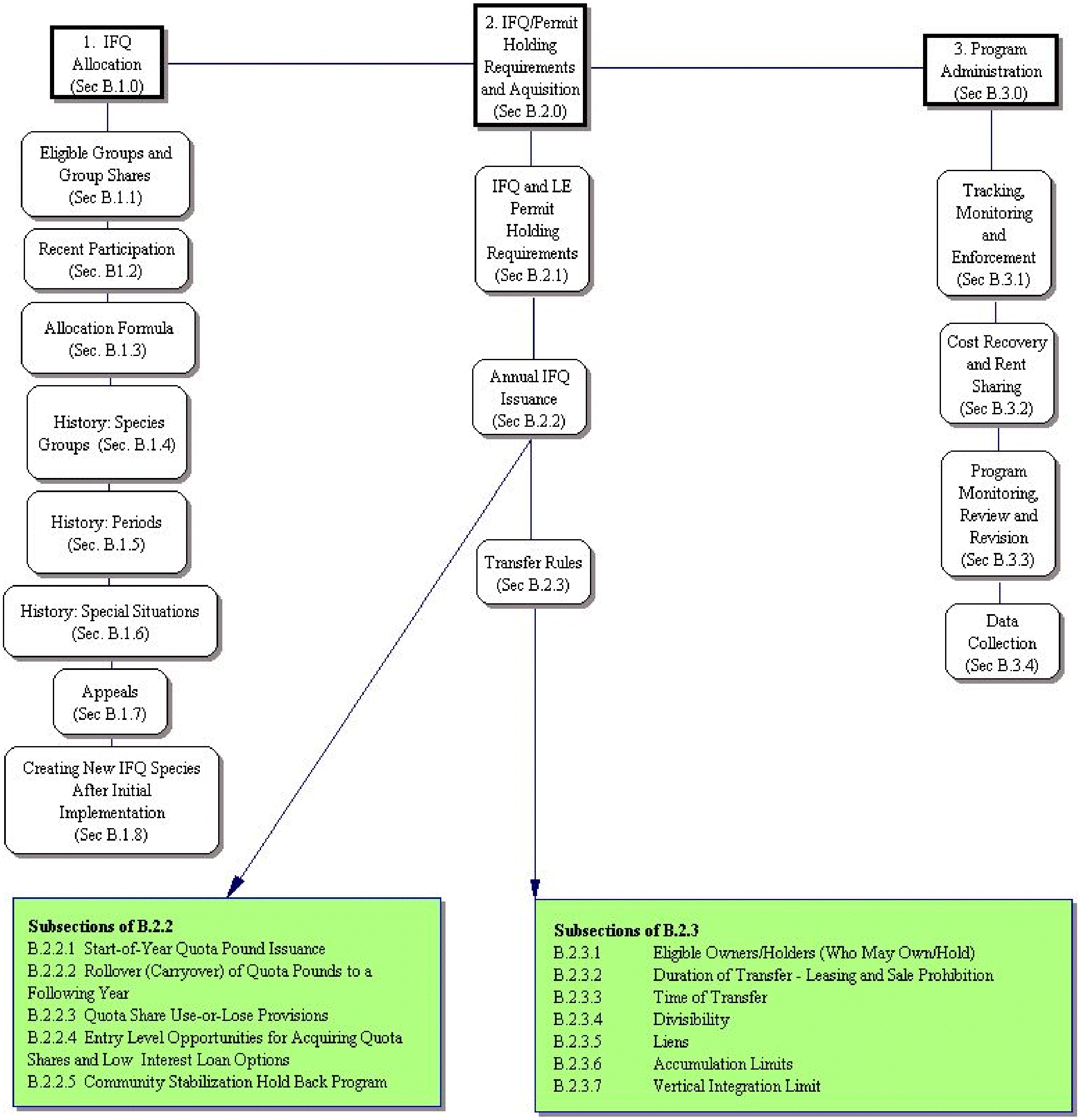

Table 1: Management regime alternatives for analysis, see end of table for Alternatives 5-7. (Page 1 of 3)

	Species Groups and Management Tools			
	Alt 1 - Status Quo	Alt 2 - IFQs for Trawl Target Groundfish	Alt 3 - IFQs for All Groundfish Except "Other Fish"[a/]	Alt 4 - IFQs for All Groundfish
IFQ Program				
IFQ Program to Be Applied (See Table 2)		Program C	Alternative 3A - Program A Alternative 3B - Program B Alternative 3C - Program C	Program C
NonWhiting Fishery Management Tools and Species (Sections 2.1.1.1 - 2.1.1.3 of the Scoping Results Document)				
Primary Management Tools	-	Manage with IFQ for target species and species for which there is a trawl allocation.	Mange with IFQ for all groundfish except the "Other Fish" category of groundfish and except in situations in which the OY for the species is very low (see below).	Manage with IFQ for all groundfish.[a/]
	Cumulative landing limits for almost all nonwhiting species/species groups.[b/]	Transferable cumulative catch limits for other groundfish species managed with cumulative landing limits under status quo.[c/]	-	-
	Monitoring only for other species.	Monitoring only for other species.	Monitoring only for other species.	-
Adjustments for Low Harvest Levels	The Council may suspend intersector allocations when a species is overfished.	Low OY Management: Same as status quo plus. For IFQ species, management does not change with low OYs. If the OY for a nonIFQ species becomes extremely low (such as for a rebuilding species) manage with nontransferable cumulative catch limits.[d/e/f/] Low OY Threshold: Establish a threshold at which point a species would switch from incidental catch management to "Low OY management." (e.g., $B_{25\%}$)	Low OY Management: Same as status quo plus. If the OY for any species becomes extremely low, switch from IFQs for that species and instead manage the sector allocation as a pool using nontransferable cumulative catch limits to control catch.[g/f/] Decide on whether or not to use "Low OY management" as part of the bienniel specifications process.	Same as status quo.

Table 1: Management regime alternatives for analysis, see end of table for Alternatives 5-7. (Page 2 of 3)

	Species Groups and Management Tools			
	Alt 1 - Status Quo	Alt 2 - IFQs for Trawl Target Groundfish	Alt 3 - IFQs for All Groundfish Except "Other Fish"[a/]	Alt 4 - IFQs for All Groundfish
	Whiting Fishery Management Tools and Species (Sections 2.1.1.1 - 2.1.1.3 of the Scoping Results Document)			
Primary Management Tools	No IFQ.	IFQ for whiting.	IFQ for whiting and all incidentally caught groundfish except the "Other Fish" category of groundfish.	IFQ for whiting and **all** incidentally caught groundfish species. [a/]
	Sector allocation with catch limited by season closure.	Possible continuation of seasons to control impacts on ESA listed salmon stocks.	Possible continuation of seasons to control impacts on ESA listed salmon stocks.	Possible continuation of seasons to control impacts on ESA listed salmon stocks.
	Possible season constraints to protect overfished species.	Sector catch caps for other incidentally caught nonwhiting groundfish species for which allocations have been established. No cumulative catch limits. Season closes when fleet catch cap is reached.	-	-
	Other species managed with monitoring only.	Monitoring only for other species.	Monitoring only for other species.	-
	Trawl Sectors and Intersector Transfers (Section 2.1.1.4 of the Scoping Results Document)			
Sectors	Three Sectors: • shoreside deliveries • mothership deliveries • catcher-processor deliveries	Four Sectors: • shoreside whiting deliveries • shoreside nonwhiting deliveries • mothership deliveries • catcher-processor deliveries (FROM 2.1.1.4 Option 3)	Three Sectors: • shoreside deliveries • mothership deliveries • catcher-processor deliveries (FROM 2.1.1.4 Option 2)	One Sector (FROM 2.1.1.4 Option 1)
Intersector Transfer/ Trading	***Whiting***: Sector allocations fixed by formula with procedure for midseason transfer of unused allocation. ***Nonwhiting species***: There is no inseason transfer of catch opportunity between trawl sectors except through Council inseason management.	***Whiting*** Option 1: IFQ nontransferable between trawl sectors. Option 2: IFQ nontransferable between trawl sectors with procedure for midseason rollover of unused IFQ to another sector. ***Nonwhiting species***: Sector catch cap roll-over: Roll-over any unused incidental catch from one whiting sector to the next as the year progresses.[h/] Allow purchase of nonwhiting species IFQ from the nonwhiting sector. Such IFQ would be placed in the pool for vessels operating in the whiting sector.	***Whiting*** IFQ nontransferable between trawl sectors. ***Nonwhiting species***: Do not allow transfer of nonwhiting IFQ from one trawl sector to another.	No subdivision of whiting sectors (there may or may not be a subdivision for purposes of initial allocation).

Table 1: Management regime alternatives for analysis, see end of table for Alternatives 5-7. (Page 3 of 3)

	Species Groups and Management Tools			
	Alt 1 - Status Quo	Alt 2 - IFQs for Trawl Target Groundfish	Alt 3 - IFQs for All Groundfish Except "Other Fish"[a/]	Alt 4 - IFQs for All Groundfish
Groundfish Catch of Limited Entry Trawl Vessels Using Gears Other Than Groundfish Trawl (Section 2.1.1.5 of the Scoping Results Document, Options are Relevant for IFQ Catch Control Only)				
Trawl Vessel Exempted Gear Quota Accounting and Catch Control (Includes Exempted Trawl and Exempted Nontrawl Gears)	**Exempted gear** catch by LE trawl vessels counts against LE allocation (trawl and fixed gear)[i/] but is subject to open access (OA) trip limits.	**Exempted gear** - IFQ is **not** required. Catch counts against the OA allocation and is managed as part of the OA fishery. Some catch will be allocated from the LE trawl to OA fishery. (FROM 2.1.1.5 Opt 2C)	**Exempted gear -** IFQ required. Catch counts against LE Trawl. Open access catch control regulations apply. (FROM 2.1.1.5 Option 1A)	**Exempted gear -** IFQ required. Catch counts against LE Trawl. Open access trip limits **do not** apply. (FROM 2.1.1.5 Option 1B)
Trawl Vessel Longline and Fish Pot Without LE Endorsement (Fixed Gear Gear Quota Accounting and Catch Control)	**Longline and fishpot** catch by LE trawl vessels counts against LE allocation (trawl and fixed gear)[i] but is subject to open access trip limits.	**Longline and fishpot** - IFQ required. Catch counts against LE Trawl. LE fixed gear catch control regulations apply. (FROM 2.1.1.5 Option 1A)	**Longline and fishpot** - IFQ required. Catch counts against LE Trawl. LE fixed catch control regulations **do not** apply. (FROM 2.1.1.5 Option 1B)	**Longline and fishpot** - IFQ required. Catch counts against LE Trawl. LE fixed catch control regulations **do not** apply. (FROM 2.1.1.5 Option 1B)

Alternative 5: **IFQ for All Groundfish Species** - same as Alternative 4 except provide IFQ for the "Other Fish" category of groundfish (uses IFQ Program C).

Alternative 6: **IFQ for Overfished Species Only** - same as Alternative 4, but provide IFQ only for overfished species (uses IFQ Program C).

Alternative 7: **Cumulative Catch Limits and Permit Stacking** - same as status quo except, change from cumulative landing limits to cumulative catch limits, allow vessels to take one cumulative limit for each permit stacked on the vessel. Only one of the permits associated with a vessel would need to have the appropriate length endorsements, additional trawl endorsed permits could be stacked without penalty or restriction related to the length endorsement. Stacking would be limited to a maximum of three permits. A monitoring and enforcement program would require 100% at-sea coverage with observers or with cameras and a full retention requirement. (Note: needed monitoring and enforcement provisions and other requirements for the IFQ program alternatives are provided in Table 2).

a/ "Other Fish" is a groundfish category that includes sharks, skates, rays, ratfish, morids, genadiers, kelp greenling, and Pacific cod.
b/ Currently only the "Other Fish" category is not covered by a cumulative limit for the trawl fishery.
c/ NonIFQ Species - Trawl share based on biennial Council decision. 1. Transferable cumulative catch limit between vessels within period (full or partial limit transfers, depending on length of limit period). 2. Any transfers between vessels are temporary.
d/ Eliminate the transferability of cumulative catch limits and implement season closure for the affected species on reaching the fleet limit for that species.
e/ Retention allowances within the catch limits may vary based on annual management measure decisions.
f/ Other measures to keep bycatch rates low may stay in place (e.g., Rockfish Conservation Areas).
g/ Implement season closure for the affected species on reaching the fleet limit for that species.
h/ There would not be a rollover from the nonwhiting to whiting sector.
i/ With the exception of sablefish for which there is a separate LE trawl allocation against which such catch is counted.

Table 2. IFQ program design alternatives, for analysis, (section and option numbers in parentheses refer to Appendix B of the Scoping Results Document). (Page 1 of 5)

	IFQ Program A	IFQ Program B	IFQ Program C
B.1.0 IFQ Allocation			
B.1.1 Eligible Groups	Allocate 50% of quota shares to current permit owners and 50% to processors (Option 3b).	Eligible Group Suboption B-1. Allocate 100% of quota shares to current permit owners (Option 1 from Appendix B). Eligible Group Suboption B-2. Allocate 100% of quota shares for nonwhiting species to current permit owners and 50% of the quota shares for whiting species to current permit owners. Allocate 50% of the quota shares for whiting species to processors. (New Option, June 2005) Eligible Group Suboption B-3. 90% of quota shares to current permit owners and 10% to processors (New Option, June 2005).	Allocate 75% of quota shares to current permit owners and 25% to processors (Option 3a).
Processor Definition:	Use special IFQ Program definition (processors: receive and process unprocessed fish; or catch and process) (Option 1).	Use FMP Definition (processors process unprocessed and already processed fish or receive live fish for resale) (Option 2).	Same as Program A.
B.1.2 Qualifying Criteria: Recent Participation	**Harvesters (including catcher-processors):** 1998-2003 participation required in order to qualify for an initial allocation of quota shares (number of trips or years to be specified) (Option 2). **For shoreside processors and motherships:** 1999-2004 recent participation requirement (number of trips or years to be specified). (Option 4).	All Members of Eligible Groups: No recent participation required in order to qualify for an initial allocation of quota shares (Option 1). OR All Members of Eligible Groups: 1998-2003 participation required (one trawl groundfish landing/delivery of any groundfish species) in order to qualify for an initial allocation of quota shares (Option 2).	Same as Program A.

Table 2. IFQ program design alternatives, for analysis, (section and option numbers in parentheses refer to Appendix B of the Scoping Results Document). (Page 2 of 5)

		IFQ Program A	IFQ Program B	IFQ Program C
B.1.3	**Elements of the Allocation "Formula"**			
	Vessel/Permit Related Allocation	Catcher vessel permit owners will receive quota shares based on their permit history plus an equal division of the quota that could be attributed to permit history of bought-back permits (catcher-processors permit owners will not receive a portion of the quota shares distributed on an equal sharing basis) (Option 2). Suboptions for incidentally caught overfished species, either: (a) same as for other species OR (b) equally divide quota for incidentally caught overfished species. For catcher-processors permit owners, use an allocation schedule developed by unanimous consent of that sector (to be provided).	Same as Program A, except no special catcher-processor schedule.	Same as Program A.
	Processor Allocation	Processors are allocated quota shares based entirely on the processing of groundfish trawl landings received unprocessed (Option 1).	No Allocation.	Same as Program A.
B.1.4	**History: Species/Species Groups to Be Used for Allocation**	Allocate Quota Shares Based on Individual Species/Species Groups: Allocate quota shares for each species/species group based on relative amounts of each respective species/species group caught/landed or processed - for permits applies to permit history; for processors applies to amounts processed (Option 2).	Same as Program A, except applies only to permit catch/landings history (i.e., there is no processor allocation).	Same as Program A.
B.1.5	**History: Allocation Periods**			
	Periods/Years to Drop:	**Vessels:** 1994-2003 Drop 2 years **for whiting sector fishing** (applies to incidental harvest and whiting). Drop 3 years **for nonwhiting sector fishing** (Option 1, Suboption B) **Shore Processors:** 1999-2004 Drop 2 years . (Option 5, Suboption B) **Motherships:** 1998-2003. No opportunity to drop worst year. (Option 4, Suboption A)	Same as Program A for vessels but no allocations for shore processors or motherships.	Same as Program A.
	Weighting Among Years:	Absolute pounds - no weighting between years (Suboption (i)).	Relative pounds (calculate history based on the entity's percent share of each year's total) (Suboption (ii)).	Same as Program B.

Table 2. IFQ program design alternatives, for analysis, (section and option numbers in parentheses refer to Appendix B of the Scoping Results Document). (Page 3 of 5)

		IFQ Program A	IFQ Program B	IFQ Program C
B.1.6	**History: Combined Permits and Other Exceptional Situations**			
	Combined permits:	All permits count. History of the permits combined into a single permit goes to the resulting permit (Option 1).	Same as Program A.	Same as Program A.
	Illegal landings/catch:	Don't count	Same as Program A.	Same as Program A.
	Landings in excess of trip limits, as authorized under an EFP:	Don't count landings in excess of the cumulative limit in place for the nonEFP fishery.	Same as Program A.	Same as Program A.
	Compensation fish:	Don't count.	Same as Program A.	Same as Program A.
B.1.7	**Initial Issuance Appeals Process**	Only one provision has been identified: Appeals would occur through processes developed by NMFS. NMFS will develop a proposal for an internal appeals process and bring it to the Council for consideration. Any proposed revisions to fishtickets would undergo review by state enforcement personnel prior to finalization of the revisions.		
B.1.8	***Creating New IFQ Species/Species Groups After initial Implementation***	Only one practical option has been identified: When a management unit is subdivided, quota shares for that unit will be subdivided by issuing quota share holders amounts of shares for the subdivisions equivalent to their holdings of the shares being subdivided. If a new management unit is established that is not a subset of an existing unit managed with IFQ, the Council will need to take action at that time to develop criteria for quota share allocation.		
B.2.0	**IFQ/Permit Holding Requirements and IFQ Acquisition (After Initial Allocation)**			
B.2.1	**IFQ and LE Permit Holding Requirements**	Catch must be covered with quota pounds within 30 days of the landing (Option 3). Only LE trawl vessels would be allowed to participate in the IFQ fishery. For any vessel with an overage (landings not covered by quota) there would be no more fishing by the vessel until the overage is covered. Additionally, for vessels with an overage, the limited entry permit cannot be sold or transferred until the deficit is cleared. A possible suboption would require some amount of quota pounds be held prior to departure from port (to be analyzed).	Same as Program A	Same as Program A
B.2.2	***Annual IFQ Issuance***			
B.2.2.1	***Start-of-Year Quota Pound Issuance***	Only one practical option has been identified: Quota pounds are issued annually to share holders based on the amount of quota shares they held. (Quota shares are issued at the time of initial IFQ allocation).		
B.2.2.2	***Rollover (Carryover) of Quota Pounds to a Following Year***			
	Nonoverfished	10% rollover for nonoverfished species (Option 3)	30% rollover for nonoverfished species (Option 5)	5% rollover for nonoverfished species (Option 2)
	Overfished	5% rollover for overfished species (Option 3)	Full (30%) rollover allowance for overfished species (Option 5)	No rollover allowance for overfished species (Option 2)

Table 2. IFQ program design alternatives, for analysis, (section and option numbers in parentheses refer to Appendix B of the Scoping Results Document). (Page 4 of 5)

		IFQ Program A	IFQ Program B	IFQ Program C
B.2.2.3	**Quota Share Use-or-Lose Provisions**	Do not include a use-or-lose provision but evaluate need as part of future program reviews (Option 3).	Same as Program A	Same as Program A
B.2.2.4	**Entry Level Opportunities for Acquiring Quota Shares and Low Interest Loan Options**	No special provisions.	No special provisions.	Provide new entrants an opportunity to qualify for revoked shares and shares lost due to non-use (if such non-use provisions are created) (Element 2)
B.2.2.5	**Community Stability Hold Back**	No special provisions.	No special provisions.	Set aside up to 25% of the nonwhiting shoreside trawl sector allocation each year and allocate that share as quota pounds for joint fishermen/processor venture proposals, ranked on the basis of objective criteria that evaluate benefits to local communities.
B.2.3	**Transfer Rules**			
B.2.3.1	**Eligible Owners/Holders (Who May Own/Hold)**	Any entity eligible to own or operate a US documented fishing vessel. (Option 2) TIQC intent: preserve opportunity for existing participants)	Same as Program A	Same as Program A
B.2.3.2	***Duration of Transfer - Leasing and Sale***	Permanent transfers and leasing of quota shares and quota pounds allowed. (Option 2)	Permanent quota share transfers only--leasing prohibited. Permanent transfers and leasing of quota pounds allowed. (Option 1)	Same as Program A
B.2.3.3	***Limits on Time of Transfer***	Allow transfers of quota shares any time during year (Option 1).	Prohibit transfer of quota shares during the last two months of the year.	Same as Program A
B.2.3.4	**Divisibility**	Only one practical option has been identified: Quota Shares: nearly unrestricted divisibility - “many decimal points." Quota Pounds: divisible to the single pound		
B.2.3.5	**Liens**	No options have been proposed to restrict liens. Liens can and should be facilitated through a central lien registry. Options for the central lien registry are covered in Section B.3.1.		
B.2.3.6	**Accumulation Limits**	50% or No Limits (Option 5).	Consider all limits as suboptions	Suboption: Most restrictive limits(1% or 5% Suboption: Intermediate level limits (10% or 25%)
B.2.3.7	**Vertical Integration Limit**	Only one option has been identified: No additional limits on vertical integration beyond those already provided through accumulation limits.		

Table 2. IFQ program design alternatives, for analysis, (section and option numbers in parentheses refer to Appendix B of the Scoping Results Document). (Page 5 of 5)

	IFQ Program A	IFQ Program B	IFQ Program C
B.3.0 Program Administration			
B.3.1 Tracking IFQ, Monitoring Landings, and Enforcement (see Table B.3-1)	Enforcement Program 2 100% at-sea monitors (observers) Discards allowed Upgraded bycatch reporting system needed Electronic landings tracking Shoreside monitoring opportunity Advance notice of landing Licenses for delivery sites Electronic IFQ reporting Unlimited landing hours VMS	Enforcement Program 1 100% at-sea monitors (observers) Full retention required No upgraded bycatch reporting system needed Electronic landings tracking 100% shoreside monitoring Advance notice of landing Limited ports of landing Electronic IFQ reporting Limited landing hours VMS	Enforcement Program 3 100% at-sea monitors (observers) or cameras Discards allowed if at-sea monitor is present (otherwise full retention) Upgraded bycatch reporting system needed Parallel federal electronic landings tracking Shoreside monitoring opportunity Advance notice of landing Licenses for delivery sites Electronic IFQ reporting Unlimited landing hours VMS
Quota Share Tracking	Create a central lien registry but exclude all but essential ownership information(Option 2).	Create a central lien registry including all related ownership information (Option 1).	Same as Program B.
B.3.2 Cost Recovery/Sharing and Rent Extraction	Cost recovery for management (not enforcement or science). Up to 3% of exvessel value, the limit specified in the Magnuson-Stevens Act.	Cost recovery for management (not enforcement or science). Up to 3% of exvessel value, the limit specified in the Magnuson-Stevens Act.	Full cost recovery: Landings fee plus privatization of elements of the management system. In particular, privatization for monitoring of IFQ landings (e.g., industry pays for their own compliance monitors). Stock assessments should not be privatized and the electronic fish ticket system should not be privatized.
B.3.3 Program Duration and Procedures for Program Performance Monitoring, Review, and Revision (Magnuson-Stevens Act (d)(5)(A))	A four year review process is specified along with review criteria. Among other factors, the review would include evaluation of whether or not there are localized depletion problems and whether or not quota shares are being utilized. Standard fishery management plan and regulatory amendment procedures will be used to modify the program.		
B.3.4 Data Collection	Expanded voluntary submission of economic data (Option 2).	Expanded mandatory submission of economic data (Option 1).	Expanded mandatory submission of economic data (Option 1).

Table 3. Comparison of provisions that vary among the IFQ programs.

Program A	Program B	Program C
Initial Allocation of Quota Shares, Section B.1.0		
Eligible Groups: 50% to current permit owners; 50% to processors.	*Eligible Group Suboption B-3:* 100% to current permit owners. *Eligible Group Suboption B-3:* Nonwhiting--100% to current permit owners. Whiting--50% to current permit owners; 50% to processors. *Eligible Group Suboption B-3:* 90% to current permit owners; 10% to processors.	*Eligible Groups:* 75% to current permit owners; 25% to processors.
Processor Definition: Use special IFQ Program definition (processors: receive and process unprocessed fish; or catch and process).	*Processor Definition:* Use FMP Definition (processors process unprocessed and already processed fish or receive live fish for resale).	*Processor Definition:* Same as Program B.
Recent Participation Periods: Harvesters, including catcher processors--1998-2003. Shoreside Processors and Motherships--1999-2004.	*Recent Participation Option B-1:* None. *Recent Participation Option B-2:* 1998-2003.	*Recent Participation Periods:* Same as Program A.
Weighting Among Years: Use pounds from each year to calculate catch history.	*Weighting Among Years:* Use percent of total pounds for the year to calculate catch history for each year.	*Weighting Among Years:* Same as Program B.
IFQ/Permit Holding Requirements and IFQ Acquisition, Section B.2.0		
Rollover to Following Year: 10% for nonoverfished species and 5% for overfished species.	*Rollover to Following Year:* 30% for nonoverfished species and 30% for overfished species.	*Rollover to Following Year:* 5% for nonoverfished species and none for overfished species.
New entrant provisions: No special provisions.	*New entrant provisions:* No special provisions.	*New entrant provisions:* Lottery for new entrants to acquire revoked shares.
Community Stability Holdback: None.	*Community Stability Holdback:* None.	*Community Stability Holdback:* up to 25%.
Leasing: Allowed.	*Leasing:* Prohibited.	*Leasing:* Allowed.
Transfer Period: Year round	*Transfer Period:* January-October	*Transfer Period:* Year round
Accumulation Limits: 50% or none.	*Accumulation Limits:* Consider all limits as suboptions.	*Accumulation Limit Suboption C-1:* 1% or 5% *Accumulation Limit Suboption C-2:* 10% or 25%
Program Administration, Section B.3.0		
Enforcement Program 2: 100% at-sea monitoring (observer), discards allowed. 100% shoreside monitoring. Upgraded bycatch reporting. Electronic state landings tracking system. Licenses required for delivery sites. Unlimited landing hours.	*Enforcement Program 1:* 100% at-sea monitoring (observer), full retention required. 100% shoreside monitoring. Electronic state landings tracking system. Limited ports of landing, no licenses required for delivery sites. Limited landing hours.	*Enforcement Program 3:* 100% at-sea monitoring (video or observer), discards allowed unless monitoring is with video cameras. Upgraded bycatch reporting. Federal electronic landings tracking system parallel to state system. Opportunity to monitor shoreside. Licenses required for delivery sites. Unlimited landing hours.
Central lien registry: Limited to necessary ownership information.	*Central lien registry:* With all ownership information.	*Central lien registry:* With all ownership information.
Cost Recovery: Up to 3%.	*Cost Recovery:* Up to 3%.	*Cost Recovery:* Full.
Data Collection: Expanded voluntary.	*Data Collection:* Expanded mandatory.	*Data Collection:* Expanded mandatory.

POTENTIAL OPTIONS FOR COMMUNITY INVOLVEMENT AND CONTROL OF COMMUNITY IMPACTS, DEVELOPED AS DIRECTED BY THE COUNCIL (JUNE, 2005)

As directed by the Council at its June 2005 meeting, the Analytical Team has developed options to address community concerns, in consultation with the Scientific and Statistical Committee. The Council's June 2005 National Environmental Policy Act (NEPA) scoping results document included various goals, objectives and constraints for the proposed groundfish trawl IQ program. Objective #7 specifically concerns communities and calls for "minimization of adverse effects from IFQs on fishing communities to the extent practical". Adverse effects can result from at least two features of IFQ management: 1) initial allocation of quota and 2) transferability of quota (NRC, 1999). Testimony presented to the NRC committee tasked with examination of individual fishing quotas, indicated that improving economic efficiency "can dramatically alter the characteristics of a fishery and can have significant social implications" including loss of employment and revenues (NRC, 1999). Other potentially adverse effects include a change in the power relationship between quota holders and crew that do not hold quota (McCay, 1995), changes in familial traditions and community perceptions (McCay, 1995), and change in the power relationship between processors and harvesters.

Based on a review of community involvement and impact control mechanisms in other individual quota programs (Appendix), three types of options have been identified that may address community concerns:

1. **Direct Allocations (Community Stability Holdbacks) (Table 1)**
   These options hold back a portion of the trawl allocation for uses designed to benefit communities.
   - Direct Allocation Option 1: the hold back would be allocated to fishermen/processor collaboratives which submit proposals designed to benefit communities. It resembles the B.C. Groundfish Development Quota program and a program submitted to Ch. 2 of the NEPA Scoping Results document on IFQs. The GDQ program is discussed in the Appendix.
   - Direct Allocation Option 2: the sets aside would be allocated to and managed for specific communities. It resembles some of the elements of the Alaska programs and discussed in the Appendix.
2. **Community Involvement[1] (Table 2)**
   The community involvement option provides formal representation for communities in the fishery policy process.
   This option resembles a committee established in the Shetland Islands and discussed in the Appendix.

[1] A general term describing various ways that representatives of coastal municipalities can provide input to the Council regarding the proposed individual fishing quota program.

Appendix

3. Community Impact Control[2] (Table 3)

The community impact control options are IFQ program design elements which provide direct or indirect control of impacts on communities.

Restrictions on Quota Share/Pounds Transferability, Landings and Catch

Option 1: Prohibit Quota Sales Temporarily
Option 2: Geographic Restriction on Transfer
- Option 2a: Absolute Restriction
- Option 2b: Right of First Refusal

Option 3: Area Of Landing/Catch Restrictions
- Option 3a: Area of Landing Restriction
- Option 3b: Area of Catch Restriction

Option 4: Limited Entry for Ports
Option 5: Partial Leasing Prohibition
Option 6: Owner-on-Board Requirement
- Option 6a: Owner-on-board for all of the quota
- Option 6b: Owner-on-board for 50% of the quota.
  - Suboption i: Prohibit ownership by entities other than individuals and nonprofit organizations representing communities,
  - Suboption ii: Allow the requirement to be met by the presence of any owners with at least a certain interest in the quota pounds being fished (e.g. 20%).

Redistribution to New Entrants

Option 7: Annual Revocation and Reissuance to New Entrants --
- Option 7a – By Lottery:
- Option 7b – By Equal Allocation

Option 8: Distribute Revoked Shares to New Entrants
Option 9: Increases in Allocation

NOTE: None of the options described here are mutually exclusive. For example, it would be possible to adopt both community stability holdback options.

The following tables outline options that can be incorporated into the IQ Alternatives chosen by the Council for analysis in June 2005. The options are intended to provide a range of programs and mechanisms that have been used by IQ fisheries around the world. Details on where and how these types of programs and mechanisms are used are included in the attached Appendix along with a table explaining the purpose of each general type of mechanism.

Included in the tables are recommendations on sections in which the new options should be placed, if accepted by the Council. These are initial recommendations and latitude should be provided to the drafters to make adjustments that may improve the logic of the organization, as they become apparent.

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[2] A general term describing various rules and regulations that directly or indirectly provide port districts and groups of fishermen economic, social, and cultural benefits.

Table 1. Community stability holdback options (renumber B.2.2.5 as B.4 and incorporate one or both of the following).		
	Community Stability Holdback Option 1	**Community Stability Holdback Option 2**
General Description	A portion of annual **quota pounds** held back and allocated to vertically integrated (fishermen/processor) collaborative ventures based on quantitative evaluation criteria which place priority on community benefits. The shares held back for this purpose will continue to be "trawl shares" and must be used in a manner consistent with the scope of the trawl individual quota program.	A portion of the **quota shares** allocated to nonprofit organizations representing port districts or other jurisdictions designated to act for fishing community interest. The port districts is the example used in this option and is intended to encompass both port and harbor districts.. The shares held back for this purpose will continue to be "trawl shares" and must be used in a manner consistent with the scope of the trawl individual quota program.
Holdback	Amount of the total annual* quota pounds allocated for the stability hold back: **Suboption A**: 20% **Suboption B:** 10% **Suboption C:** 5% **Suboption D:** 5% in year one, increasing by 5% percentage each year until the total set aside is 20%. * It may be determined that the optimal period for these allocations is greater than one year.	Amount of the trawl allocation allocated for the stability hold back: **Suboption A:** 20% **Suboption B:** 10% **Suboption C:** 5% **Suboption D:** 5% in year one, increasing by 5% percentage each year until the total set aside is 20% (each year in which there is an increase, quota shares held by others will be diminished by 5% to offset the 5% increase for the stability holdback).
Holdback Management Body[3]	**Council Committee** **Committee Authority and Appointment:** Magnuson-Stevens Act authority. Appointed by the Council. Recommendations would require approval by the Council before being forwarded to NMFS. **Committee Role:** Make recommendations to Council (based on specific measurable criteria) on allocation of a specific amount of quota pounds to vertically integrated collaboratives ("teams" of processors and fishermen[4]) for the purpose of achieving specific community development, enhancement, or stabilization goals. **Composition:** Representatives from West Coast regions, port districts, processors, and fishermen established under a Council operating procedure.	**Nonprofit Organization** **Nonprofit Organization Authority and Appointment:** Established under community based non-profit organizations. The non-profit organizations would be required to be approved by the port district. Only one non-profit from each qualifying port district would be eligible to apply for an allocation A single nonprofit could represent multiple port districts. NMFS would certify that these standards are met by any applicant for community quota. **Non-Profit Organizations Role:** Manage the community holdback quota allocated to the port district it represents. The non-profit organizations would contract with fishermen and make transfers of quota through the NMFS Limited Entry Office in a fashion similar to any other entity holding quota. Thus transfers would be subject to Federal rules restricting transfers, for example, accumulation limits. . These private contracts may specify a payment from the fishermen to

[3] A body (here, a committee or nonprofit organization) tasked with managing hold back quota either by providing allocation recommendations to the Council or distributing quota allocated to it by the Council/NMFS.
[4] A definition is needed for "fishermen." Is this to include some or all of the following: limited entry permit owners/lessees, vessel owners, licensed crew members, any crew members (WA does not require licenses for crew members), anyone holding quota shares?

Table 1. Community stability holdback options (renumber B.2.2.5 as B.4 and incorporate one or both of the following).		
	Community Stability Holdback Option 1	**Community Stability Holdback Option 2**
	Staffing and Administration: Option A: Committee reports to be developed for the committee by the staff of the NMFS Limited Entry Office and related expenses to be included as part of program costs to be covered by fees. Other staffing functions to be carried out by the Council. Option B: All staffing functions to be carried out by the Council.	the nonprofit or otherwise obligate and constrain how the fishermen choose to use or transfer the quota according to directions provided by the port district. **Composition:** Determined locally. **Staffing and Administration:** Local nonprofit organizations. Possibly operating on proceeds generated from the quota shares allocated to the organizations.
Eligibility for participation	Vertically integrated collaborations that submit proposals. A person (fisherman or processor) may only participate in one collaborative agreement.	Qualifying port districts: **Suboption A:** No restrictions **Suboption B:** With landings history > 0 during the period used for allocation of quota shares to limited entry permit holder (based on where landings are made) **Suboption C:** With landings history > 0 during the period used for allocation of quota shares to limited entry permit holder (based on permit holder residence[5])
Allocation Criteria	**Basis for allocating among collaborative agreement proposals.** A set of quantitative criteria will be developed that can be applied to objectively determine the amount of quota pounds to be allocated for each proposal received from a collaborative. A list of potential criteria some of which may or may not be included by the Council as part of the final list adopted, is provided in a footnote. [6] Comment will be	**Basis for initial distribution of community stability holdback among port districts.** Under each of these options, each qualified port district would be eligible to qualify for an allocation, even if represented by a nonprofit organization that also represents other port districts. **Suboption A:** Lottery[7] (Each qualified port district is eligible to enter

[5] Wherever the "residence" is used to specify an option, criteria will have to be established for determining residents, particularly for perons who may hold quota shares but have operations in multiple geographic locations. One option may be to use the address listed on Federal tax records.

[6] Example quantitative criteria to be used in objectively evaluating and weighting collaborative proposals.

Past Performance: Proportion of performance on past commitments for each criteria. (where applicable, does not apply to overfished species).

Utilization: Proportion of raw product to be converted to consumptive and non-consumptive human use (including meal and fertilizer) times past performance on utilization commitments. Indicator of wastage and potential pollution externalities.

Local Added Value: Fair market value of proposed exports from community divided by fair market value of exvessel landings. The allocation committee will determine a fair market value and apply the same per pound market values to all proposals. (Apply as a past performance measure if advance commitment to product forms is not tenable). For this criteria, scores of all proposals will be scaled proportionally such that a score of 1 will be assigned to the proposal with the greatest added value ratio.

Local Labor 1: Local employees divided by total individuals employed (FTE) by the firms that are parties to the collaborative agreement.

Local Labor 2: Total local wages to be paid per dollar fair market value of proposed exports or final products. Proportionally scale the scores of all proposals such that the proposal with the largest ratio is scaled to one.

Table 1. Community stability holdback options (renumber B.2.2.5 as B.4 and incorporate one or both of the following).		
	Community Stability Holdback Option 1	**Community Stability Holdback Option 2**
	solicited from the public on these and other criteria that should be used, if any. Each criteria will be scaled such that they are evenly weighted and values fall between 0 and 1 (or between 0 and 100). **Calculation of Allocation** Add scores for all criteria together to derive a single score for each proposal. Sum the scores for all proposals. The amount to be allocated to each collaborative proposal will be the score for that proposal divided by the sum of all scores times the total holdback for each species covered by the application.	a lottery for coastwide shares and those shares specific to their geographic area. Shares will be distributed in blocks. The number of blocks for each type of quota will be twice the number of lottery entrants and every entrant will have an equal chance of winning each block. **Suboption B:** Port district landings history – allocate based on port district landings history using the same period and number-of-years-to-be-counted used for the allocation of quota shares to permit owners (Section B.1.5). **Suboption C:** Equal allocation among qualified port districts. **Suboption D:** Auctions.? (not currently permissible under the MagnusonStevens Act). **Restriction on transfer of quota shares issued to communities.** Sub option: Community annual pounds can be distributed only to individuals and may not be distributed or transferred to other types of legal entities.
Transfers between communities	NA	Transferability of community quota between participating port districts **Suboption A:** No **Suboption B:** Yes
Accumulation	The additional quota shares acquired by a person through participation in a collaborative will, count toward accumulation caps.	The amount of quota shares controlled by any single port district may not exceed X% of the total quota shares of that type.

Amount of quota pounds committed to the project by the applicants. The exvessel fair market value of all pound committed (based on previous years prices) will be summed and divided by the fair exvessel value of all pounds committed by all proposals. For this criteria, scores of all proposals will be scaled proportionally such that a score of 1 will be assigned to the proposal with the greatest amount of pounds committed.
Public Debt Related to Fisheries Development: For the port in which the landings will be made, the amount of public debt directly related to investments supporting the fishing industry and relying on fishing activity for debt recovery divided by the total amount of debt identified in all such proposals and scaled proportionally such that a score of 1 is assigned to the proposals benefiting ports with the greatest fishing infrastructure related debts.
Public Investment Dedicated to Fisheries: For the port in which the landings will be made, the amount of public investments directly supporting the fishing industry divided by the total amount of such investments identified in all such proposals and scaled proportionally such that a score of 1 is assigned to the proposals benefiting ports with the greatest fishing industry related debts.
Port Dependence: Proportion of port revenue from activities of vessels, buyers, and processors divided by total port revenues. Proportion of revenues in all proposals will be adjusted proportionally such that the largest proportion of revenues receives a score of one..
Other Criteria: To be identified through public comment.

[7] If there are other reasonable allocation criteria that might be considered, such as recent or historic participation (Magnuson-Stevens Act, Section 303(b)(6)), a lottery might be considered contrary to the Magnuson-Stevens Act and arbitrary.

Table 1. Community stability holdback options (renumber B.2.2.5 as B.4 and incorporate one or both of the following).		
	Community Stability Holdback Option 1	**Community Stability Holdback Option 2**
Limits		**Suboptions:** 1%, 5%, 20%, 25% The additional quota shares aquired by a person through from a port district will count toward that person's accumulation caps.
Transferability Between Persons Receiving the Holdback Quota for Use	Quota pounds may be transferred as long as they stay within the same collaborative and are handled and landed in all manners originally specified in the collaborative proposal, with the exception of the change in the relative amounts landed by each collaborative participant.	**Suboption A**: Not transferable, pounds issued for community holdback quota shares must be returned to the port district holding the shares. They may not be transferred to another person. **Suboption B:** Transferable, but landings must be made in the port district holding the shares for which the pounds were issued. **Suboption C:** Transferable, but the person to whom a transfer is made must reside in the port district OR in the county(ies) containing the port district, OR within XX miles of the port district boundary (COUNCIL TO CHOOSE ONE) **Suboption D**. Transferable but the port district or its representative has the right to review any transfers of quota pounds outside its designated boundaries and has the right of first refusal (ROFR). Depending on how the program is established and structured the ROFR can be written within a leasing contract, handled by a committee of community members, or handled by the non-profit organization. **Suboption D.** Suboption B and Suboption C. **Suboption E:** Port districts individually determine the transfer restrictions that will bind those to whom their shares are distributed and specify those restrictions in private contracts. Other rules of the IFQ program will continue to apply (e.g. accumulation limits, limits on time of transfer, etc.)

Table 2. Community Involvement Option (incorporate in Section B.2.2 as part of the "Monitoring Program Performance" provisions)	
Community Advisory Committee[8]	The Council will convene a committee comprised of representatives from West Coast regions, port districts, processors, and fishermen. The committee would meet at Council discretion to make recommendations to the Council pertaining specifically to the proposed individual fishing quota program and its impacts to port districts, regions, processors and fishermen. [9]

Table 3. Community Impact Control Mechanism Options (not mutually exclusive)	
Existing Impact Control Mechanisms	It should be noted that some community impact control mechanisms have already been incorporated into the alternatives chosen for analysis, including the following: 1) *Allowing communities to hold quota (Section B.2.3.1)* ; 2) *Setting limits on quota accumulation (Section B.2.3.6); 3) Allocations of whiting and nonwhiting groundfish species for shoreside and at-sea delivery (Options 2 and 3 of Section 2.1.1.4).*
Quota Restrictions	**Option 1: Prohibit Quota Sales Temporarily** – Temporarily prohibit quota share transfer after initial allocation (In Section B.2.3.2, the Option 2 suboption would prohibit permanent transfers of quota shares during the first year of the program. The suboption will be discussed in the analysis but is not included as part of one of the three IFQ program alternatives adopted for analysis.) **Option 2: Geographic Restriction on Transfer** (Incorporate as an option(s) in new sections: B.1.9 and B.2.3.8)**.** **Option 2a: Absolute Restriction:** Place geographic restrictions on quota share and quota pound transfers (but not necessarily for overfished species). **Method for associating quota shares with a geographic area:** Any quota initially issued to the resident of a coastal county may only be transferred to other residents of that coastal county. Any quota initially issued to a Washington-Oregon-California resident who is not a resident of a coastal county may only be transferred to other residents of that state. Any quota initially issued to a resident of a state other than Washington, Oregon or California may be transferred to owners residing in any geographic locality. Geographic areas larger or smaller than coastal county may be considered (e.g. INPFC area boundaries) See footnote 5 regarding identification of residence. . **Option 2b: Right of First Refusal:** Geographic assignments will be made as in 2a, but transfers outside of an area may occur if the shares or pounds are first put up for sale to any entity within the designated geographic area, including nonprofit organizations representing the community (right of first refusal (ROFR)). **Option 3: Area Of Landing/Catch Restrictions** (Incorporate as an option(s) in Section 2.1.1 **--** **Option 3a:** The species and species groups for which quota shares are issued will be subdivided by area of landing (but not necessarily for overfished species). The initial area divisions for landings will correspond to INPFC area and existing regional management lines. The Council may make further modifications to the areas before or after initial implementation.) **Option 3b:** The species and species groups for which quota shares are issued will be subdivided by area of catch (but not necessarily for

[6] A committee not tasked with allocating quota.
[9] The committee might meet at least annually for the first four years of the program to discuss problems related to the IFQ program and make recommendations for adjustments to the program. After the first four years, the committee might meet at least once every four years to provide advice and comment on the four year program review.

	overfished species). The initial area divisions will be by INPFC area and existing regional management lines. The Council may make further modifications to the areas before or after initial implementation. **Option 4: Limited Entry for Ports–** Identify the current groundfish trawl ports and do not allow groundfish trawl landings to be made at other ports. Base the current list on those ports receiving groundfish caught with groundfish trawl gear by trawl limited entry vessels during the quota share allocation period. (Incorporte under a new section B.2.4, Restrictions on Use) **Option 5: Partial Leasing Prohibition --** Prohibit quota share owners from leasing more than 50% of their quota shares or pounds each year (for species other than overfished species). Exempt nonprofit organizations representing communities. (Incorporate as an option in Section B.2.3.2) **Option 6: Owner-on-Board Requirement** **Option 6a:** Require that the owner of quota shares used for a landing be onboard the vessel while it is fishing (for species other than overfished species). **Option 6b**: Require that the owners of at least 50% of the quota share used for a landing be onboard the vessel while it is fishing (for species other than overfished species). **For both options** • Provide a grandfather clause exempting initial recipients from this requirement. The grandfather clause would expire when ownership of the quota shares changes. For corporations, partnerships and other such entities a change would be deemed to occur with the addition of a new member to the ownership organization but not with the subtraction of an existing member. • Exempt nonprofit organizations representing communities. • For corporations partnerships and other such entities: Suboption i: Prohibit ownership by entities other than individuals and nonprofit organizations representing communities, Suboption ii: Allow the requirement to be met by the presence of any owners with at least a certain percent interest in the quota pounds being fished (e.g. 20%). (Incorporate Option 6 as part of Section B.2.1)
Redistribution to New Entrants	For purposes of these options, a new entrant is an individual or nonprofit community organization that has owned quota shares for less than a specified period of time (e.g. three years) and did not receive an initial allocation. In order to qualify for a redistribution, the new entrant must own some quota share and be a licensed crew member, vessel operator, vessel owner, or nonprofit organization or governing body representing a community. Crew members, and vessel operators must be able to demonstrate at-sea experience in the West Coast groundfish trawl fishery (for example, 3 months). Vessel owners may qualify only if all individual owners of the vessel are new entrants (e.g. all participants in a partnership or all with an ownership in a corporation owning a vessel. **Option 7: Annual Revocation and Reissuance to New Entrants --** Each year 5% of the total quota shares will be reissued to new entrants. Quota shares to be reissued will **Option 7a -- Lottery:** be divided into equal blocks of a number equal to . . . **[i twice; ii half] . . .** the number of new entrants and be distributed through a random lottery in which every participant has an opportunity to receive each block. After reissuance, blocks will be divisible, subject to the same restrictions as all other quota shares. Lottery shares may not be awarded that would result in a person exceeding its accumulation cap. **Option 7b -- Equal Allocation:** equally divided among all new entrants. (Incorporate Option 6 as part of Section B.2.2.4).

	Option 8: **Distribute Revoked Shares to New Entrants –** Distribute to new entrants quota reclaimed through forfeiture due to fishermen non-compliance available. Distribution will be through one of the methods listed under Option 7. (Already provided as a potential design element in the alternatives adopted for analysis, see Section B.2.2.4, Element 2). **Option 9: Increases in Allocation--**Set aside, for distribution to new entrants, increases in annual trawl allocation above that provided in the first year of the program, as described below. Allocation may change through a change in the OY or the intersector allocation rules. Distribution will be through one of the methods listed under Option 7. (Incorporate Option 9 as part of Section B.2.2.1 and 2.2.4) **Establishing Baseline Shares and Quota Pounds:** A baseline amount of quota pounds for each management unit will be established in the first year of the program, based on the trawl fishery's allocation in that year. The shares issued at the time of initial program implementation will be termed "base shares." Base shares will entitle the base share holder to quota pounds from the baseline amount. **Issuance of Expansions Shares:** Expansion shares will be issued in each year in which there is an increase in the trawl allocation above that which had occurred in any previous year, including the baseline year. Expansion shares will apply only to the amount of the allocation above the baseline amount. Expansion shares issued in different years will be equivalent to one another in terms of the amount of pounds issued annually for each expansion share.[10] The amount of pounds issued annually for each expansion share will likely vary from the amount issued for each baseline share. **All Variation Above the Baseline to Be Absorbed by Holders of Expansion Shares:** Once expansion shares have been issued, any decrease in the trawl allocation will be taken up entirely by the expansion shares, until the baseline amount is reached (pounds per expansion share equal zero). Contractions below the baseline amount will be absorbed proportionally by holders of the base shares. Expansion shares will not entitle the holder to quota pounds unless the trawl allocation is above the baseline amount. **All shares transferable.** After initial issuance, all shares will be transferable such that persons may acquire and hold both base shares and expansion shares.

[10] One method of achieving this end would be to issue one expansion share for each pound of increase.

Appendix: Community Involvement Programs and Community Impact Control Mechanisms Used in ITQ Systems

Introduction

In June 2005, the Council asked NMFS, in consultation with the SSC, to draft a range of appropriate alternatives that reflect community involvement in ITQ systems for Council consideration at the November 2005 meeting. This document summarizes the experiences of several fisheries that have incorporated community involvement and community impact control mechanisms into their IQ management programs. Section 1 of this document provides summary information on various community involvement and protection mechanisms. This list includes mechanisms discussed in the GAO's document, "Fishing Quotas: Methods for Community Protection and New Entry Require Periodic Evaluation" (2004). Section 2 provides more detailed information about several community involvement and protection mechanisms used by fisheries in British Columbia, Alaska, Shetland Islands and Iceland. Detailed information includes: a) a description of each fishery, b) the reasons for community involvement, c) the management structure that community involvement mechanisms are used under, and d) the design elements each fishery has implemented that affect communities. Information about the description of the fishery, reasons for community involvement and management structure under which the fishery is prosecuted is provided to give the reader some context regarding the environment in which the community involvement mechanisms operate. The variance in the amount of detail provided between different programs is a result of information availability. In general, this document does not discuss the impacts of the various community involvement and protection mechanisms. This task will be undertaken in the EIS.

Section #1: Summary of Community Involvement and Protection Mechanisms

This section presents summarized information about community involvement and protection mechanisms. The paragraphs below review the mechanisms for community involvement and protection identified through our own research presented in Section 2 and mechanisms identified by the GAO (2004) in their study "Methods for Community Protection and New Entry Require Periodic Evaluation" for community protection and new entry. Table 1 generalizes the community involvement and protection mechanisms summarized in this section, and divides them into various categories as a means of condensing a large amount of information.

Community Involvement

Several programs have been developed to allow communities, specifically, the option for involvement in the fisheries management decision-making process. They include:

- ❖ **Creation of non-profit organizations representing communities that require partnering with industry members to gain access to the fishing resource.** CDQ groups accepted proposals from the industry and selected proposals that met their common goals *(Western Alaska Community Development Quota Program).*

- **Creation of corporations that hold and then "lease" annual IFQ permit amounts to community residents** *(Gulf of Alaska Community Quota Share Purchase Program).*

- **Creation of non-profit organizations** with Board members that represent municipalities, regions, groups of fishermen, processors, and shoreworkers **that make recommendations regarding allocation of a portion of the TAC to partnerships of processors and harvesters. Allocation recommendations are based on objectives that provide some economic, social, or cultural benefit to communities** (*British Columbia GDA*).

- **Creation of organizations with individuals representing communities**, fishermen, processors, environmental groups, and fisheries scientists **that make recommendations on implementation of new fisheries management regulations and alteration to current fisheries management regulations** (*Shetland Islands SSMO*).

- **Creation of organizations representing communities and fishermen that obtain funds to purchase annual quota in order to make it available for communal use** by fishermen within a fishing organization and purchase of annual quota in order to make it available for communal use by new entrants (*Shetland Islands SFPO and SLAP program*).

Community Protection

Various mechanisms have been used to help protect: geographically located communities, groups of individuals (ex: new entrants, shoreworkers, and current harvesters), social and cultural amenities, diversity of fishing communities, support industries (ex; shipbuilders), and others from negative impacts of IQ implementation. These include:

- **Create rules regarding who is eligible to hold/trade quota** to protect certain groups of fishery participants. For example,

  - Allow crew members to own quota (*Alaska*)
  - Allow communities to hold quota (*Alaska*)
  - Restrict ownership of quota to individual vessel owners only

- **Prohibit quota sales permanently** to help prevent movement of quota out of communities (*Norway*).

- **Prohibit quota sales temporarily after initial allocation** to prevent premature sale and give fishermen time to make better informed decisions.

- **Place geographic restrictions on quota transfers or leases** to protect communities (*Alaska crab*).

- **Limit quota leasing** as a way to minimize the number of "absentee" quota holders. For example, prohibit quota holders from leasing more than 50 percent of their quota pounds each year (*Iceland*).

- **Set limits on quota accumulation** to ensure a certain minimum number of harvesters (*Alaska, Iceland, BC, others*).

- **Establish separate quota for different sectors of the fishery**.

- **Require quota holders to be on their vessels**. This inhibits speculative quota trading by those not invested in the fishery (*Alaska halibut*).

- **Restrict landings to particular ports** that there is an interest in protecting.

- **Facilitate quota access to new entrants.** Because it is often prohibitively expensive to enter an IQ fishery without an initial allocation, other fisheries have: a) implemented specific program design elements that enable and/or facilitate quota access to new entrants, b) set aside quota for new entrants specifically, and c) developed methods to distribute quota in order to facilitate entry post initial allocation (see below).

Specific program design elements that enable and/or facilitate quota access to new entrants include:

- Transferability of quota (i.e. allow quota to be bought/sold and leased); and
- Designation of blocks of small amounts of quota. Management agencies can place a cap on the number of blocks held. This enables smaller (and therefore less expensive) purchases of quota than might otherwise be available.

Some ways to access quota to set aside for new entrants include:

- Set aside a portion of the total quota specifically for new entrants;
- Buy or reclaim quota from existing quota holders (reclaimed quota could be obtained through forfeiture due to fishermen non-compliance);
- Issue quota for a fixed period of time and then roll it over for distribution to new entrants. An illustration of how this might work is provided in GAO (2004):

> *…a rollover system has been proposed for Australia's New South Wales fishery under which fishery managers would issue quota for a finite period of time (e.g., 30 years) under one set of program rules and, periodically (e.g., every 10 years), quota holders would have the opportunity to choose whether to continueto participate in the old system or move their quota into a new system with different rules for another 30 years.*

and

- Set aside increases in annual total quota for distribution to new entrants.

Some methods of distributing quota to new entrants include:

- Sell quota through an auction;
- Distribute quota by lottery; and
- Distribute quota to individuals who meet certain criteria (for example, some minimum amount of fishing experience)

As the value of quota increases, affordability of quota becomes an issue for new entrants. To make the quota more affordable, loans, grants and/or subsidies could also be used (GAO, 2004).

Table 1 generalizes the community involvement and protection mechanisms summarized in this section, and provides brief description and/or purpose information on each. Community involvement mechanisms are grouped into: “Organizations with quota allocation tasks” and “Organizations with no quota allocation tasks”. Community impact control mechanisms are listed without categorization.

Table 1. Generalized Community Involvement and Community impact control mechanisms (based on IFQ program descriptions).

Community Involvement Mechanisms	Description and Purpose
A. Mechanisms <u>with</u> quota allocation	
1. Community organizations that hold quota and lease annual quota to community residents	This type of program would provide community members access to quota that may be too expensive or inaccessible under normal conditions. A non-profit organization is established that represents specific communities and serves as an organizational element for purchasing quota and making the quota available to individuals within member communities. The organization may be responsible for returning benefits from leases to the community in the form of community development, or they may just provide the infrastructure required for individuals in communities to access quota shares. Reporting requirements to NMFS are likely to be required to track quota shares and any use caps or other unique community measures that may be included in a community program.
2. Organizations representing communities that "partner" with industry members to access fishing resources	This option may provide a bridge between communities without strong fishing infrastructures, but with a strong fishing culture to become more engaged in the fishery and benefit from the resource. Non-profit organizations can be established to help smaller communities whom are unlikely to have the infrastructure and resources to participate in a fishery off-shore. These organizations can serve as the link between industry members and these smaller communities. Communities may be allocated quota shares that the non-profit organization would manage and return revenue to the community. Industry members may enter into specific agreements with the non-profit organization to gain access to this designated community quota. Agreements would be required for the non-profit organization and its roles and responsibilities to its member communities and industry groups would yield some economic benefit to the communities in exchange for the access to the community quota share.
3. Organizations representing communities that allocate a portion of the total quota to various individuals that propose to benefit communities through use of the allocated quota.	This option creates a coastwide organization with Board members representing municipalities, regions, groups of fishermen, processors, and shoreworkers. Board members review proposals made by fishermen and processors to harvest a portion of the total quota the organization is responsible for making recommendations about. Allocation recommendations are based on predetermined objectives that provide some economic, social or cultural benefit to communities. A predetermined formula is used to rank the annual proposals.
B. Mechanisms <u>without</u> quota allocation responsibilities	
1. Organizations representing communities that make recommendations on implementation of new fisheries management regulations and alteration to current fisheries management regulations	The organization could make recommendations pertaining specifically to the proposed individual fishing quota program and its impacts to communities.
Community impact control mechanisms	**Description and Purpose**
1. Allow communities to hold quota	This enables communities to purchase quota for use by area residents.
2. Allow crew to hold quota	This would allow crew that meet designated criteria to hold quota. The quota may move between vessels with the crew member or be restricted to specific vessels within the crews' community of origin, essentially a regional restriction. Transferability may be limited to those who hold crew quota shares.
3. Allow only vessel owners to hold quota	This type of restriction typically seeks to prevent quota ownership for speculation purposes and large corporate ownership of quota. Vessel owners are likely to live in coastal communities.
4. Prohibit quota sales permanently	This restriction prevents concentration of quota ownership and slows geographic re-distribution of quota.
5. Prohibit quota sales temporarily after initial allocation	This restriction typically seeks to encourage quota owners to educate themselves about the value of the fishery and their quota under a new system. In this way, individuals can more carefully consider the impacts of their transfer decisions. This prevents immediate concentration of quota ownership and slows geographic re-distribution of quota. During this restriction on quota transferability, information about the future value of the fishery and quota may become evident. Typically, quota value increases over time following initial allocation as people's confidence in the system increases and the value of the asset becomes more apparent.

6. Area based management	While this mechanism is sometimes established based on biological characteristics of the stocks, it has been suggested that it could also be used to protect coastal communities from localized depletion of stocks off their coastline.
7. Place geographic restrictions on quota transfers	This restriction could designate quota to a particular region and deny transfer of quota between regions. This restriction may or may not be successful in controlling where landings occur but could help prevent permanent geographic relocation of large numbers of vessels.
8. Limit quota leasing	Limitation on quota leases could provide a way to minimize the number of "absentee" quota holders. For example, quota holders could be prohibited from leasing more than 50% of their quota pounds each year. If quota holders live in coastal communities, this mechanism can help ensure that the benefits they receive from IFQ ownership are shared with their local community.
9. Set limits on quota accumulation	This commonly used mechanism typically places upper limits or caps on ownership, use and sometimes control of quota. In this way, the fishery is assured of some minimum number of fishery participants, including communities and community members. Quota accumulation limits can help maintain dispersion of benefits geographically.
10. Establish separate quota pools for different sectors of the fishery	This mechanism established specific amounts of quota share to different groups of individuals. As long as transfers are not allowed to occur between quota pools, to some degree, re-distribution of quota can be controlled. This mechanism can help ensure a more widely dispersed distribution of benefits to coastal communities than might occur otherwise.
11. Require quota owners to fish their own quota	This aims to prevent "absentee ownership" or "armchair fisherman" and therefore in turn benefits coastal communities where the fishermen live.
12. Restrict landings to specific ports	This mechanism could be employed for both socioeconomic goals and enforcement feasibility. This mechanism helps ensure the economic viability of particular coastal communities.
13. Facilitate new entry by setting aside a portion of the total quota for new entrants only	This mechanism enhances future access to a limited system for those who may wish to enter post implementation. This mechanism may be useful if very little quota is expected to be available for purchase or lease. Quota distribution could occur through lottery or some other method. The amount of quota set aside for distribution could be taken "off the top" of the TAC, reclaimed through forfeiture of quota due to non-compliance or be a result of annual increases in the TAC. Using this mechanism to create additional participation options for fishermen without quota could benefit coastal communities if new entrants reside in those areas. This mechanism can also help ensure a wider geographic distribution of benefits than a situation where the set aside methods redistribute to current quota owners. The option might also make it more difficult for some to hold and not use quota over a long period of time (and, by not using, depriving fishing communities of the benefits of the fishery).
14. Designate blocks of small amounts of quota	Designation of a portion of the TAC as blocks of small amounts of quota enables smaller and therefore less expensive purchases of quota that might not otherwise be available. Restrictions on combining small blocks to create larger blocks can help keep small blocks available and more affordable. This can benefits small vessel operations and new entrants who live in coastal communities.
15. Issue quota for a fixed period of time and then roll it over for re-distribution to new entrants and current participants	This mechanism could provide enhanced opportunity for new entrants whom did not qualify or were not initially involved in the original allocation process to enter the program after the program is established. This mechanism could prevent consolidation and geographic concentration of quota. This mechanism could help distribute the benefits of the fishery more widely than might otherwise occur.

Note: Some of these community involvement and community impact control mechanisms listed here are already incorporated into the Alternatives identified by the PFMC for analysis.

Section #2: Specific Fishery Program Information

To review, the Council asked NMFS, in consultation with the SSC, to draft a range of appropriate alternatives that reflect community involvement in ITQ systems for Council consideration at the November 2005 meeting. Section #1 of this report presented a list of mechanisms used by various fisheries to involve and protect communities impacted by IQ programs. This section provides more detailed information about the community involvement and protection mechanisms included in Section #1. Each fishery summary includes: a) a description of each fishery, b) the reasons for community involvement, c) the management structure that community involvement mechanisms are used under, and d) the design elements each fishery has implemented that affect communities.

British Columbia Groundfish Trawl Fishery

Description of the Fishery

The British Columbia groundfish trawl fishery is a multispecies fishery that harvests over 25 species of fish in 55 different area quota allocations. Each year, 80 percent of the groundfish Total Allowable Catch (TAC) is allocated as Individual Vessel Quotas (IVQs) and 20 percent are set aside for allocation by the Minister of Fisheries, subject to advice given to him by the Groundfish Development Authority (GDA), an organization created for this purpose and discussed below. Two programs are facilitated by the GDA: the Groundfish Development Quota (GDQ) program and the Code of Conduct Quota (CCQ) program. The GDQ program in particular has objectives that seek to benefit communities.

Reasons for Community Involvement in the IVQ process

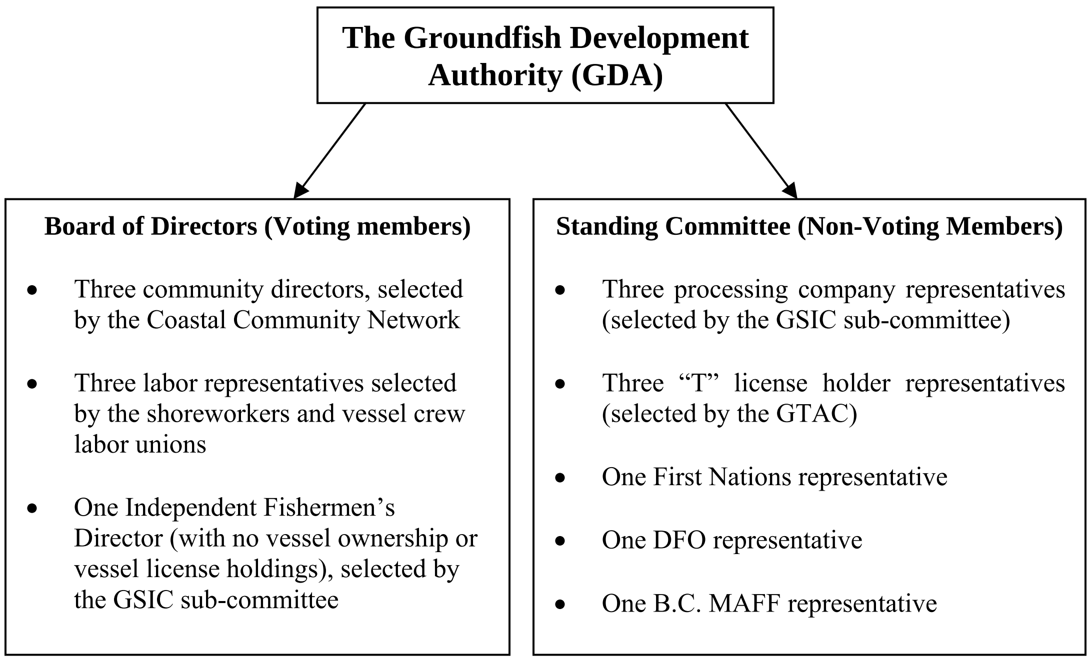
The GDA was established as a result of an agreement between the Department of Fisheries and Oceans (DFO), the B.C. Ministry of Agriculture, Fisheries and Food (MAFF) and the Coastal Community Network (CCN) and fishing industry participants. In their report regarding a review of the GDA in 2003, an industry committee summarizes the process by which the GDA was created following closure of the groundfish trawl fishery halfway through the 1995-96 season. Statements on key turning points include:

- *…As discussions on workable options became negotiations, it was clear that a new system which conferred 100 percent of quota to vessels was not acceptable to some of the interests formally represented in the process;*
- *The interests on the Groundfish Special Industry Committee who argued to implement a 100 percent IVQ system were not successful;*
- *A system whereby some portion of available quota would be owned/held/administered to non-vessel owners became inevitable – a range of options were discussed, including enterprise (processor) allocations, and community-owned quota;*
- *The compromise achieved was that non-vessel owning interests – specifically communities and unions representing both fishermen and shore-workers – would influence the allocation of 20 percent of available quota to vessels, through the GDA...*(GSIC, 2003).

Management Structure

The groundfish trawl fishery operates according to the Pacific Region Integrated Fisheries Management Plan. The Plan outlines the operation of the GDA. The Groundfish Development Authority (GDA), among other objectives, was created to allow for community involvement in management of the groundfish trawl fishery.
The Groundfish Development Authority (GDA) provides advice to the Minister of Fisheries on allocations of the Groundfish Development Quota (GDQ) and Code of Conduct Quota (CCQ). Seven members comprise the Board of Directors (voting members) and nine advisors sit on the Standing Committee (non-voting members that provide background information and expertise to the Board of Directors). Figure 1 provides more information about representation on the GDA.

Figure 1. Representatives comprising the GDA (GDA, 2005).



British Columbia’s Coastal Community Network referred to in Figure 1 was created as a representative council with a mandate to promote the economic and social well-being of West Coast communities and ensure local access to the natural resources that have sustained them for generations. Members of the Coastal Community Network are Regional Districts, Tribal Councils and other private and corporate members of the communities that border on B.C.’s tidal waters (CCN, 2005).

Code of Conduct Quota (CCQ)
The advice provided by the GDA with regards to CCQ is based on general principles, guidelines and an allocation procedure. The CCQ program was designed to ensure fair treatment of crew[11]

[11] “’Fair treatment of crew’ means that crew sharing arrangements will not be adversely affected by the introduction of an IVQ system. This includes, but is not limited to, the following: 1) crewmembers will not be asked to contribute to the cost of the vessel/T license’s IVQ allocation, 2) crewmembers will not be asked to contribute to the cost of

and safe vessel operation. It is intended to alleviate changes to crew shares that occur solely as a result of the introduction of an IVQ system and is not intended to enforce minimum standards or minimum crew shares on trawl licensees. Regarding allocation, at the beginning of each year, DFO assigns the CCQ to each licensed vessel based on the vessel's IVQ holding for that year. If a complaint is made to the GDA by a crewmember or other person, and found to be valid, a recommendation is made to the Minister of Fisheries and Oceans to withhold the quota. A confidential complaints procedure protects the crewmember bringing the complaint. A complaint can be made by a crewmember, a legal representative or a third party who believes that a crewmember has been unfairly treated or his safety compromised according to established guidelines. A complaints process directs the executive director of the Groundfish Development Authority on how to proceed. If CCQ principles are found to have been violated and resolution of the conflict cannot be achieved by any other means, the GDA Board may issue a letter of warning and/or recommendation to the Minister that all or part of the vessel's CCQ be withheld for the following season (GDA, 2005).

Groundfish Development Quota (GDQ)
The GDQ program distributes two hake allocations (10 percent of the TAC for Gulf and Offshore hake) and a groundfish allocation (10 percent of each quota species area group TAC). Under the GDQ program, the GDA receives proposals prepared by one or more processor(s) or buyer(s) and one or more licensed vessel owner(s). Each proposal must detail aspects of the operation of processors and vessels committing quota to the processors with regard to the GDA objectives. The GDA considers the benefits of each proposal and how well they contribute to the following objectives (details on the intent of each objective is included as a footnote):

1) Market Stabilization
    - The intent of this objective is to encourage market stability by eliminating the race for fish and allowing a more stable pace of landings throughout the year (GDA, 2005).
2) Maintain Existing Processing Capability
    - The intent of this objective is to recognize the importance of maintaining existing processing for reasons of jobs, tax investments, community infrastructure, etc. by mitigating against sudden wholesale change in location of processing while allowing for the evolution of a healthy processing sector (GDA, 2005).
3) Employment Stabilization in the Groundfish Industry
    - The intent of this objective is to ensure that the proponent's plans reflect the concept that an IQ fishery should generate more shoreworker stability by spreading landings out more uniformly over the entire year and by providing more certainty of plant operations. With respect to vessel crew employment, it was recognized that DFO licensing is the main engine that determines job security within the groundfish trawl industry, and that part of the rationale for an IQ fishery was to rationalize the fleet at a lower level. However, once that new level has been achieved, this objective looks at the stabilization of vessel crew employment (GDA, 2005).
4) Economic Development and Benefits in Coastal Communities

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replacing original allocated quota that is moved off the vessel/T license by the original owner (that is, the owner of the vessel/T license at April 1, 1997), 3) crewmembers will not be coerced into contributing to the leasing of additional IVQ, or any other non-traditional costs associated with the operation of the vessel" (GDA, 2005).

- The GSIC Sub-Committee defined coastal communities as all locations that rely, at least in part, on the fishing industry for their economic viability. To ensure that economic benefits generated by the groundfish and hake industries contribute to the economic viability and growth of all stakeholders including processing companies, vessel owners, shoreworkers, vessel crews and secondary service industries in coastal communities (GDA, 2005).

5) Increasing the Value of Groundfish Production
   - The intent of this objective is to ensure that the proponent is taking full advantage of the opportunities presented by an IVQ system to achieve the best possible rate of return for product through wise use of the resource (GDA, 2005).
6) Industry Training Opportunities
   - The intent of this objective is to ensure that workforces in the groundfish industry are properly trained to work safely and efficiently in order to fulfill the other objectives with respect to increased production value, market stability, and economic benefits (GDA, 2005).
7) Sustainable Fishing Practices
   - The intent of this objective is to encourage operators to utilize the highest percentage of their holdings out of the water in a manner that makes best use of all fish caught while adhering to recognized sustainable management practices designed to ensure long-term sustainability of the stocks (GDA, 2005).

Assessment Criteria have been developed and are included in the Groundfish Development Authority Operations Plan. The assessment criteria are used by the GDA to rank proposals. The criteria are directly related to the objectives of the program.

There is also a Proposal Allocation Formula and a License Allocation Formula. The Proposed Allocation Formula[12], which is applied to the data included in the GDQ proposals, is used to rank proposals. The factors used in the Proposal Allocation Formula include:

(1) verifiable production history over the past three seasons of the processing company/buyer or companies/buyers in the application (25 percent of the weight in the formula),
(2) the total amount of IVQ all vessels in the application commit to the plan (25 percent of the weight in the formula), and
(3) "a rating as determined by the GDA based on the GDA objectives, on the performance of the proponent in meeting his previous year's production goals and, in the case of new entrants or innovative new ideas, perceived merit of proposed production plans" (50 percent of the weight in the formula) (GDA, 2005; GSIC, 2003).

The License Allocation Formula[13] is used to determine the amount of quota an application receives.

Other characteristics of the program include:

[12] $GDQ_{Proposal} = \{[(3 \text{ year groundfish history} * \text{GDA Rating})/\sum (3 \text{ year groundfish history} * \text{GDA Rating})] + [(\text{IVQ Committed} * \text{GDA Rating})/(\sum (\text{IVQ committed} * \text{GDA Rating})]\}/(2 * GDQ)$

[13] $GDQ_{License} = GDQ_{Proposal} * (\text{IVQ Committed}_{License}/\text{IVQ Committed}_{Proposal})$

- GDQ are non-transferable.
- Each year, a flat submission fee is charged by the GDA for each proposal.
- An additional per pound[14] fee is charged to cover operational costs of the GDA. The fee is assessed based on a calculation of quota holdings. Failure to pay fees results in forfeiture of GDQ for that season.
- Guidelines and a Commitment Compliance Review Process have been established to help in determining catch delivery compliance or non-compliance.

Additional Design Elements that Affect Communities

Ownership and holdings (leasing) caps

Both species caps (4-10 percent depending on species) and individual vessel quota holdings caps (2 percent cap on total amount held by an individual license holder) exist in the B.C. groundfish fishery.

Transferability

GDQ and CCQ are not transferable.

Community held quota

Although only groundfish vessel owners holders are able to hold quota, vessel owners can hold GDQ, which are used for purposes of furthering community development goals.

New entrants program

The GDQ program allows for allocation of GDQ to new entrants. The formulas used by the GDA, however, disadvantage new entrants compared to those individuals with a history of quota holdings and prior use of GDQ.

Area based quota management

While area based quotas can potentially be used to help protect certain coastal areas, in the B.C. groundfish trawl fishery, area based quota were not used for this reason. Area based quota were developed based on stock geographic location.

Western Alaska Community Development Quota Program

Description of the Fishery

The Western Alaska Community Development Quota (CDQ) is a multi-species fishery for the Bering Sea and Aleutian Island (BSAI) region of Alaska. The Bering Sea is encompassed by Russia on the west, the Bering Strait to the north, the west coast of Alaska to the east and the Aleutian Islands to the south, encompassing an estimated 800,000 square kilometers. The unique character of the continental shelf yields a productive ecosystem. The multi-species fishery includes, but is not limited to pollock, sablefish, halibut, multi-species groundfish and crab. CDQ pollock allocations are 10 percent of the TAC, while 7.5 percent is allocated to CDQ for most multi-species and crab fisheries. The CDQ program is unique to this region of Alaska and has objectives to reach community development goals.

[14] Individual species pounds are converted to groundfish equivalent pounds (GFE) through a series of conversion ratios based on species-specific ex-vessel values.

Reasons for Community Involvement in the CDQ Process

The concept of the CDQ program was initially proposed during the mid- 1980's after the transition of the Bering Sea fisheries from foreign to domestic fisheries. Domestic fleets with larger vessels, inshore and offshore sectors and catcher-processor arrangements yielded great benefits to the domestic fishery. However, this domestic fishery was not heavily based in Alaska, rather many vessels hailed from Washington State. As a result, the Alaskan Native fishermen of rural western Alaska yielded no benefits from the fishery. These fishermen came from small villages that required economic support and development to gain any benefit from the surrounding fishery.

In 1990, approximately 25 percent of the populations of these small villages were living beneath the poverty line. The English language, housing, utilities and phones were all examples of modern day necessities that did not exist in these communities. Resulting impacts included poor health, poor sanitation, high rates of infectious diseases and low standards of living. Community development was required to stabilize these rural and remote communities.

By 1992, the North Pacific Fishery Management Council (NPFMC) finalized the regulations and procedures for the CDQ program which were then made permanent with the 1996 reauthorization of the Magnuson-Stevens Fishery Management and Conservation Act (MSFMCA). The creation of the CDQ program now provided an opportunity for the Alaskan Native communities to gain some source of economic income and participate in development programs.

Management Structure

The CDQ program has a complex management structure that can be separated into two general categories. One category includes the government structure, both federal and state governments, while the second category pertains to the CDQ groups.

Government Structure

NMFS and the Council

Initially the CDQ program was approved by the Secretary of Commerce for the BSAI Pollock fishery and was expanded with the 1996 revisions to the MSFCMA to include CDQs for groundfish and crab under Fishery Management Plans (FMP). Community eligibility criteria were established, CDQ groups, a CDQ Team, an application process and allocation process were all developed. Community criteria and CDQ groups will be addressed in the next section.

NMFS's role in the CDQ process includes ensuring the implementation of federal regulations, and providing final recommendations to the Secretary, who holds overall authority in the allocation process. Federal staff also participates in the monitoring of the program to include daily catch monitoring, debriefing of fishery observers, regulation writing and program review (Alaska 2003). NMFS is also responsible for reviewing, recommending and adjusting Community Development Plan (CDP) applications forwarded from the State of Alaska CDP process. These recommendations are provided to the Secretary of Commerce for final approval.

Allocations occur for all commercially valued species in the BSAI; however, the management of each species group varies slightly according to species. The NPFMC and NMFS manage the multi-species groundfish fishery in the BSAI. The commercial crab fisheries in the BSAI are primarily regulated by the Alaska Board of Fisheries, and the Alaska Department of Fish and Game (ADF&G) as designated by the Council (NRC 1999). The International Pacific Halibut Commission (IPHC) manages the commercial halibut fishery. Once the TACs are assigned and approved by the respective parties, the portion that is allocated to the CDQ program is then further broken down for distribution to the specific CDQ groups. The State of Alaska recommends the distribution of the allocation between the groups and the NMFS reviews the allocation recommendations and through the council process the allocations to specific CDQ groups are determined, with the final authorization made by the Secretary of Commerce.

NMFS is responsible for reviewing Community Development Plans (CDP) provided by the state to ensure that the plans meet all applicable requirements and have the required letter of support from member communities.

The State of Alaska

Daily administration of the CDQ program was delegated to the State of Alaska by the Secretary of Commerce. As a result of this responsibility, the state implemented regulations under Alaska State Code 6AAC 93. The State of Alaska is responsible for the review of CDQ proposals, provides allocation recommendations, and conducts ongoing monitoring of each CDQ group's performance. The Governor of Alaska designated a CDQ team comprised of representatives from multiple State of Alaska agencies (Alaska 2003). The CDQ team manages the CDP process, which is an application process for the CDQ groups entering the competitive process for CDQ allocation. The process includes applications, application evaluations, public hearings and final application review. The CDQ Team makes recommendations of applications to the Governor, who consults with the NPFMC, and sends any final findings and rationale to NMFS.

Community and Industry Structure

Communities

The communities in the CDQ program are typically small rural isolated villages. These communities in Western Alaska are some of the most economically depressed in the United States. The goals of the CDQ program are to provide capital generated from long-term commercial fishing activities to these fishing communities. To qualify for the CDQ program, community eligibility criteria were established as follows:

- Location within 50 nautical miles of the Bering Sea
- Native village, as defined by the Alaska Native Land Claims Settlement Act
- Residents conduct over 50 percent of their current commercial or subsistence fishing effort in the waters of the Bering Sea
- No previously developed harvesting or processing capacity sufficient to support substantial groundfish fisheries participation

During the implementation of the program, 56 communities were identified to qualify for the program. Over the years, additional communities were added to a current total of 65 communities involved in the program. Eligibility criteria for communities allow for communities to petition inclusion in the program if they were not initially selected for participation in the program. Approximately 9 communities were added through this process after the initial determinations of eligible communities.

Due to the economically depressed atmosphere of the communities, none of the communities had the resources to participate in the offshore commercial fisheries. As a result, industry partners with the resources were sought out and located in a process that established CDQ groups.

CDQ Groups
In the process of seeking organization of the CDQ eligible communities, management agencies held planning meetings and CDQ groups were essentially “self- determined” based on cultural boundaries and regional similarities (Alaska 2003). Each CDQ group represents multiple communities within its regional area. The CDQ groups are non-profit organizations and each group has a Board of Directors. The Board is composed of at least one representative from each CDQ community represented in a particular CDQ group, and state regulations require that at minimum three-quarters of the board is comprised of commercial or subsistence fishermen.

CDQ groups required partnering with the industry members to gain access to the fishing resources. CDQ groups accepted proposals from the industry and selected proposals that met their common goals. An arrangement of royalty payments from the industry to the CDQ groups, for use of the CDQ allocation for each group was determined. The funding from the royalty payments is then used by the CDQ group to meet community development goals. Examples of goals include but are not limited to: the development of port and harbor facilities, business planning services, boat and gear revolving loan programs, training and educational scholarships.

CDQ groups must prepare a CDP during the states application period in order to competitively be considered for CDQ allocation.

Design Elements that Affect Communities

Eligibility Criteria
The eligibility criteria discussed above limits participation in the program to targeted small, rural and economically depressed communities.

CDQ Allocation
Allocations for the CDQ program are specific to the affected communities and their represented groups. The CDQ program is allocated 10 percent of Pollock, 7.5 percent of crab and all other groundfish species, 20 percent if sablefish, and 20-100 percent of halibut (varied on halibut management areas) TACs in the BSAI.

Transferability
Communities may transfer quota with other CDQ groups, but cannot transfer quota outside the CDQ program. Requirements are outlined within the federal regulations.

Community Development

CDQ groups must invest in activities and investments that contribute to the development of their member communities, and a large percentage of those activities are targeted fisheries-related projects.

Community Representation
Requirements to include representatives from each community on the board of directors for the relevant CDQ group may be considered as community representation in the CDQ group planning process. Resources from the use of the CDQ allocations are required to be directed to the representative communities.

Gulf of Alaska Community Quota Share Purchase Program

Description of Fishery
The Gulf of Alaska (GOA) halibut and sablefish fisheries moved from a limited access management system to an IFQ program with quota shares in 1995. Consolidation under the IFQ program resulting in economic hardship for small communities led to the development of the Community Quota Share (QS) Purchase Program, which became effective in June 2004. The intention of the QS program is to provide an option for eligible GOA communities to purchase halibut and sablefish QS.

Reasons for Community Involvement in the QS program
Consolidation of IFQ QS in larger communities along with the poor prices for salmon resulted in declining access to IFQ QS for smaller communities. Leaders of these smaller communities organized themselves into the Gulf of Alaska Coastal Communities Coalition (GOACCC), whose purpose was to advocate for a solution to the access problem for smaller coastal communities. Their efforts were successful with the development of the Community QS Purchase Program.

Management Structure
The program was approved by the NPFMC in April of 2002 and became effective in June of 2004. Eligibility criteria were established, and the Final Rule directs the development of non-profit organizations to act on behalf of eligible communities. These non-profit organizations are referred to as Community Quota Entities (CQE), and may represent more than one community.

NMFS and the Council
The NPFMC initially identified a list of 42 qualified communities. Any additional communities that wish to apply for qualification for the program must seek NPFMC action and approval from the Secretary of Commerce.

NMFS reviews applications from CQE’s requesting eligibility to participate in the program. NMFS provides the State of Alaska with copies of the applications. The State has 30 days to provide comments, which NMFS will consider before certifying a CQE. Once CQE’s are established, NMFS reviews annual reports required from the CQEs and takes any corrective action if reports are not filed.

Communities

Communities that are targeted to participate in this program are usually small rural communities that may have lost access to diverse fisheries with the consolidation of the QS in the IFQ program. In order to qualify as a community under this program, eligibility criteria are as follows:

- Population of less than 1500 persons based on the 2000 United States Census
- Have direct saltwater access
- Lack direct road access to communities with a population greater than 1500 persons
- Have historic participation in the halibut and sablefish fisheries
- Be specifically designated by the NPFMC.

Initially 42 communities were identified and designated in the Final Rule (69 FR 23681, April 30, 2004). Designation of additional qualified communities requires action by the NPFMC and the Secretary of Commerce. Communities that were not initially identified through the Council process as eligible communities can seek qualification through the council process. All communities are represented by a CQE, but may not be represented by more than one CQE.

Community Quota Entities

CQEs must apply to NMFS for certification to participate in the GOA QS program. Once certified as a CQE, they hold and then "lease" annual IFQ permit amounts to community residents (Smith 2004). CQE's are new corporations that were organized after April of 2002, are organized under Alaska State Law, and have the support of one or more eligible communities. Regulations identify how support must be obtained and how support varies between tribal governments, city councils, municipalities and communities too small to have these governmental structures.

Once the CQE qualifies for the program, it is issued a Transfer Eligibility Certificate, and obtains its QS through transfer. The CQE then leases the QS to individual permanent community residents to fish. The CQE can obtain new QS and transfer QS within the regulatory restrictions for transfer and QS caps.

The CQE is responsible for submitting annual reports to NMFS. The reports contain information detailing the use of the QS by its member communities and individuals from communities. If an annual report is not submitted, the CQE will be suspended from holding QS until the report is submitted and reviewed by NMFS. The CQE is responsible for remaining in compliance with the CQE program regulations, and is subject to participation barriers if non-compliance is determined.

Individuals

Regulations indicate criteria for individuals who are eligible to lease quota from a CQE. An eligible individual must be a permanent resident of the community the CQE is representing. The individual must have maintained a domicile in the represented community for a minimum of 12 months prior to applying for QS.

An individual who leases QS from a CQE may not designate a skipper to fish the community IFQ; the QS must be fished by the designated individual. Individuals who hold leases of IFQ from CQEs are considered IFQ permit holders and are subject to the same regulations as the aforementioned group.

In addition to permanent residents, IFQ crew members who have demonstrated at least 150 days fishing experience or whom have received QS by initial issuance may also be eligible to receive CQE QS.

Design Elements that Affect Communities

Use Caps for Individual Communities
Caps for holdings under the Community QS Purchase Program are the same as those for individuals under the existing program and are identified in the respective federal regulations. Examples of use caps include 0.5 percent of all GOA halibut QS, 1 percent of all sablefish QS, and 1 percent of SE sablefish QS.

Cumulative Use Caps for All Communities
Cumulative caps limit the total amount of holding for all participant communities within the Community QS Purchase Program. Caps were determined for the first seven years of the program starting with a limit of 3 percent for the first year increasing by 3 percent each consecutive year up to 21 percent during the seventh year. These cap amounts are subject to review during the program review process by the Council. These caps apply to both halibut and sablefish.

Block Limits
Block limits of QS were established in the initial IFQ program to prevent consolidation of blocked QS and allow for smaller less expensive blocked QS to remain on the market. The regulations for blocked QS apply to the community allocations as well. Block limits are set at 10 blocks of halibut and 5 blocks of sablefish in any one management area. In addition, CQE's are prohibited from purchasing or transferring small QS blocks that may be "swept up" to form larger blocks. Specific limits per specific areas are identified in the federal regulations.

Bering Sea and Aleutian Island (BSAI) Crab Rationalization Program

Description of Fishery
The BSAI crab fisheries are managed under the Bering Sea and Aleutian Islands King and Tanner Crab FMP. Specific species identified in Final Rule (70 FR 10174, March 2, 2005) are included in the Crab Rationalization program and no longer require a License Limitation Program (LLP) license from the previous management structure. The Final Rule identifies several crab fisheries that are excluded from the Crab Rationalization Program and still require LLP permits. The program issues quota share (QS) allocations, processor quota share (PQS) allocation, IFQ, individual processor quota (IPQ), crew QS, has structure for harvesting cooperatives, CDQ allocations and provides options for community protection measures.

Reasons for Community Involvement in the Fishery
The Crab Rationalization Program aims to remove excess capacity, diminish the race for fish and increase safety. The program provides for revitalization of the economic benefits of the crab

fisheries, provides for conservation to increase the efficacy of crab rebuilding strategies and measures of the program aim to limit geographic shifts of fishing resources outside communities. Small entities and communities in the program will have an opportunity to stabilize their economic benefit and gain more consistent returns from the fishery.

Management Structure

The program was approved by the NPFMC in April of 2003 and became effective on April 1, 2005. Community purchase provisions and community protection measures were included in the development of the program. Eligibility criteria were established, and the Final Rule provides for the development of non-profit organizations to purchase shares on behalf of eligible communities. These non-profit organizations are referred to as Eligible Crab Communities Organizations (ECCOs).

NMFS and the Council

NMFS has played a large role in the implementation of the program. The application process was handled completely by NMFS, which included notification of application periods, tracking of applications, processing challenges to initial quota share allocations based on historical catch and public outreach activities. NMFS has developed a computer system to track most activity for the program to include transfers, caps, fees and quota issuance. Annually, the agency issues quota shares for program participants whom have met and continue to meet program eligibility requirements throughout the year. NMFS also approves all transfer requests. A transfer does not become effective without being processed through NMFS, manage the landings reporting system, collect cost recovery fees and support enforcement efforts.

Eligible Crab Communities and EEC Organizations

Eligible Crab Communities (EECs) can qualify to purchase quota shares and utilize community protection measures if they have at least 3 percent of the initial PQS allocation of any BSAI crab fishery. It was determined that nine communities qualified, however, some differences between the communities led to some specific program elements to be waived or applied uniquely to some communities[15]. ECCOs are responsible for purchasing quota share and leasing the IFQ to community members. They must submit an annual report to NMFS and meet designated performance standards. ECCOs are not restricted in their use of revenues from the leasing of programs.

Design Elements that Affect Communities[16]

CDQ Allocations

Allocations of the TAC for program crab fisheries to CDQ groups have been increased from 7.5 percent to 10 percent. In addition to allocation increases, the CDQ program was expanded to

[15] Examples of unique considerations may be seen in Adak. Adak has a special allocation of Aleutian golden king crab TAC, an ROFT is not required due to direct allocations, and allocation under the rationalization program must be utilized for development in Adak.

[16] Please note that the Crab Rationalization program has many types of QS that may be held by crew, processors, cooperatives etc. While QS held by these type of QS holders may have impacts on a community, for the purpose of this paper we have only identified the design elements that are directly designed for communities.

include two crab fisheries the Eastern Aleutian Islands golden king crab fishery and the Western Aleutian Islands red king crab fishery. CDQ groups are eligible to obtain crab QS and PQS by transfer, but are still subject to use caps.

Regionalization
Regional delivery requirements for QS are intended to preserve the historic geographic distribution of landing in the fisheries. Specific QS is regionally designated and crab harvested with regionally designated IFQ will be required to be delivered to a processor in the designated region. In addition, a processor with regionally designated IPQ is required to accept delivery of and process crab in the designated region.

Community Protection Measures
Various community protection measures were established to minimize adverse impacts of the program on communities. To qualify for these protection measures, communities must have had 3 percent or more of the initial PQS allocation of qualified landings in any crab fishery included in the program. Nine Eligible Crab Communities (ECCs) were determined. The community protection measures are a "Cooling Off" Period, Right of First Refusal (ROFR) and QS purchase.

"Cooling Off" Period
Until July 1, 2007, PQS and IPQ based on processing history earned in an EEC generally cannot be transferred from that community. The use of IPQ outside the community during this period is limited to 20 percent of the IPQ each year, except for specific hardship provisions. This protection measure should limit geographic distribution of QS outside communities in the initial years of the rationalization program.

Right of First Refusal (ROFR)
Before the issuance of PQS by NMFS, an EEC may establish a contract with that PQS holder which guarantees the EEC first rights to any PQS proposed for sale for use outside that community. EECs will have a ROFR on the transfer of PQS and IPQ originating from processing history in the community if the transfer will result in relocation or use of the shares outside the community. Specifications of a ROFR may vary by EEC community based on the characteristics of the community. For example, Adak is not eligible for ROFR provision because the community is to receive a direct allocation, and Kodiak must have a ROFR from communities in the GOA in a specific latitude range.

Community QS Purchase
Any non-CDQ community in which 3 percent or more of any crab fishery was processed, an EEC, can form a non-profit organization referred to as an eligible crab community organization (ECCO). The ECCO can purchase QS and lease the IFQ to community residents, and is limited to the amount of QS and IFQ it can use. The ECCO is required to submit an annual report to NMFS.

Sea Time Waiver
Sea time eligibility requirements for the purchase of QS are waived for CDQ groups and community entities in EECs, allowing those communities to build and maintain local interests in

harvesting. CDQ groups and EECs are eligible to purchase PQS but are not permitted to purchase Crew QS.

Shetland Islands Fisheries

Description of the Fishery

The Shetland Islands economy is heavily dependent on fishing, and alternative employment opportunities are limited. Almost a quarter of the workforce in Shetland Islands is employed in the seafood industry and over 80 percent of all exports consist of fish and fish products. A fleet of about 150 boats fish for groundfish (cod, haddock, monkfish, whiting and saithe), herring, mackerel, blue whiting, sand eels and shellfish (lobster, crab, scallops and whelks) (Goodlad, 1999).

Reasons for Community Involvement in the Fishery

As the cost of acquiring quota increased, concern developed that "a fisheries dependent community such as Shetland could see its quota traded out of the islands and thereby lose its marine resource base for the future. It was this fear that drove the Shetland Producer Organization to investigate the innovation of community owned fish quotas" (Goodlad, 2004).

In the shellfish fisheries, the lack of effective regulation in the Shetland shellfish fishery had resulted in overexploitation, stock decline and subsequent decrease in earnings. In the case of the shellfish fishery, the Shetland Fishermen's Association (SFA), a representative organization of Shetland fishermen, advocated for a fundamental change in the way shellfish stocks are managed. They sought a regional approach to regulation of the shellfish fishery through introduction of new legislation, without success. Eventually, the SFA employed existing legislation in the form of a Regulating Order to enable community based management. A Regulating Order "enables a fishery to be managed by an organization set up for the purpose of conserving the stock and improving the fishery" (Goodlad, 2004).

Management Structure

UK fisheries, of which the Shetland Islands are a part, are managed through distribution of annual quota to producer organizations (POs) and fortnightly or monthly quota to individuals. Distribution of quota to POs is called sectoral quota management while distribution of quota to individuals is called non-sectoral management. In the Shetland Islands, the Shetland Fish Producers Organization Ltd (SFPO) used a Government program to purchase fish quota in association with the decommissioning of vessels/licenses. The purpose of the effort was to hold the quota in common ownership for all vessels to use. The local government of Shetland, called the Shetland Islands Council (SIC) also invested in quotas in order to secure a pool of community held quota. The SFPO holds this quota for the SIC. The two quota pools amount to 37 percent held in community ownership.

Efforts by two fishing industry organizations in the Shetland Islands, the Shetland Fish Producers Organization Ltd (SFPO) and the Shetland Fishermen's Association (SFO), have resulted in two separate vehicles for community involvement in management of the marine resource. Efforts by the SFPO resulted in a significant amount of community ownership of groundfish quota while efforts by the SFO resulted in community based management of Shetland's shellfish fisheries. Both methods for community involvement are explained below.

The Shetland Fish Producers Organization Ltd and the New Entrants Program
The SFPO purchased pool of quota, described above, is used to supplement its members' and future generations' quota allocations. Due to the increased cost of entry into the Shetland Islands fisheries by new entrants, the other quota pool is used to help new entrants establish themselves in the industry. The new entrants lease quota by paying a portion of their earnings to the SFPO. In this way, the new entrants are able to fish without buying quota[17].

The Shetland Fishermen's Association and Community Shellfish Fisheries Management
In the case of the Shetland shellfish fisheries, the Shetland Fishermen's Association (SFA) helped to establish a management group called the Shetland Shellfish Management Organization (SSMO). The SSMO is comprised of local government representatives, community councils, shellfish processors, environmental groups, fisheries scientists, and the SFA. The SSMO applied for establishment of a Regulating Order that extended management of the shellfish stocks out to 6 miles from shore, limited permit ownership to fishermen with historic fishery participation and other effort restrictions, and managed a stock enhancement scheme. The Regulating Order was established in 2000.

Iceland

Description of the Fishery
Iceland is heavily dependent on fish resources with communities on all areas of the coast participating in the fisheries. Fish products account for approximately 80 percent of exports in Iceland. The groundfish fishery is the most important Icelandic fishery in value with landings of cod, haddock, saith, redfish and Greenland halibut. There are also pelagic fisheries based on capelin and herring. Shrimp, lobster and scallop fisheries are important to a lesser degree.

IQ implementation began with certain fisheries in 1975. By 1991, a complete uniform system of ITQs had been implemented for all fisheries (19 species and over 30 substocks) in Iceland (Arnason, 2004). There were 1497 licensed vessels fishing Icelandic waters in 2002 (Arnason, 2004). Fishing ports numbered 61 in 1996 (Eythorssen, 2000). Quota are permanent, divisible and transferable. In addition to ITQ regulations, fishing vessels are restricted by other measures including gear use, mesh size and closed areas restrictions.

Reasons for Past and Current Use of Community Protection Measures

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[17] The following table was included in GAO (2004) showing leasing fees charged for use of the community fish quota.

Percent of quota borrowed	Percent of quota already held	Fee charged (based on revenues from landings)
100	0	6.0 percent of all landings
80	20	4.8 percent on 80 percent of the landings
50	50	3.0 percent on 50 percent of the landings
20	80	1.2 percent on 20 percent of the landings

The overall aim of Iceland's Fisheries Management Act 1990 is to protect marine resources in order to bring about an economic and efficient utilization of stocks and thereby to support the seafood industry and secure employment in the country. Runolfsson and Arnason (1997) write, "The fishing industry' size relative to the whole economy means that any fisheries' policy has far reaching implications for the economy. The fishing industry is a major determinant of personal incomes and income distribution and in many parts of Iceland the fishing industry is virtually the only basis for economic activity."

Management Structure

The Iceland Ministry of Fisheries is responsible for management of the Icelandic fisheries and the implementation of legislation to this effect. The Marine Research Institute is the centre of scientific research for marine resources and responsible for recommendation of the annual TAC for the stocks subject to catch restrictions. The Directorate of Fisheries and the Coast Guard are responsible for ensuring compliance with the Fisheries Management Act. The Iceland Directorate of Fisheries administers the fisheries' daily activities. Governance of Icelandic fisheries is based on the 1990 Fisheries Management Act. Annual quotas are distributed based on each individual's percentage of ownership of quota share for each species and the TAC. Management and surveillance of the ITQ system relies heavily on landings data and a real time computer system that reports the landings data.

For the most part, the fishing industry is vertically integrated. Regarding employment, Icelandic fishermen belong to different unions and associations depending on whether they are deckhands, officers, engineers, or vessel owners. Small boat owners also belong to an association. These organizations, to some degree, have representation on different task forces and committees appointed by the Government for reviewing fisheries policy.

Design Elements that Affect Communities

Ownership caps

A maximum of 8-12% of the share of total quota can be held by a vessel owner. A cap of 10-20% is in place for individual species.

Geographic Restrictions on Quota Transfers

Under geographic restrictions, annual vessel quota transfers were only allowed to occur between vessels within the same geographic region with the intent of stabilizing local employment (Runolfsson and Arnason, 1997). These annual vessel quota transfers were reviewed by regional fisher's unions and local authorities.

"Right of First Refusal"

Transfers outside of a particular region were subject to what is referred to as a "community right of first refusal" rule, which provided the community an opportunity to purchase vessels (which, at the time, had to have quota attached to them) at the market rate with their designated annual quota from within the community before the vessels were sold outside of the community (GAO, 2004). However, few inter-regional transfers were actually blocked (Runolffson and Arnason, 1997). There have not ever been any regional restrictions on the transferability of TAC shares.

Emergency Community Quota Allocations
The "emergency community quota allocations" allocate small blocks of quota to communities harmed by transfer of quota out of their area. Other protection measures used in the past include a rule that allowed small vessels (less than 6 tons), to opt to fish under days at sea restrictions instead of ITQs.

Restrictions on Quota Leasing
A vessel is allowed to transfer some of its quota between fishing years, but the vessel loses its quota if it catches less than 50 percent of its total quota in two subsequent years. Another rule specifies that the net transfer of quota from any vessel must not exceed 50 percent within a single year (Icelandic Ministry of Fisheries, 2005). Information was not available on the purpose of this rule.

Table 2 lists the community involvement and protection mechanisms summarized in this section, and divides them into various categories as a means of condensing a large amount of information. Community involvement mechanisms are categorized again into one of two groups: "Organizations with quota allocation tasks" and "Organizations with no quota allocation tasks". Community impact control mechanisms are divided into one of four groups: "Quota accumulation caps", "Protection mechanisms enabled through eligibility restrictions/qualifications", "Protection mechanisms enabled through transferability restrictions" and "Other". Other appropriate groups could have been created. The authors of this document note that this categorization was chosen for convenience only.

Table 2. Summary of Community Involvement and Protection Mechanisms by Fishery.

	Community Involvement Mechanisms		**Community impact control mechanisms**			
	Organizations with quota allocation tasks	***Organizations with no quota allocation tasks***	***Quota accumulation caps***	***Protection mechanisms enabled through eligibility restrictions/qualifications***	***Protection mechanisms enabled through transferability restrictions***	***Other protection mechanisms***
British Columbia Groundfish Trawl Fishery	An organization called the Groundfish Development Authority (GDA) provides recommendations to the Minister of Fisheries on allocation of 10% of the TAC for purposes of encouraging appropriate treatment of crew and 10% of the TAC for purposes of community development.		Species caps (4-10% depending on species) Individual vessel quota holdings caps (2% cap on total amount held by an individual vessel license holder)		Restrictions on the amount of quota that can be temporarily transferred (leased) each year is expected to be implemented in 2006.	
Shetland Islands	An industry group called The Shetland Fish Producers Organization Ltd. (SFPO) manages two pools of quota. The first pool was purchased by the SFPO and is used to supplement its members' quota allocations. The second pool of quota was purchased by the local government and is managed by the SFPO. This second pool of quota is available to be leased out to new entrants. These two quota pools amount to 37% of the total quota held in community ownership.	The Shetland Fisherman's Association established a management group for Shetland shellfish fisheries using current legislation. The management group is comprised of local government representatives, community councils, shellfish processors, environmental groups, fisheries scientists and fishing industry representatives. The management group established a limited entry program, effort restrictions, and manages a stock enhancement scheme.		Community organizations can purchase quota.		
Iceland		Icelandic fishermen belong to various unions and associations depending on whether they are deckhands, officers, engineers, or vessel owners. To some degree, these organizations have representation on different task forces and committees appointed by the Government for reviewing fisheries policy.	A cap of 10-20% is in place for individual species. A maximum of 8-12% of the share of total quota can be held by a vessel owner.	Quota holdings are limited to owners of fishing vessels.	Geographic restrictions on annual vessel quota transfers specify that transfers are only allowed to occur between vessels within the same geographic region. When quota was transferred outside the region, the community had an opportunity to purchase vessels and quota. This is called "community right of first refusal". A vessel is allowed to transfer some of its quota between fishing years, but	Emergency community quota allocations are used to allocate small blocks of quota to communities harmed by transfer of quota out of their area. At one time, small vessels were allowed to opt to fish under days at sea restrictions instead of ITQs.

	Community Involvement Mechanisms		Community impact control mechanisms			
	Organizations with quota allocation tasks	***Organizations with no quota allocation tasks***	***Quota accumulation caps***	***Protection mechanisms enabled through eligibility restrictions/qualifications***	***Protection mechanisms enabled through transferability restrictions***	***Other protection mechanisms***
					the vessel loses its quota if it caught less than 50% of its total quota in two subsequent years. The net transfer of quota from any vessel must not exceed 50% within a single year.	
Western Alaska Community Development Program	Regulations provide for a 7.5% allocation of multi-species and crab fisheries TAX and 10% of Pollock allocations. The State of Alaska provides allocation recommendations to NMFS and the council for CDQ groups. CDQ groups determine use of quota and allocation to industry groups to best support their development goals.		CDQ group caps are set at 33% of the total CDQ program allocation.	Eligibility Criteria for communities are: • Location within 50 nautical miles of the Bering Sea • Native village ad defined by the Alaska Native Land Claims Settlement Act • Residents conduct over 50% of their current commercial or subsistence fishing effort in the waters of the Bering Sea • No previously developed harvesting or processing capacity sufficient to support substantial groundfish fisheries participation.	Transfer of CDQ is only permissible between CDQ groups and many not be transferred outside the CDQ program.	CDQ groups are required to invest in fisheries-related projects within their represented communities. These goals are identified in the Community Development Plans submitted by the CDQ groups. Development plans are required to be considered for CDQ allocations. Allocations are based on the CDQ groups meeting the community development goals outlined in their development plans.
Gulf of Alaska Community Quota Share Purchase Program		The NMFS and the NPFMC established the infrastructure for the program to allow for the establishment of community Quota Entities (CQEs) whom may purchase and lease IFQ to community residents. No allocations are required, as this is a quota share purchase program. Annual reports are reviewed by the agency to ensure compliance with the program requirements.	Caps for holdings are the same as those for individuals under the existing program. Any community resident is limited to holding IFQ permits not to exceed 50,000 lb each, of sablefish and halibut IFQ from any source. Vessel limits specifically identify where no vessel on which IFQ is leased from the community QS program, can fish in excess of 50,000 lbs each of halibut and sablefish, inclusive of all IFQ	Eligibility criteria for the communities are: • Population of less than 1500 persons based on the 2000 United States Census • Have direct saltwater access • Lack direct access to communities with a population greater than 1500 persons • Have historic participation in the halibut and sablefish fisheries • Be specifically designated by NPFMC If not initially qualified by the NPFMC during the establishment of the program, communities can seek	Transferability restrictions exist on block units, where CQE's are prohibited from purchasing or transferring small QS blocks that may be combined to form larger blocks, referred to as 'swept up.' Specific and detailed transferability restrictions with reference to vessel types (size) and area location are identified in the Final Rule.	Leasing guidance and restrictions specific to communities have been established. Only permanent residents of the community represented by the CQE are eligible to lease IFQ from community held QS. Residency is determined by affirmation of a domicile maintained in the community from which the IFQ is leased for 12 consecutive months immediately preceding the time when the residency assertion is made. Applicants can not claim residency in any other community, state, territory, or country for that period of time. Sale restrictions prohibit a CQE from selling its QS unless the sale will generate revenues to improve, sustain, or expand the

	Community Involvement Mechanisms		Community impact control mechanisms			
	Organizations with quota allocation tasks	*Organizations with no quota allocation tasks*	*Quota accumulation caps*	*Protection mechanisms enabled through eligibility restrictions/qualifications*	*Protection mechanisms enabled through transferability restrictions*	*Other protection mechanisms*
			fished aboard that vessel. Cumulative use caps limit the total holdings for all participant communities. The cap levels start at 3% of the halibut QS and 3% of the sablefish QS and increase by 3% each year for a total of 21% by the seventh year of the program. These limits are subject to review during the fifth year review of the program.	qualification through Council review.		opportunities for community residents to participate in the IFQ fisheries.
Bering Sea and Aleutian Islands Crab Rationalization Program		Eligibility purchase program with no allocation. Infrastructure of program administration is established and managed by NMFS. This includes criteria for the establishment of eligible crab communities to form non-profit organizations to obtain and lease IFQ to community residents.	Individual communities are held to the same use caps as individual harvest share holders in the crab rationalization program and CDQ groups have caps as well. Caps vary based on species, geographic location, and QS holder and are detailed in the Final Rule.	Communities that have at least 3% of the initial PQS allocation of any BSAI fishery can qualify to become an Eligible Crab Community (ECC) and for an EEC organization to purchase IFQ and lease it to community residents.	No ownership or transfer restrictions apply to specific community held harvest shares.	

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Council Family Role in the Stage 1 Development of the Trawl Individual Quota (TIQ) Environmental Impact Statement (EIS)

(Italicized and underlined items to be set by November 4)

Date	Event	Who
	2005	
October 17	**Project Launch**	Council Staff and NEI (Contractor)
Oct 30-Nov 4	**Council Meeting** – *advisors identify point people for contact and review*	SSC, GMT, EC
Nov 28-Dec 2	**Internal Review** of Definition of Status Quo, Time Frame for Analysis, Harvest and Regulatory Projections	**Tech Review Opportunity**: IEP/SSC/AT/GMT, NOAA GC, and NWR
Dec 19-30	**Internal Review** of Framework Draft	**Tech and Impact Review Opportunity**: IEP/SSC/AT/GMT, TIQC, GAP, EC, NOAA NWGC, and NWR
	2006	
March 6-17	**Internal Review** of First Completed Stage 1 Draft	**Tech Review Opportunity**: IEP/SSC/AT/GMT, NOAA GC, and NWR
April ?? 3 days 12-14, 17-21	**Workshop**	IEP/SSC/AT/GMT, TIQC, GAP, EC, NOAA NWGC, NWR and Public. Organized and facilitated by NEI.
May 24	**Draft delivered** for June Briefing Book	NEI
June 12-16	**Council Meeting** – final review and comment	NEI, Council, and advisors
July 28	**Final** Stage I document delivered	NEI

Analytical Team (AT); Enforcement Consultants (EC); Groundfish Advisory Panel (GAP); Groundfish Management Team (GMT); Independent Experts Panel (IEP); National Marine Fisheries Service Northwest Region (NWR); National Oceanic and Atmospheric Administration Northwest Regional Counsel (NOAA NWGC) Northern Economic Incorporated (NEI); Scientific and Statistical Committee (SSC); Trawl Individual Quota Committee (TIQC)

Overview of Options and Preliminary Identification of Some Potential Impacts

Agenda Item H.11.a, Attachment 3

Table 1.	Community Stability Holdback Options	2 Options
Table 2.	Community Involvement Option	1 Option
Table 3.	Community Impact Control Mechanisms	9 Options

- Quota Restrictions (6 options)
- New Entrant Provisions (3 options)

Table 1. Community Stability Holdback Options

- Community Stability Holdback Option 1 – Quota pounds to collaboratives based on merit of proposals
- Community Stability Holdback Option 2 – Quota shares to qualified communities

Stability Holdback Option 1

- Main Decision Areas Within Option 1
  - Percent for holdback
  - Criteria for allocation (utilization, value added, local labor, public works, port dependence, amount of quota)

Stability Holdback Option 2

- Main Decision Areas Within Option 2
  - Percent for holdback
  - Governing entities to represent ports (port/harbor dist)
  - Geographic boundaries
  - Performance standards
  - Qualifying criteria
  - Allocation formula
  - Transferability among communities
  - Community accumulation caps
  - Transferability among individuals

Stability Holdback Option 1

- Potential Impacts and Issues
  - Where collaboratives arise, communities can benefit through
    - Increased stability in product flow
    - Increased employment
  - Increased interaction within and between communities through allocative committee and collaboratives
  - Quantitative evaluation criteria are likely to be imperfect, controversial and may require ongoing policy decisions

Stability Holdback Option 1 (cont'd)

- Potential Impacts and Issues (cont'd)
  - Additional administrative costs for Council and NMFS
  - Increased complexity
  - Decreased initial allocation to others or reallocation among quota share holders
  - Possible reduction in potential economic efficiency gains

Stability Holdback Option 2

- Potential Impacts and Issues
  - Communities that receive shares benefit from initial allocation
  - Positive effect on economic stability for these communities

Stability Holdback Option 2 (cont'd)

- Potential Impacts and Issues (cont'd)
  - Increased interaction within communities
  - Nonprofits can provide representation for small communities
  - Decreased initial allocation to others or reallocation among quota share holders
  - Possible reduction in potential economic efficiency gains

Stability Holdback Option 2 (cont'd)

- Potential Impacts and Issues (cont'd)
  - Policy challenges associated with establishing community boundaries
  - Decision needed as to whether Federal standards would be required
  - Increased complexity

Table 2. Community Involvement Option

The Council would convene a committee comprised of representatives from West Coast regions, ports, processors and fishermen.

Community Involvement Option

- Potential impacts and issues
  - Advisory body provides a contact point for communities
  - Likely increase in articulation of community needs within the Council process
  - Additional administrative costs for the Council

Table 3. Community Impact Control Mechanism Options – **Quota Restrictions (6 Options)**

1. *Temporary Prohibition of Quota Share Transfers (included)*
2. Geographic restriction on transfer of quota shares and pounds (where owners live)
3. Geographic restriction on area of landing/catch
4. Limited entry for ports
5. Partial leasing prohibition
6. Owner on board requirement

1. Temporary Restriction on Transfer

- Impacts and Issues
  - Promotes increased fisherman knowledge of asset value prior to sales.
  - Prevents immediate concentration.
  - Slows geographic redistribution.
  - Delays some benefits.
  - May initially decrease quota share value.
  - May be circumvented by private contract.

2. Geographic restriction on quota transfers
2a Absolute
2b Right Of First Refusal

- Impacts and Issues
  - Requires setting area boundaries
  - Requires rules for determining the geographic area with which a person is associated
  - May influence but does not restrict where fish are landed and processed
  - May indirectly maintain some of the benefits associated with quota share ownership
  - Increased administrative complexity and costs
  - May decrease quota value

2. Geographic restriction on quota transfers
2a Absolute
2b Right Of First Refusal (cont'd)

- Impacts and Issues (cont'd)
  - 2a Absolute
    - More difficult to aggregate/consolidate fishing
  - 2b Right of First Refusal (ROFR)
    - Slows transactions
    - Increases transaction costs (private and public)
    - Potentially circumvented

3. Area of landing/catch restrictions

- Impacts and Issues
  - Requires designation of areas
  - Division of shares among more geographic areas may make it more difficult to aggregate and consolidate fishing activities
  - May decrease quota value
  - May stabilize fishing grounds for locally dependent communities
  - May directly (landing restrict) or indirectly (catch restrict) stabilize local landings

4. Limited Entry for Ports

- Impacts and Issues
  - Requires designation of geographic boundaries for port areas
  - Potential controversy over qualification requirements
  - Potentially limits future development of economically viable and beneficial operations in other ports
  - May reduce enforcement costs
  - May increase administrative costs

5. Partial Leasing Prohibition

- Impacts and Issues
  - Unclear how a leasing restriction would work for nonvessel owners
  - May assists in prevention of absentee ownership
  - Restriction could be circumvented by a private contract
  - May decrease quota share value
  - May increase administrative costs

6. Owner on Board Requirement

- Impacts and Issues
  - Provisions needed to deal with
    - corporations, partnerships, etc. (suboptions)
    - coverage of overages after landing (Option 6b – 50%)
  - Increases the likelihood that the quota share owner will be a member of the community and that the associated revenue and activities will benefit the community
  - Decreases operational flexibility and increases costs
  - May decrease quota share value
  - Increases administrative costs
  - Changes social relationships

Table 3. Community Impact Control Mechanism Options (cont'd)

<u>Opportunity for New Entrants (3 Options)</u>

- Potential Criteria to Qualify as New Entrant
  - no initial allocation
  - owns some quota share but for fewer than X years
  - crew/vessel/permit owner/community

7. Fixed % Revoked and Reissued Annually (lottery or equal)
8. *Confiscated Shares Reissued* (lottery or equal)
9. Increases in Trawl Allocation (lottery or equal)
   Base Shares
   Expansion Shares

Reissuance to New Entrants (General – Options 7, 8, and 9)

- Impacts and Issues
  - With the right criteria, new entrants may be more likely to be members of coastal communities
  - New entrants may have to acquire additional quota shares to hold the right mix of species (or transfer quota received)
  - Increases administrative costs
  - Responds to M-S Act requirements to consider provisions for new entrants

7. Annual Revocation and Reissuance to New Entrants

- Impacts and Issues
  - Provides a consistent flow to "new entrants"
  - Makes it more difficult to maintain quota shares and not use them
  - May decrease quota share value

8. Shares Revoked for Illegal Activities Reissued to New Entrants

- Impacts and Issues
  - Uncertain and uneven flow of quota for reissuance.

9. Increases in Trawl Allocation Distributed to New Entrants

- Impacts and Issues
  - Increased complexity
  - Reduces stewardship incentives for holders of baseline shares
  - May decrease quota share value.

GROUNDFISH ADVISORY SUBPANEL REPORT ON UPDATE ON TRAWL INDIVIDUAL QUOTA PROCESS AND CONSIDERATION OF ADDITIONAL COMMUNITY PROTECTION OPTIONS

The Groundfish Advisory Subpanel (GAP) heard an update from Mr. Jim Seger on the progress of Trawl Individual Quota Process and the addition of community protection options. In addition, Mr. Seger summarized the Trawl Individual Quota Committee's (TIQC) recommendations to the Council.

While the GAP is unsure how individual components of different options including community protection options would actually work to accomplish set goals and objectives of the program, the GAP endorses the TIQC recommendations detailed in the Supplemental TIQC Report and recommends the Council accept these recommendations and continue to proceed through the analytical process as outlined for Stage 1 of the Environmental Impact Statement.

SCIENTIFIC AND STATISTICAL COMMITTEE REPORT ON UPDATE ON TRAWL INDIVIDUAL QUOTA PROCESS AND CONSIDERATION OF ADDITIONAL COMMUNITY PROTECTION OPTIONS

Mr. Jim Seger updated the Scientific and Statistical Committee (SSC) on the process for trawl individual quotas (TIQs) in the West Coast Limited Entry Groundfish Trawl Fishery. This update was a follow up to the presentation by Ms. Kate Quigley and Ms. Suzanne Russell at the September 2005 Council meeting that reviewed literature on TIQ programs with a community-based component. The SSC understands that prior to an April 2006 workshop, the range of alternatives for general elements of the TIQ program (e.g. initial allocation, rules for trade, etc.), and the mechanisms for community involvement will be narrowed. An analysis will be provided to the SSC that evaluates efficiency-equity trade offs among the different options. With the Council's approval, members of the SSC Economics and Groundfish Subcommittees plan to review that analysis and participate in the April 2006 TIQ workshop.

PFMC
11/2/05

TRAWL INDIVIDUAL QUOTA COMMITTEE REPORT ON
UPDATE ON TRAWL INDIVIDUAL QUOTA PROCESS AND CONSIDERATION OF
ADDITIONAL COMMUNITY PROTECTION OPTIONS

The Trawl Individual Quota Committee (TIQC) met Sunday, October 30th and addressed:

- options to address community concerns,
- the overfished species individual quota (IQ) alternative (added by the Council after TIQC scoping deliberations were completed); and
- individual processor quotas.

The TIQC recommends:

- continuing the analysis with
  - a revised community stability holdback Option 1 (consensus recommendation),
  - the creation of a panel of community advisors (consensus recommendation), and,
  - other community impact control mechanisms already included in the package adopted for analysis (consensus recommendation);
- elimination of the overfished species individual fishing quota (IFQ) alternative (consensus recommendation); and
- consideration of an individual processing quota (IPQ) alternative (majority recommendation).

These recommendations and supporting rationale are detailed below.

Options to Address Community Concerns

The TIQC included in its original recommendations a number of design provisions which would benefit communities, such as allowing communities to purchase IQ, limits on quota accumulation, and alternatives which would maintain the division of harvest among the traditional three whiting sectors. The TIQC reviewed the additional options to address community concerns developed at the Council's request (Agenda Item H.11.a, Attachment 3) and has the following recommendations.

Table 1. Community Stability Holdback Options

Community Stability Holdback Option 1 – Quota Pounds for Collaboratives

This option further develops an option already included in the alternatives adopted for analysis.

Recommendation: Include this option with the following adjustments:

- Modify so that collaboratives may be comprised of any quota share holders.
- Clarify that the set aside comes from the shoreside component only.
- Use the example criteria in footnote 6, for the analysis and add criteria to encourage new entrants.

Community Stability Holdback Option 2 – Quota Shares for Communities

Recommendation: Do not include this option for the following reasons.

- The amount of quota shares allocated to a community are not likely to be enough to efficiently manage.
- There is a lack of community interest in this kind of provision and likely local political controversy.
- Overall administrative costs of the IQ program will likely be large. Enforcement and administrative costs of the program are already likely to be substantial in contrast to the potential efficiency improvements and other gains. Addition of this provision may have a substantial adverse effect on the balance of costs and benefits expected from the program while the interest and benefit to communities appears to be limited.

Table 2. Community Advisory Committee

Recommendation: Include this option. Convene the community committee during the TIQ deliberation process and extensively involve it in the program review process.

Table 3. Community Impact Control Mechanisms

Option 1: Prohibit Quota Sales Temporarily

This option is already available for consideration in the package adopted.

Option 2: Geographic Restriction on Transfer of Quota Shares and Quota Pounds (Location of Ownership)

Recommendation: Do not include for the following reasons.

- Appears that individuals moving between communities would have to sell their quota shares and buy quota shares in their new community.

- Divides quota shares into small pools increasing the difficulty of matching catch to quota.
- Increases administrative and monitoring costs while decreasing efficiency benefits and quota values.

Option 3: Area of Landing/Catch Restrictions

Recommendation: Consideration of catch area restrictions to address biological concerns is included as part of the Council's June 2005 action. The TIQC has previously recommended that area restrictions on IQ be the minimum necessary to address biological concerns. Do not include creation of landing area restrictions or additional catch area subdivision to address community concerns for the following reasons.

- The information necessary to properly manage small areas may not be available.
- Reduces flexibility and ability of industry to respond to changing conditions.
- Increases administrative and monitoring costs while decreasing efficiency benefits and quota values.

Research should be undertaken on the problem of localized depletion and the need for area management. Evaluating whether localized depletion has occurred and determining ways to address identified impacts should be part of the periodic program review process.

Option 4: Limited Entry for Ports

Recommendation: Do not include for the following reasons:

- Restricts flexibility and ability of industry to respond to changing market and environmental conditions.
- Potentially constrains efficiency gains.
- May reduce quota values.

Option 5: Partial Leasing Prohibition

Recommendation: Do not include for the following reasons.

- Restricts flexibility and ability of industry to respond to changing conditions.
- Not consistent with allowing those who do not own vessels to hold quota, does not work for crew, etc.
- Increases administrative and monitoring costs while potentially decreasing efficiency benefits and quota values.

Option 6: Owner-on-Board Requirement

Recommendation: Do not include for the following reasons.

- Restricts flexibility and ability of industry to respond to changing conditions.
- Increases administrative and monitoring costs while potentially decreasing efficiency benefits and quota values.

Option 7: Annual Revocation and Reissuance to New Entrants

Recommendation: Do not include for the following reasons.

- Increases administrative and monitoring costs while decreasing quota values without adding sufficient value to justify it.

Option 8: **Distribute Revoked Shares to New Entrants**

This option is already available for consideration in the package adopted.

Option 9: Increases in Trawl Allocation Distributed to New Entrants

Recommendation: Do not include for the following reasons.

- TIQC would strongly emphasize that this removes incentives for stewardship.
- Increases administrative and monitoring costs while decreasing quota values.

Individual Quotas for Overfished Species

The TIQC recommends dropping Alternative 6 on overfished species for the following reasons.

1. The alternative controls overfished species while leaving management of other species unaddressed, presumably remaining under a cumulative limit system.
2. The system would perform like a transferable individual bycatch quota.
3. The fishery or individuals could be shut down as a result of a single disaster tow. Because of the concern with this potentially, the TIQC included in its TIQ program alternatives a provision that specifically would not have TIQ for species at very low optimum yields (OYs).
4. The rationalization and efficiency benefits would likely be minimal while full costs of a TIQ program would be incurred.
5. When overfished species recover, the existing management situation will return.
6. This alternative adds complexity to the analysis and it is highly unlikely it will be the preferred alternative.

Individual Processor Quota Alternative

The TIQC voted on the addition of an individual processor quota option, on a motion by Mr. Jay Bornstein.

- 5 in favor
- 3 opposed
- 4 abstained
- 6 absent

Those in favor felt that such an option should be included in order to have a complete package, with a full range of alternatives considered. Those opposed felt that developing full alternatives which included processor shares would be very time consuming and would greatly delay the completion of the environmental impact statement (EIS). Further, processor shares are not currently authorized under the Magnuson-Stevens Fishery Conservation and Management Act and not included in our present contract with Northern Economics.

PFMC
11/03/05

Pacific Marine Conservation Council
Linking science, policy, and community to benefit the marine environment and the people and livelihoods connected to the sea

Mr. Donald K. Hansen
Chairman
Pacific Fishery Management Council
7700 NE Ambassador Place, Suite 200
Portland, Oregon 97220-1384

October 24, 2005

Re: Community protection options – TIQ (Agenda item H.11.c)

Dear Chairman Hansen,

Pacific Marine Conservation Council (PMCC) offers these comments regarding community protection options, to be included for analysis within the trawl individual quota environmental impact statement. PMCC is a nonprofit, public benefit corporation, with offices in Astoria, OR; Port Townsend, WA; and Arcata, CA. Our organization has a diverse 12-member Board of Directors representing commercial and sport fishermen, marine scientists, coastal community advocates and other constituent groups, all dedicated to sustaining healthy and diverse marine ecosystems. PMCC works to link science, policy and communities to benefit the marine environment and the people and livelihoods connected to the sea.

We appreciate the opportunity to comment on this important matter. Although individual quota programs can enhance economic efficiency for some fishing businesses, they can also pose serious risks of adverse impacts to the economies of coastal communities. The design of rights-based fisheries programs involves decisions both of limiting access, and unleashing market forces that raise compelling concerns around issues of social justice and stewardship of the public trust.

PMCC is pleased that the Pacific Fishery Management Council included as a primary objective for the dedicated access privilege (DAP) program under analysis *"7. Minimize adverse effects from IFQs on fishing communities."* The challenge is to provide an adequate range of alternatives that would meet this objective.

The Council should provide adequate time to develop alternatives.

Members of the TIQ Analytical Team have explored options for community involvement and community protection, and are offering the Council possible alternatives. This is useful information, especially to the extent that the Council and the public can closely examine the background information that informed this presentation of possibilities. However, this material was only made available on October 20, less than ten days before the start of the Council meeting.

At the November meeting, PMCC recommends that the Council consider reports from the TIQ Committee and other advisory bodies, as well as public testimony regarding community protection alternatives. Perhaps some alternatives can begin to be refined, even in the short time frame. It is essential, however, that adequate time be made available for all interested parties to digest the new information and craft alternatives that effectively meet the Council's objective. We encourage continuing analysis, but believe that the door should remain open to additional community projection alternatives for the EIS. These are issues that are critical to public acceptance of any DAP program and should be fully scoped and explored. We are very concerned that alternatives to mitigate adverse impacts to communities might be included as afterthoughts and given inadequate attention. There is no Council committee specifically charged with evaluating community concerns, so outreach to and input from the public is especially important to informing the range of alternatives.

DAP alternatives that incorporate area-based management can protect communities and the marine environment.

There is a growing awareness that community concerns can be linked with area-based alternatives for fisheries management. For example, new research has demonstrated that some Pacific rockfish species tend to concentrate in populations with a limited geographical range. This raises a concern that these localized populations could be depleted, and under a coast-wide TIQ system the possibility for such depletions could be exacerbated. There are dramatic implications for the marine ecosystem as well as on nearby fishing communities.

Among the Constraints and Guiding Principles as adopted by the Council for this DAP program is *"Take into account the biological structure of the stocks including such factors as populations and genetics."* Fisheries science and our understanding of the marine ecosystem continue to develop. Any new system, such as a DAP program, needs to clearly allow and encourage adaptive management that responds to new information. Adding spatial components to this program at the onset would wisely anticipate future area-based adaptations while protecting communities from adverse economic and ecological impacts. This foresight would protect communities and fisheries from unnecessary disruption as improved science and ecosystem-based principles are applied.

While systems of DAPs are not the only means to move toward more discrete geographically defined management units, spatial components should be part of the design of DAPs whenever area-based management can be associated with the biology of fish populations, or when this approach makes sense for communities. In addition to these considerations, communities would benefit if DAPs are designed with explicit linkage to bycatch reduction.

Bycatch monitoring and reduction can protect communities, and must remain a priority.

In its Problem Statement supporting the development of a trawl IFQ program, the Council identifies the monitoring and reduction of bycatch as major problems that could be addressed through the implementation of an IFQ program. As published in the Notice of Intent to Produce an EIS, the Problem Statement says in part *"…in the current system there are uncertainties* *about the accuracy of bycatch estimation, few incentives for the individual to reduce personal bycatch rates, and an associated loss of economic opportunity related to the harvest of target species."* We agree that bycatch monitoring and reduction are challenges that affect both the environment and the fishing communities. With or without individual quotas fisheries managers have a legal obligation to adequately count what's caught in the fishery and to take all practical steps to reduce bycatch.

Reducing bycatch, especially in appropriately spatially explicit ways, is one tangible way to protect and benefit fishing communities. Reducing bycatch by providing positive incentives for avoiding encounters with the constraining overfished species, for example, benefits communities by conserving fishing opportunities. Improved monitoring and data processing, as well sector and individual cap systems, will allow for swifter reactions for in-season changes that could avoid lost opportunities like we've seen in the winter petrale fishery over the past two years.

The Council's preferred alternative for the Final Bycatch Program EIS is described in the Executive Summary:

Alternative 7 would substantially reduce groundfish regulatory discard/bycatch (compared to the status quo) by assigning every commercial limited entry vessel to one or more sectors. Annual fishing mortality allocations for each overfished species would be established for each sector. All vessels in a sector would be required to stop fishing for the remainder of the designated period if any of its caps were reached. Trip limits would continue to be used for each sector. In addition, individual vessels could gain access to larger trip limits for nonoverfished groundfish by paying for full observer coverage. These vessels would be assigned non-tradeable restricted species quotas for overfished species and would stop fishing for groundfish if any catch limit were reached. This would guarantee that their sector would not be closed by other vessels that fail to reduce their catch and/or bycatch of overfished species. These catch limits could be of similar duration to trip limits, and would be similar to individual, non-transferable quotas that would expire at the end of the period. The observer program would be restructured to monitor bycatch in each sector and to provide catch and bycatch data inseason. Regulatory bycatch of overfished species would be reduced, especially by vessels that volunteer for catch limits. These vessels would also be likely to reduce non-regulatory (economic) bycatch/discard of groundfish because they would want to maximize their revenues before reaching any catch limit. For vessels participating in sectors, regulatory and economic bycatch would be reduced over time as additional observer data became available. This would be especially true as observer data become available inseason. Bycatch of other groundfish species would not be significantly affected by this alternative unless all trip limits were defined as catch limits. In that case, vessels would retain a larger proportion of groundfish because all catch would apply towards the vessel limits.

NOAA Fisheries provided a practicability analysis in the EIS Executive Summary:

The Council determined that Alternative 7 minimizes bycatch to the extent practicable. The Council recognized that eliminating all groundfish bycatch is not practicable because it would require vessels to retain all fish caught or else not fish. By grouping vessels into sectors, and *rewarding sectors that more effectively mitigate bycatch, vessels will be encouraged to develop methods and gears that better achieve the FMP's bycatch minimization objectives. Alternative 7 requires allocations to sectors and the subsequent monitoring and management by sector, both of which would increase management costs substantially. However, the Council believes the allocations are feasible and the observer program may be modified to achieve the desired results. Development of the monitoring infrastructure will take time, but will also lay important groundwork for development of dedicated access programs (individual fishing quotas).*

It makes sense to develop the infrastructure and policies to implement the adopted Bycatch Program preferred alternative, and additional required measures, as swiftly as possible. Once all practical bycatch minimization systems have been implemented, consideration may be given to augmenting these systems with thoughtfully designed DAPs.

Explicit linkages need to be made between area-based management, bycatch monitoring and reduction, community involvement and protection, and DAP system development.

In summation, we once again want to express our appreciation to the Council for beginning development of community involvement and community protection alternatives in the current IFQ analysis. The work done so far by the Analytical Team is impressive and needs to be made available for an adequate amount of time to allow interested parties, especially members of our fishing communities, to develop additional alternatives or groupings of alternatives that achieve the Council's objectives. PMCC recommends keeping the opportunity for initial input open through the March 2006 Council meeting before adopting alternatives. Some of these alternatives should include spatial elements that support area-based approaches and improved bycatch monitoring and reduction. And, fundamentally, any new DAP system should encourage adaptation that progressively incorporates ecosystem-based management principles.

Respectfully submitted,

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UPDATE ON TRAWL INDIVIDUAL QUOTA (TIQ) PROCESS AND COMMUNITY CONCERNS

Process Update

The development of a West Coast Groundfish Trawl Individual Quota Environmental Impact Statement (EIS) is proceeding using $250K provided by National Marine Fisheries Service (NMFS) for this purpose. A portion of this funding has been obligated to hold relevant meetings and support the intersector allocation EIS; however, the dominant amount has been obligated to work on the EIS process and document. The Council received notice that these funds were available on July 22, released a request for proposals on August 15 (Agenda Item H.11.a, Attachment 1), selected a contractor on September 23, and finalized agreement on the contract on October 12. Northern Economics Incorporated was selected to begin work on the EIS. Dr. Ed Waters has been contracted separately to develop information that will be used during Allocation Committee deliberations over resolution of intersector allocation issues. Additional funding will be requested to complete the EIS and intersector allocation process, however the $250K received will sustain expected progress through early 2006.

Community Protection Options

At its June 2005 meeting, the Council adopted a range of TIQ alternatives for analysis (Agenda Item H.11.a, Attachment 2). While the alternatives adopted for analysis included options to control impacts on communities, such as allowing communities to hold quota and setting limits on quota accumulation, the Council directed the TIQ Analytical Team, in consultation with the Scientific and Statistical Committee (SSC), to draft a range of appropriate options to address community concerns for Council consideration at its November 2005 meeting. TIQ Analytical Team members Ms. Kate Quigley (NMFS, Northwest Region) and Ms. Suzanne Russell (NMFS, Northwest Science Center) took the lead in reviewing other IFQ programs from around the world to identify a set of potential tools for Council consideration. Their work was reviewed by the SSC at its September meeting. Using these general tools as a guide, Ms. Quigley and Ms. Russell then worked with Council staff to develop some example options that might be incorporated into the alternatives the Council adopted for analysis at its June meeting. The results, including example options, have been provided in the briefing materials for review by the Trawl Individual Quota Committee and other Council advisory bodies (Agenda Item H.11.a, Attachment 3).

As part of this effort, the Council directed consideration of the Government Accounting Office (GAO) report "Individual Fishing Quotas, Methods for Community Protection and New Entry Require Periodic Evaluation (GAO-04-277, February 2004) was reviewed (Agenda Item H.11.a, Attachment 3). This report notes:

> "In considering methods to protect communities and facilitate new entry into IFQ fisheries, fishery managers face issues of efficiency and fairness, as well as design and implementation. Community protection and new entry methods are designed to achieve social objectives, but realizing these objectives may undermine economic efficiency and raise questions of equity."

The report notes that IFQ programs differ depending on the circumstances of the fishery and objectives of the program and states:

> "Depending on the fishery, fishery managers may be willing to trade some potential gains in economic efficiency in exchange for the opportunity to protect fishing communities or facilitate new entry."

The GAO report recommends that Regional Councils which design community protection measures, develop clearly defined and measurable objectives, build performance measures into the program, and monitor progress in meeting objectives. The report also notes that National Standard 8 requires that fishing communities be taken into account in Council recommendations.

Council Action:

Refine Community Related Options for Alternatives Adopted for Analysis.

Reference Materials:

1. Agenda Item H.11.a, Attachment 1: Section 2.1 of the Request for Proposals (6 pages) **(Full Document on CD).**
2. Agenda Item H.11.a, Attachment 2: Groundfish Trawl Individual Quotas for the Pacific Coast July 2005 Informational Report.
3. Agenda Item H.11.a, Attachment 3: Potential Options For Community Involvement And Control of Community Impacts, Developed As Directed By The Council (June, 2005).
4. Agenda Item H.11.a, Attachment 4: Executive Summary "Individual Fishing Quotas, Methods for Community Protection and New Entry Require Periodic Evaluation (GAO-04-277, February 2004) **(Full Document on CD)**.

Agenda Order:

a. Agenda Item Overview — Jim Seger
b. Reports and Comments of Advisory Bodies
c. Public Comment
d. **Council Action:** Refine Options

PFMC
10/18/05

GROUNDFISH MANAGEMENT TEAM REPORT ON 2007-2008 GROUNDFISH FISHERIES—PART II

Based on the Council action taken under Agenda Item H.3, the Groundfish Management Team (GMT) updated the acceptable biological catch (ABC)/optimum yield (OY) tables (Attachment 1), identified specific items to be considered for 2007-2008 management, and developed a suggested course of action relative to the development of management measure alternatives.

Preliminary Range of ABCs/OYs

In the updated ABC/OY table, all species with new assessments in 2005 are displayed in bold. The GMT made the following changes:

1. Table structure: Added columns for alternative ABCs and the Council-preferred ABC and OY.

2. Pacific whiting: Ranged ABCs and OYs between the current ABC and OY by ± 30%.

3. Chilipepper: Added an OY alternative equal to the ABC.

4. Remaining rockfish north and remaining rockfish south: returned subcomponents for specific species listed. The GMT notes that these serve to provide reference within the group OY and do not represent separate OYs.

5. California scorpionfish: added two ABC alternatives which equal each OY alternative.

6. Petrale sole *assessment area* OYs: Corrected error in OY Alt 1 and added 3rd alternative to provide alternatives originally intended by the GMT. The tables presented under H.3 showed Alt 1 coupled with a 25% reduction for the base model in the south with the low spawning biomass model in the north. For Alt 1, correctly aligned the low spawning biomass model OYs for north and south, and added Alt 2 OY with the base model OY in north and a 25% reduction from the base model to reflect the greater uncertainty in the southern assessment. Alt 3 OY is the base model north and south.

7. Petrale sole *adjusted area* OYs: Adjusted ABCs and OYs with a regional split north and south of 40°10' N. latitude. Data source for adjustment: Used General Linear Model (GLM)-adjusted triennial trawl survey data by area averaged over 3 years to calculate the portion of the southern area ABC and OY to shift to the north.

8. Starry flounder: added ABCs and corrected OYs.

The GMT had a discussion on the two-year process and how to better serve the purpose of the two-year cycle relative to creating management stability and simplifying management measures and how they are established. With different OY targets for successive years in the management cycle, there is a need for two sets of management measures that correspond to the OY targets for each year. Therefore, for simplicity, the GMT recommends consideration of averaging the OY values for 2007 and 2008 and using the same value for each year as annual OYs, with the understanding that the OYs would be capped at the ABC level should the average OY exceed the annual ABC.

<u>2007-2008 Management Issues</u>

The GMT has identified the following items to be among those considered for the 2007-2008 management and specifications:

1. Develop a range of management measures for commercial and recreational fisheries that, in combination, stay within the range of OYs adopted by the Council earlier this week.

2. Develop a range of alternatives for commercial/recreational sharing of overfished species that are particularly constraining (e.g., canary and yelloweye rockfish).

3. Identify sectors and species for which to consider sector limits, harvest guidelines, and harvest targets.

4. Review gear definitions including chafing gear, midwater gear, and selective flatfish gear, and recommend revisions as needed.

5. North of 40^{o}10’N lat., consider requiring that vessels adhere to the more restrictive trip limits for the entire two-month cumulative period if more than one type of gear is used during the period (i.e., if selective flatfish trawl gear is used at any time during the period, then the selective flatfish trawl trip limits will apply for the entire period for all species).

6. Review of rockfish conservation areas (RCAs) coastwide and add boundaries as necessary.

7. Consider modifying the boundaries of the Cowcod Conservation Areas.

8. Consider use of hotspots for canary and/or yelloweye rockfish for recreational fisheries and the potential use of hotspots for commercial fisheries.

9. Consider mandatory release devices and/or gear modifications in the recreational fisheries.

10. Review discard mortality rates for groundfish species in the commercial and recreational fisheries, and recommend changes if there is supporting research to change it from status quo.

11. Consider a trip limit for lingcod with groundfish pot gear.

12. Consider implementing selective flatfish trawl gear south of 40^{o}10’N latitude.

The GMT is aware that the Groundfish Advisory Subpanel (GAP) has identified specific management measure alternatives for commercial and recreational fisheries. However, the GMT anticipated that a preliminary range of alternatives to address these items, and additional items identified through the public process, would be developed over the winter and presented at the April 2006 Council meeting. Therefore, if the Council chooses to approve a portion or all of the items on the GAP lists for public review, then the GMT recommends that this be identified as a minimum list, and not the full range of alternatives. The GMT also recommends that the Council pare down the list, to the extent possible, to exclude items which are likely outside of a reasonable range of alternatives.

<u>Allocation Alternatives</u>

As mentioned in the GMT report presented in September, the GMT recommends that the Council provide guidance to the Allocation Committee on the sideboards around the range of alternatives to be considered, primarily for items 2. and 3. listed above. Regarding item 2., which is commercial/recreational sharing alternatives for overfished species including canary and yelloweye, the GMT suggests the Council consider a range similar to what was considered for 2005-2006, which is:

60% comm./40% rec. (status quo for canary)
50% comm./50% rec. (status quo for yelloweye)
40% comm./60% rec.

The GMT believes that analyzing all three commercial/recreational sharing alternatives for canary and yelloweye represents a reasonable range.

With regard to item 3., which is identifying the sectors and species for which to consider sector limits, harvest guidelines, and harvest targets, the GMT offers the following recommendations:

1. Consider continuing bycatch limits for the non-tribal whiting fishery for canary and widow rockfish.

2. Consider continuing using separate harvest guidelines for recreational fisheries in the north (WA/OR combined), and the south (CA) for canary and yelloweye rockfish, and lingcod, with state-specific harvest targets.

3. Consider continuing separate harvest guidelines by state for recreational fisheries in the south for black rockfish.

The GMT also recommends that the Council provide the flexibility to the Allocation Committee to work with the GMT and GAP over the winter to further develop the range of management measures within the sideboards recommended above.

GMT Recommendations

1. Consider averaging the OY values for 2007 and 2008 and using the same value for each year as annual OYs with the understanding that the OYs would be capped at the ABC level should the average OY exceed the annual ABC.
2. Approve the preliminary range of ABCs and OYs for public review.
3. Provide guidance (if any) on the list of items the GMT has identified for consideration for 2007-2008.
4. Consider the list of management measure alternatives developed by the GAP and pare down the list, if possible.
5. Provide sideboards to the Allocation Committee regarding commercial/recreational sharing for canary and yelloweye rockfish (and other species, as needed).
6. Include bycatch limits for the non-tribal whiting fishery for canary and widow rockfish as alternatives for consideration.
7. Include status quo recreational harvest guidelines and harvest targets for consideration.
8. Provide flexibility to the Allocation Committee to work with the GMT and GAP to further develop the range of management measures within the sideboards identified.

TABLE 1. GMT-recommended alternatives for acceptable biological catches (ABCs) and total catch optimum yields (OYs) (mt) for **2007**. (Overfished stocks in CAPS).

Stock	No Action Alternative				2007 Action Alternatives								
	2005 ABC	2005 OY	2006 ABC	2006 OY	Alt 1 ABC	Alt 2 ABC	Alt 1 OY	Alt 2 OY	Alt 3 OY	Alt 4 OY	Alt 5 OY	Council ABC a/	Council OY a/
Lingcod - coastwide b/	2,922	2,414	2,716	2,414	6,706		6,706	6,492				6,706	
Columbia and US-Vanc. areas		1,694		1,694			5,830	5,830					
Eureka, Monterey, and Conception areas		719		719			876	662					
N. of 42 (OR & WA)		1,801		1,801			5,960	5,960					
S. of 42 (CA)		612		612			746	532					
Pacific Cod	3,200	1,600	3,200	1,600	3,200		1,600					3,200	1,600
Pacific Whiting (Coastwide)	269,545	269,069	To be determined in March 2006		188,682	350,409	188,348	349,790				To be determined in March 2007	
Sablefish (Coastwide)	8,368	7,761	8,175	7,634	6,210		4,634	5,998				6,210	5,998
N. of 36 (Monterey north)		7,486		7,363			4,470	5,785					5,785
S. of 36 (Conception area)		275		271			164	213					213
PACIFIC OCEAN PERCH	966	447	934	447	900		0	84	397	506	741	900	397
Shortbelly Rockfish	13,900	13,900	13,900	13,900	13,900		13,900					13,900	13,900
WIDOW ROCKFISH	3,218	285	3,059	289	5,334		0	322	447	903	1,352	5,334	447
CANARY ROCKFISH c/	270	47	279	47	172		0	24	43	67		172	43
Chilipepper Rockfish	2,700	2,000	2,700	2,000	2,700		2,000	2,700				2,700	
BOCACCIO	566	307	549	309	602		0	147	216	314	425	602	
Splitnose Rockfish	615	461	615	461	615		461					615	461
Yellowtail Rockfish	3,896	3,896	3,681	3,681	4,585		4,585					4,585	4,585
Shortspine Thornyhead - coastwide					2,488		1,655	2,488				2,488	
Shortspine Thornyhead - N. of 34deg27'	1,055	999	1,077	1,018			1,232	1,642					
Shortspine Thornyhead - S. of 34deg27'							423	846					
Longspine Thornyhead - coastwide	2,851	2,656	2,851	2,656	3,953		2,724	3,930				3,953	
Longspine Thornyhead - N. of 34deg27' d/		2,461		2,461			2,242	2,989					
Longspine Thornyhead - S. of 34deg27' d/		195		195			482	941					
COWCOD - S. of 36 (Conception area)	5	2.1	5	2.1	17		0	3	7	9	11	17	
COWCOD - Monterey area	19	2.1	19	2.1	19		0	3	7	9	11	19	
DARKBLOTCHED	269	269	294	294	456		0	130	219	317	456	456	
YELLOWEYE	54	26	55	27	47		0	12	17	21	24	47	17 or 21
Nearshore Species													
Black Rockfish (WA)	540	540	540	540	540		540					540	540
Black Rockfish (OR-CA)	753	753	736	736	725		725					725	725
Minor Rockfish North	3,680	2,250	3,680	2,250	3,680		2,250	2,270	2,290			3,680	
Nearshore Species		122		122			122	142	162				
Shelf Species		968		968			968	968	968				968
Slope Species		1,160		1,160			1,160	1,160	1,160				1,160
Remaining Rockfish North	1,612	1,216	1,612	1,216	1,612		1,216						
Bocaccio	318	239	318	239	318		239						
Chilipepper - Eureka	32	32	32	32	32		32						
Redstripe	576	432	576	432	576		432						
Sharpchin	307	230	307	230	307		230						
Silvergrey	38	29	38	29	38		29						
Splitnose	242	182	242	182	242		182						
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	3,403		1,753	1,855	1,898	2,006		3,403	
Nearshore Species		615		615			413	515	558	666			
Shelf Species		714		714			714	714	714	714			714
Slope Species		639		639			626	626	626	626			626
Remaining Rockfish South	854	689	854	689	854		689						
Bank	350	263	350	263	350		263						
Blackgill	343	305	343	305	292		292						
Gopher	97	48.5	97	48.5	302		48.5	151	227	302			
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						
California scorpionfish	Not specified - managed as part of Minor RF				137	219	137	219					
Cabezon (off CA only)	103	69	108	69	94		69					94	
Dover Sole	8,522	7,476	8,589	7,564	28,522		16,500	28,522				28,522	
English Sole	3,100	3,100	3,100	3,100	6,773		6,773					6,773	6,773
Petrale Sole (coastwide) b/	2,762	2,762	2,762	2,762	2,917		1,866	2,510	2,917			2,917	
Columbia and US-Vanc. areas							818	1,289	1,289				
Eureka, Monterey, and Conception areas							1,048	1,221	1,628				
N of 40deg10'							1,094	1,611	1,718				
S of 40deg10'							772	899	1,199				
Arrowtooth Flounder	5,800	5,800	5,800	5,800	5,800		5,800					5,800	5,800
Starry Flounder	Not specified - managed as part of Other Flatfish				1,221		854	1,138					
Other Flatfish	6,781	4,909	6,781	4,909	6,731		4,884					6,731	4,884
Other Fish	14,600	7,300	14,600	7,300	14,600		7,300					14,600	7,300
Kelp Greenling HG (OR)							No Fed HG	fed HG = state HG					

a/ Council ABC and Council OY represent the Council's preferred harvest alternative for 2007.

b/ Area OYs/HGs are stratified according to the assessment areas and alternatively adjusted by management areas for lingcod and petrale sole.

c/ The canary rockfish OY alternatives assume a 50:50 commercial:recreational catch share. 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. Therefore, a higher OY would result from a higher commercial catch share.

d/ The No Action alternative OYs for 2005 and 2006 were specified north and south of 36 deg. N latitude. The GMT recommends specifying longspine thornyhead OYs north and south of 34 deg.27' N latitude. OY apportionment may change based on further analysis of survey catch rates.

TABLE 2. GMT-recommended alternatives for acceptable biological catches (ABCs) and total catch optimum yields (OYs) (mt) for **2008**. (Overfished stocks in CAPS).

Stock	No Action Alternative				2008 Action Alternatives								
	2005 ABC	2005 OY	2006 ABC	2006 OY	Alt 1 ABC	Alt 2 ABC	Alt 1 OY	Alt 2 OY	Alt 3 OY	Alt 4 OY	Alt 5 OY	Council ABC a/	Council OY a/
Lingcod - coastwide b/	2,922	2,414	2,716	2,414	5,853		5,853	5,683				5,853	
Columbia and US-Vanc. areas							5,025	5,025					
Eureka, Monterey, and Conception areas							828	658					
N. of 42 (OR & WA)							5,155	5,155					
S. of 42 (CA)							698	528					
Pacific Cod	3,200	1,600	3,200	1,600	3,200		1,600					3,200	1,600
Pacific Whiting (Coastwide)	269,545	269,069	To be determined in March 2006		188,682	350,409	188,348	349,790				To be determined in March 2007	
Sablefish (Coastwide)	8,368	7,761	8,175	7,634	6,058		4,513	5,869				6,058	5,869
N. of 36 (Monterey north)		7,486		7,363			4,353	5,661					5,661
S. of 36 (Conception area)		275		271			160	208					208
PACIFIC OCEAN PERCH	966	447	934	447	911		0	89	412	522	756	911	412
Shortbelly Rockfish	13,900	13,900	13,900	13,900	13,900		13,900					13,900	13,900
WIDOW ROCKFISH	3,218	285	3,059	289	5,144		0	335	464	931	1,385	5,144	464
CANARY ROCKFISH c/	270	47	279	47	179		0	25	45	69		179	45
Chilipepper Rockfish	2,700	2,000	2,700	2,000	2,700		2,000	2,700				2,700	
BOCACCIO	566	307	549	309	618		0	150	219	316	422	618	
Splitnose Rockfish	615	461	615	461	615		461					615	461
Yellowtail Rockfish	3,896	3,896	3,681	3,681	4,510		4,510					4,510	4,510
Shortspine Thornyhead - coastwide	1,055	999	1,077	1,018	2,463		1,666	2,463				2,463	
Shortspine Thornyhead - N. of 34deg27'							1,247	1,626					
Shortspine Thornyhead - S. of 34deg27'							419	837					
Longspine Thornyhead - coastwide	2,851	2,656	2,851	2,656	3,860		2,668	3,930				3,860	
Longspine Thornyhead - N. of 34deg27' d/		2,461		2,461			2198	2,989					
Longspine Thornyhead - S. of 34deg27' d/		195		195			470	941					
COWCOD - S. of 36 (Conception area)	5	2.1	5	2.1	17		0	4	7	9	11	17	
COWCOD - N. of 36 (Monterey area)	19	2.1	19	2.1	19		0	4	7	9	11	19	
DARKBLOTCHED	269	269	294	294	487		0	130	238	343	487	487	
YELLOWEYE	54	26	55	27	47		0	12	17	21	24	47	17 or 21
Nearshore Species													
Black WA	540	540	540	540	540		540					540	540
Black OR-CA	753	753	736	736	719		719					719	
Minor Rockfish North	3,680	2,250	3,680	2,250			2,250	2,270	2,290				
Nearshore Species		122		122			122	142	162				
Shelf Species		968		968	968		968	968	968				968
Slope Species		1,160		1,160	1,160		1,160	1,160	1,160				1,160
Remaining Rockfish North	1,612	1,216	1,612	1,216	1,612		1,216						
Bocaccio	318	239	318	239	318		239						
Chilipepper - Eureka	32	32	32	32	32		32						
Redstripe	576	432	576	432	576		432						
Sharpchin	307	230	307	230	307		230						
Silvergrey	38	29	38	29	38		29						
Splitnose	242	182	242	182	242		182						
Yellowmouth	99	74	99	74	99		74						
Other Rockfish North	2,068	1,034	2,068	1,034	2068		1,034						
Minor Rockfish South	3,412	1,968	3,412	1,968	3,403		1,753	1,855	1,898	2,006			
Nearshore Species		615		615			413	515	558	666			
Shelf Species		714		714			714	714	714	714			714
Slope Species		639		639			626	626	626	626			626
Remaining Rockfish South	854	689	854	689	854		689						
Bank	350	263	350	263	350		263						
Blackgill	343	306	343	306	292		292						
Gopher	97	48.5	97	48.5	302		48.5	151	227	302			
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	2558		1,279						
California scorpionfish	Not specified - managed as part of Minor RF South				137	219	137	219					
Cabezon (off CA only)	103	69	108	69	94		69					94	69
Dover Sole	8,522	7,476	8,589	7,564	28,442		16,500	28,442				28,442	
English Sole	3,100	3,100	3,100	3,100	5,701		5,701					5,701	5,701
Petrale Sole	2,762	2,762	2,762	2,762	2,919		1,976	2,488	2,849			2,919	
Columbia and US-Vanc. areas							1,001	1,405	1,405				
Eureka, Monterey, and Conception areas							975	1,083	1,444				
N of 40deg10'							1,258	1,691	1,786				
S of 40deg10'							718	797	1,063				
Arrowtooth Flounder	5,800	5,800	5,800	5,800	5,800		5,800					5,800	5,800
Starry Flounder	Not specified - managed as part of Other Flatfish				1,395		926	1,234					
Other Flatfish	6,781	4,909	6,781	4,909	6,731		4,884					6,731	4,884
Other Fish	14,600	7,300	14,600	7,300	14,600		7,300					14,600	7,300
Kelp Greenling HG (OR)							No Fed HG	Fed HG = State HG					

a/ Council OY is the Council's preferred harvest alternative for 2008.

b/ Area OYs/HGs are stratified according to the assessment areas and alternatively adjusted by management areas for lingcod and petrale sole.

c/ The canary rockfish OY alternatives assume a 50:50 commercial:recreational catch share. 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. Therefore, a higher OY would result from a higher commercial catch share.

d/ The No Action alternative OYs for 2005 and 2006 were specified north and south of 36 deg. N latitude. The GMT recommends specifying longspine thornyhead OYs north and south of 34 deg.27' N latitude. OY apportionment may change based on further analysis of survey catch rates.

GROUNDFISH ADVISORY SUBPANEL REPORT ON MANAGEMENT RECOMMENDATIONS FOR 2007-2008 GROUNDFISH FISHERIES—PART II

The Groundfish Advisory Subpanel (GAP) considered the kinds of management measures that should be explored for use in meeting conservation objectives for the 2007-2008 fishery. The following should be used as a general guide for structuring alternatives for consideration.

In general,

- the GAP supports evaluation of additional boundaries so that they may be available for consideration, and
- a coast wide Petrale optimum yield (OY) with a management line at 40°10' and harvest guidelines north and south.

The GAP opposes the Washington troller lingcod retention allowance because it may potentially encourage targeting and the attendant increases in impacts on yelloweye and canary.

Limited Entry Trawl

See the appended trip limit table for an example of the kinds of season structures and depth restrictions that should be explored in the development of management measures to meet conservation objectives. In general, the trawl representatives on the GAP would like to see a reduction in front loading of fishing opportunities in order to maintain a year-round fishing opportunity.

Consider

- a 250 fathom (fm) line south of 38°
- a 180 fm line coastwide
- regional management of Petrale sole

The GAP understands that an analysis of a restriction limiting vessels to a single trawl gear type per two month period may be useful. However, the GAP is not in agreement that such a provision should be implemented.

Open Access and Limited Entry Fixed Gear

Rockfish Conservation Areas (RCAs)	
North of OR/WA Border	
Consider a range of seaward lines: 100 fm, 125 fm, 150 fm, and 200 fm	
OR/WA Border to 34°27'	
Option A	20 to 200 fm
Option B (preferred)	30 to 150 fm
Option C	40 to 120 fm
South of 34°27'	
Option A	40 to 180 fm
Option B (preferred)	60 to 150 fm
Option C	80 to 120 fm

Trip Limits	Pounds per 2-months.					
	Jan-Feb	Mar-Apr	May-Jun	Jul-Aug	Sep-Oct	Nov-Dec
Minor Nearshore (NS) Rockfish	**Limited Entry and Open Access Fixed Gear**					
OR/CA Border to 40°10'						
Option A	Year-round: 4,000 pounds of minor nearshore rockfish per two months of which no more than 1,200 pounds could be other than blacks and blues.					
Option B	Year-round: 8,000 pounds of minor nearshore rockfish per two months of which no more than 2,000 pounds could be other than blacks and blues.					
Shallow NS Rockfish	**Limited Entry and Open Access Fixed Gear**					
40°10' of 34°27'						
Option A	**200**	**Closed**	**400**	**500**	**400**	**200**
Option B (SQ)	**300**	**Closed**	**500**	**600**	**500**	**300**
Option C	**400**	**Closed**	**600**	**700**	**600**	**400**
S of 34°27'						
Option A	**200**	**Closed**	**400**	**500**	**400**	**200**
Option B (SQ)	**300**	**Closed**	**500**	**600**	**500**	**300**
Option C	**400**	**Closed**	**600**	**700**	**600**	**400**
Deep NS Rockfish	**Limited Entry and Open Access Fixed Gear**					
40°10' to 34°27'						
Option A	**400**	**Closed**	**400**	**400**	**300**	**400**
Option B (SQ)	**500**	**Closed**	**500**	**500**	**800**	**500**
Option C	**600**	**Closed**	**600**	**600**	**800**	**600**
S of 34°27'						
Option A	**400**	**Closed**	**500**	**500**	**500**	**300**
Option B (SQ)	**500**	**Closed**	**600**	**600**	**600**	**400**
Option C	**600**	**Closed**	**600**	**600**	**600**	**500**
California Scorpion Fish	**Limited Entry and Open Access Fixed Gear**					
S of 34°27'						
Option A	**300**	**Closed**	**300**	**300**	**300**	**300**
Option B	**500**	**Closed**	**500**	**500**	**500**	**500**
Option C	**700**	**Closed**	**700**	**700**	**700**	**700**
Shelf Rockfish	**Limited Entry and Open Access Fixed Gear**					
OR/CA Border to 40°10'						
Option A	**200**	**200**	**200**	**200**	**200**	**200**
Option B	**1,000**	**1,000**	**1,000**	**1,000**	**1,000**	**1,000**
40°10' to 34°27'						
Option A	**200**	**Closed**	**200**	**200**	**200**	**200**
Option B (SQ)	**300**	**Closed**	**200**	**200**	**300**	**300**
Option C	**400**	**Closed**	**300**	**300**	**400**	**400**
S of 34°27'		**Limited Entry Fixed Gear**				
Option A	**2,000**	**Closed**	**2,000**	**2,000**	**2,000**	**2,000**
Option B (SQ)	**3,000**	**Closed**	**3,000**	**3,000**	**3,000**	**3,000**
Option C	**4,000**	**Closed**	**4,000**	**4,000**	**4,000**	**4,000**
		Open Access Fixed Gear				
Option A	**500**	**Closed**	**500**	**500**	**500**	**500**
Option B (SQ)	**750**	**Closed**	**750**	**750**	**750**	**750**
Option C	**1,000**	**Closed**	**1,000**	**1,000**	**1,000**	**1,000**

Bocaccio	**Limited Entry and Open Access Fixed Gear**					
40°10' to 34°27'						
Option A	**200**	**Closed**	**200**	**200**	**200**	**200**
Option B (SQ)	**300**	**Closed**	**300**	**300**	**300**	**300**
Option C	**400**	**Closed**	**400**	**400**	**400**	**400**
S of 34°27'			**Limited Entry Fixed Gear**			
Option A	**200**	**Closed**	**200**	**200**	**200**	**200**
Option B (SQ)	**300**	**Closed**	**300**	**300**	**300**	**300**
Option C	**400**	**Closed**	**400**	**400**	**400**	**400**
			Open Access Fixed Gear			
Option A	**50**	**Closed**	**50**	**50**	**50**	**50**
Option B (SQ)	**100**	**Closed**	**100**	**100**	**100**	**100**
Option C	**200**	**Closed**	**200**	**200**	**200**	**200**

Lingcod—Limited Entry and Open Access Fixed Gear

North of 40°10'

For all options: Evaluate zero to 20, 30, and 40 fm lines
Trip limits of 300 lbs/month to 1,000 lbs/month
Size limits of 0"-24" with size limits equal to the sport size limits

Option A 6 month season, May-Oct
Option B 8 month season, March-October
Option C 12 month season

40°10' to US-Mex

For all options: Evaluate zero to 20 and 30 fm lines
Open Access: Trip limits of 300 lbs/mo to 400 lbs/mo
Limited Entry: 400 lbs/mo
Size limits of 22"-24"

Option A 6 month season, May-Oct
Option B 10 month season, CLOSED March-April

Sablefish--Limited Entry and Open Access Fixed Gear

Analyze a year round fishery with the largest possible trip limits which would not be expected to exceed the OY.

Shortspine Thornyheads

S of 34°27'—Open Access Fixed Gear

Option A: 50 lbs/day and 1,000 lbs per 2 months
Optoin B: 200 lbs/day and 2,000 lbs per 2 months

S of 34°27'—Limited Entry Fixed Gear

Option A: 2,000 lbs per 2 months
Optoin B: 3,500 lbs per 2 months

Longspine Thornyheads--Limited Entry and Open Access Fixed Gear

S of 34°27'

Status quo.

Recreational Fishery

Management Lines

- Evaluate a management line at Point Arena.
- Consider use of existing lines at Pedro Point and Pigeon Point

Gear Regulations

Consider the following, along with any other restrictions that might enhance fishing opportunity.

- Consider requiring light weights (6 oz max) when fishing over greater than 20 fm
- No bait
- Hex bars
- Recompression release devices.

Washington Recreational

Ideal outcome: Maximize take of lingcod within current rockfish bag and minimizing take of yelloweye/canary rockfish.

Tools for analysis: in no particular order of importance. With commentary on reasoning.

1. Analyze lines at 22 fm, 25 fm, and 30 fm for shoreward impacts of canary/yelloweye. Ideally break down analysis into respective impacts based on coastal areas 1, 2, 3, 4. Lines may be appropriate for high/low OY options of yelloweye for inseason action.
2. Consider no retention of lingcod/rockfish outside of closure line with halibut onboard. Reduces targeting of lingcod in areas where impacts of overfished species are greatest.
3. Consider no retention of lingcod outside of closure line in any month. Impacts of species of concern are greater while targeting lingcod. This would allow fishing for abundant midwater or schooling rockfish deeper with greatly reduced impacts on canary/yelloweye. This could be especially effective between 22 fm and 50 fm.
4. Consider up to four fish retention of lingcod; with and without minimum size. Abundance of lingcod is extremely high, this could be tailored for use in areas with less canary/yelloweye impacts.
5. Designate more yelloweye conservation areas such as the one in northern WA. This would also lessen canary impacts.
6. Consider early closure lines with inseason liberalization, most impacts on species of concern occur before July 1. Effort shifts to salmon around the same time.
7. Consider status quo for areas with least impact on species of concern. Especially areas where enforceability is not as difficult.
8. Reopen discussion of halibut “boxes”, or hotspots where halibut could be targeted cleanly in conjunction with closure lines.

We are making the assumption that even at the high OY option for yelloweye rockfish, this is still the constraining stock for recreational, and crafting options to avoid canary would be redundant.

The push to increase lingcod take is solely a balancing measure to attract anglers, but does not mean that every person will take more. Commercial passenger fishing vessel catch of lingcod would increase little with proficient anglers giving away less fish and taking home more, perhaps giving the less successful angler more time to catch their own.

Public perception is everything in recreational fisheries, and negative press seems to cause more hardship and economic loss than many management measures. Most options here could be implemented with little impacts on catch per unit of effort (CPUE) for healthy stocks, while greatly reducing impacts on species of concern, but the economic hardship caused will be devastating. Current management measures have coastal communities struggling; these options are stopgap measures to keep this fishery open, not the new mean for a viable and stable economy.

The use of specific options for each OY of yelloweye at this time seems premature, suffice it to say we would like to see as little of these options used as possible.

Oregon Recreational

Option A: Year Round
8 marine fish bag limit
2 lingcod bag limit, min 24" limit
0-20 fathoms
Allow retention of canary and yelloweye

Option B: Year Round
6 marine fish bag limit
3-4 lingcod bag limit, min 22" limit
0-40 fathoms
Allow retention of canary and yelloweye with a sub-bag of 1 each

Option C: Year Round
5 marine fish bag limit
3-4 lingcod bag limit, no size limit
All depths, consider hotspot closures with yelloweye as the primary consideration
No retention of canary and yelloweye

Also Consider:

- benefits of recompression release devices
- an option with an opening to 30 fathoms
- rockfish bag limit reductions

California Recreational

The California recreational options include evaluation of the benefits of recompression release devices. The following should also be explored:

- Some retention of overfished species (e.g. first 10 rockfish/cabezon/greenling(RCG))

OR/CA Border to 40°10' Recreational

Year-round fishing
10 rockfish/cabezon/greenling bag limit (including canary and yelloweye)
2 or 3 lingcod bag limit, 22"-24" limit

Depth Restrictions	**Analyze mortalities related to the following depth restrictions, with and without recompression devices**					
	Jan-Feb	**Mar-Apr**	**May-Jun**	**Jul-Aug**	**Sep-Oct**	**Nov-Dec**
Option A	**0-20 fm**	**0-20 fm**	**0-20 fm**	**0-20 fm**	**0-20 fm**	**0-20 fm**
Option B	**0-30 fm**	**0-30 fm**	**0-30 fm**	**0-30 fm**	**0-30 fm**	**0-30 fm**
Option C	**0-40 fm**	**0-40 fm**	**0-40 fm**	**0-40 fm**	**0-40 fm**	**0-40 fm**

40°10' to 34°27' Recreational

Option A

July-Dec
10 RCG bag limit
2 lingcod bag limit, 24" limit
0-20 fathoms, no lingcod in December

Option B

Jan-Feb
10 RCG bag limit
2 or 3 lingcod bag limit, 22"-24" limit
0-30 fathoms, avoid canary hot spots outside 20 fathoms (to be defined)
July-Dec – same as Jan-Feb except
0-20 fathoms

Option C

Jan-May
10 RCG bag limit
2 or 3 lingcod bag limit, 22"-24" limit
0-40 fathoms, avoid canary hot spots outside 20 fathoms (to be defined) and/or use recompression release devices.
Jun-Dec – same as Jan-May except
0-30 fathoms

South 34°27’ Recreational

10 RCG bag limit
2 or 3 lingcod bag limit, 22”-24” limit
Scorpionfish open when rockfish open (5 fish bag)

	Jan-Feb	Mar-Apr	May-Jun	Jul-Aug	Sep-Oct	Nov-Dec
Option 1 (Status Quo)	**Closed**	**0-60 fm**	**0-60 fm**	**0-60 fm**	**0-30 fm**	**0-60 fm**
Option 2	**Closed**	**0-50 fm**	**0-50 fm**	**0-50 fm**	**0-30 fm**	**0-60 fm**
Option 3	**Closed**	**0-30 fm**	**0-30 fm**	**0-30 fm**	**0-30 fm**	**0-30 fm or Closed**

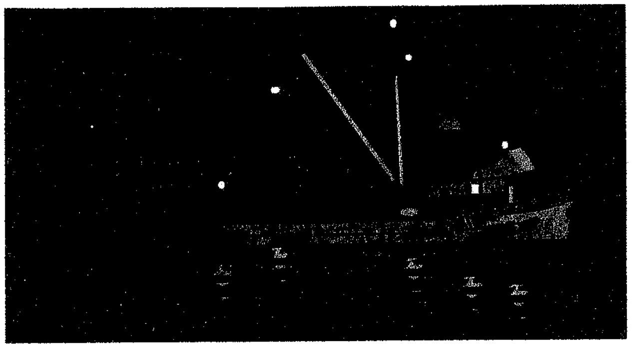
Processors/Trawlers Support for 2007-2008

Option 3

Subarea	Period	RCA Config INLINE	OUTLINE	Cumulative Limits Sable	Lspine	Sspine	Dover	O'flat	Petrale	Arrowtth	Slope Rock
North 40 10	Jan	75	200*	7,000	7,500	2,000	25,000	55,000	30,000	50,000	2,000
	Feb	75	200*	7,000	7,500	2,000	25,000	55,000	30,000	50,000	2,000
	2	75	200	14,000	15,000	4,000	50,000	110,000	30,000	100,000	4,000
	3	100	200	20,000	23,000	5,800	35,000	110,000	30,000	100,000	4,000
	4	100	200	20,000	23,000	5,800	35,000	110,000	30,000	100,000	4,000
	5	75	200	20,000	23,000	5,800	35,000	110,000	30,000	100,000	4,000
	6	75	200*	14,000	15,000	4,000	35,000	110,000	60,000	100,000	4,000
N 40 10: If SFFT gear used during period	Jan	75	200*	2,500	1,500	1,500	10,000	45,000	12,500	40,000	2,000
	Feb	75	200*	2,500	1,500	1,500	10,000	45,000	12,500	40,000	2,000
	2	75	200	7,000	3,000	3,000	28,000	90,000	25,000	80,000	4,000
	3	100	200	13,500	3,000	3,000	28,000	90,000	28,000	80,000	4,000
	4	100	200	13,500	3,000	3,000	28,000	90,000	28,000	80,000	4,000
	5	75	200	7,000	3,000	3,000	28,000	90,000	28,000	80,000	4,000
	6	75	200*	5,000	3,000	3,000	20,000	90,000	25,000	80,000	4,000
38 - 40 10	Jan	75	150	8,500	9,500	2,450	25,000	55,000	30,000	5,000	4,000
	Feb	75	150	8,500	9,500	2,450	25,000	55,000	30,000	5,000	4,000
	2	100	150	17,000	19,000	4,900	50,000	110,000	30,000	10,000	8,000
	3	100	150	17,000	19,000	4,900	35,000	110,000	30,000	10,000	8,000
	4	100	150	17,000	19,000	4,900	35,000	110,000	30,000	10,000	8,000
	5	100	150	17,000	19,000	4,900	35,000	110,000	30,000	10,000	8,000
	6	75	150	17,000	19,000	4,900	35,000	110,000	60,000	10,000	8,000
S 38	Jan	75	150	8,500	9,500	2,450	25,000	55,000	30,000	5,000	20,000
	Feb	75	150	8,500	9,500	2,450	25,000	55,000	30,000	5,000	20,000
	2	100	150	17,000	19,000	4,900	50,000	110,000	30,000	10,000	40,000
	3	100	150	17,000	19,000	4,900	35,000	110,000	30,000	10,000	40,000
	4	100	150	17,000	19,000	4,900	35,000	110,000	30,000	10,000	40,000
	5	100	150	17,000	19,000	4,900	35,000	110,000	30,000	10,000	40,000
	6	75	150	17,000	19,000	4,900	35,000	110,000	60,000	10,000	40,000

note: splitnose limits are equivalent to slope rock limits
petrale is a sublimit of other flatfish in periods 2-5
* means that petrale areas are open during the period

Agenda Item H.12.d
Supplemental Public Comment
November 2005



Independent Fish Filleter
Kelly Barnett
8365 Warren Street
Bay City, OR 97107
(503)377-0259
"have knife...will travel"

RECEIVED
OCT 25 2005
PFMC

To: Pacific Fishery Management Council
7700 N.E. Ambassador Place
Suite 200
Portland, OR 97220-1384

October 21, 2005

Council Members, Advisory Boards, Staff and all Interested Parties,

My name is Kelly Barnett I have worked many different jobs in my 18 years of commercial seafood processing as well as spending a third of my youth as a fishing boat deckhand. My father spent the majority of his working career as a commercial fisherman or a seafood processor. My sister spent her entire adult life as a seafood processor; she taught both my father and me how to fillet groundfish. My wife was seafood offloading dock foreman when I met her. Of the people mentioned in this paragraph I am the only one still living so I feel that I have earned a heritage in the seafood business, one that I would like to continue for the rest of my life and leave for the generations to come.

This is why I have decided to learn about the council and how it and all of the affiliated agencies operate. So when I lose the right to or the ability to survive in my chosen occupation, my heritage, at least I would have not gone out without presenting my opinions and those of my co-workers and friends who also want to continue living their chosen way of life.

The following letters are from some of those friends and co-workers in Garibaldi, Oregon, they would like them presented to the council.

Sincerely,

Kelly Barnett

OREGON GOURMET

OREGON GOURMET CRAB, INC.
606 Commercial
P.O. Box 484
Garibaldi, Oregon 97118
(503)322-2544 phone
(503)322-2544 fax

10-23-05

Pacific Fisheries Management Council
7700 NE Ambassador Suite 3200
Portland, Oregon

Dear Council members,

My name is Steve McGrath, I am the owner of Oregon Gourmet Crab, a seafood processing plant in Garibaldi Oregon. I am a Port Commissioner from Garibaldi as well. It is frustrating to say the least when we discuss Ground fish. Talking to the actual people who do the sampling measuring from Washington to California, you would think there is no problem. The wildlife biologists from Oregon and Washington, who I know, well tell me there is actually growth in our Black Rock species and today there is more than ever.

Talking directly, buying directly from licensed fisherman, they say the same. It's easier now to full Rockfish quotas than past years, Lingcod especially. To hear and see this, makes us wonder what information this council is receiving and from who.

The decision of the National Marine Fisheries last year to cut off ground fish days before Labor Day, the largest tourist day on our coastline was devastating. Over 529,000 dollars was lost to Garibaldi alone. This kind of timing decisions are truly uncalled for and are based on speculation at best.

As a Port commissioner to Garibaldi, it is difficult to see the economic impact on an already struggling portal city. Council members demand the facts, review the economic impact lives are at stake.

Sincerely

Steve McGrath

Joe & Siggi Gierga

October 2005

Pacific Fishery Management Council
San Diego, CA.

Ref. Ground fish management

Dear Council Members:

My name is Joe Gierga. I am 74 years old. I have been a Commercial Fisherman, a Charter Boat Captain and now a sport fisherman for more then forty years.
I was a member of the Ground Fish Advisory Panel in the early years of the Pacific Fishery Management Council representing the Oregon Charter Boat industry.
Having been involved in many different aspects of the fishery off the Oregon Coast, I consider myself knowledgeable enough to express my opinion on fishing issues.
When the council was formed all of us in the fishing community felt that it was over due. All of us were shocked and appalled what was happening to our fishing resource. Big trawlers from many foreign countries were invading and raping our fishing grounds.
We too felt that regulations had to be placed not only on the foreign fleets but also on big draggers with roller gear that destroyed much of the habitat. Such regulations were good for the fishery and for the resource.
Much of the species have recovered since and it is time to review what resource needs farther protection and what fishery can be opened for harvest again.
Speaking as a sport fisherman, I can not understand the current regulations that are in place now, especially the regulations pertaining to the Canary Rockfish as well as the Black Rockfish.
The sport fishery has never targeted canary Rockfish. Incidental catches have been small. For the sport fisherman to distinguish a school of Canaries from other midwater fish, is almost impossible considering the type of so called "fish finders" used on small boats.
Black Rockfish often caught in shallow water on sport gear have been the mainstay for the small boater. I too have fished for Black Rockfish many years and by many means.
I was also involved in different studies, offering my Charter boat to The Department of Fish and Wildlife for tagging purposes in years past.
It was determent then that it was impossible to estimate the biomass of this species that travels up and down the Northwest coast. Fish tagged off point Ledbetter in Washington were caught at Cape Lookout and Pacific City. Fish tagged of the Oregon coast have been caught of the Washington coast.

Can sport fishermen decimate a specie and wipe out a resource by catching one fish at a time?
Having limits is fine, having ridicules and changing limits that nobody can keep up with is not right. Why does Washington have different seasons and limits while fishing on the same biomass?

Please consider the economic effects you impose on our communities before you make any more mistakes.

Sincerely;
Joe Gierga

Joe Gierga

P. O. Box 829 Garibaldi, Or. 97118
Tel. (503) 322-2070 Fax: (503) 322-2526 Cell Phone: (503) 801-0968
E-Mail: siggi@oregoncoast.com

From : Garibaldi Charters <fishon@garibaldicharters.com>
Sent : Tuesday, October 18, 2005 7:49 AM
To : "kelly barnett" <kelly_barnett12@msn.com>
Subject : Re: PFMC Meeting in San Diego

Kelly,
I think we should emphasize the part of the Magnusson-Stevens act that deals with the economic impact on coastal areas. Constantly changing the rules has a deleterious effect on the local economy. Also ,more current information, like stock assessments more often, would be very helpful.
Mick & Linda
----- Original Message -----
From: "kelly barnett" <[illegible]>
To: <[illegible]>
Sent: Monday, October 17, 2005 7:38 AM
Subject: PFMC Meeting in San Diego

PO Box 844
Garibaldi, Or 97118
October 18, 2005

to whom it may concern,

We are northwest fishermen that have been severly affected by your recent change in the bottom fishing quotas. You have hurt us financially, putting our boats (three) into dry dock because of the low quotas. Someone is not properly assessing the fish stocks which we have complained of on numerous occasions. There are so many schools of black rock out there and such an abundance of fish that it takes us usually less than two hours to catch our limit of two hundred pounds. Each year they cut back more and more and even your scientists feel the count isn't correct. Several times we've offered our services to show you fellows the multiple fish schools out there with no response. Everyone takes notes at the meetings and does nothing but restrict us more and more. We feel its not financially benefit to sit around all summer to catch our few pitant quotas you've allowed us. You've made us ready to quit and sell our boats than to keep up our profession of fishing. You've hurt several of the businesses also in the area because they can't get the product due to the small quotas. Theres way too much retorick going around with nothing getting done. We've stopped going to the meetings because nothing ever comes out of them -- there mainly just political to keep everyone passified while you all do nothing. I think its time you make a change, get off your --- and take proper assessments with the folks that know where the fish are -- the fishermen.

1	2	3
Invader	Intruder	Intrepid
Or194VN	OR296AAY	OR569ABC

Sincerely,

Ellen Haley
Ken Jewell
Doug Ball
Judy Ball
Fisherman's Restaurant
Allen Baily

OREGON GOURMET

OREGON GOURMET CRAB, INC.
606 Commercial
P.O. Box 484
Garibaldi, Oregon 97118
(503)322-2544 phone
(503)322-2544 fax

10-23-05

Pacific Fisheries Management Council
7700 NE Ambassador Suite 3200
Portland, Oregon

Dear Council members,

My name is Patsy McGrath, I own a seafood processing plant in Garibaldi, Oregon. We buy from commercial fisherman on the west coast. I disagree with several decisions that have been made in the past years. Commercial fishing fleet catching rock fish, we are told that the fish are there. I know that observers have accompanied the fisherman at times to observe the fish. Did it ever occur to anyone that on these trips, they may not find the fish on purpose? It's a funny world today. I know that from what we are told the supplies are there and the fish are around. They have feeding habits like we do. Our ocean has more feed available now that it did 5 years ago. I understand that we need to monitor the Fishing Industry and I agree we need to protect the fish, but I also feel that you have not looked at the whole eco system. Our world has a balance system and I feel mankind has been changing the pattern of which fish and what amounts we keep, throwing that eco system off. The fish need each other to survive. We have altered that. By changing the quotas of certain fish being caught, we are changing the food chain for all fish. We need to go beyond the scientific data we use today. It's flawed and doesn't relate to today's fishing industry. The fishing industry has restricted areas for certain fish that the fish don't even migrate too.

In past years we've created laws to protect the fishing fleet and industry. The reality today is that it's now slowly eliminating the small fisherman.Truly I see that the ways the quotas are dispersed are inconsistent to the whole fleet. I feel it should be fair to all. Some get larger amounts than others. Fishing areas are not being regulated evenly. The scientific data is wrong. I feel we need to help the Fishing Industry today not destroy it. It begins with management. I feel we need to eliminate the excess and redo the scientific data base before we loose it all.

Sincerely

Patsy McGrath

To whom it may concern!

My wife and I have been Hook and Line fishing commercially for over the past 11 years, for Black Rockfish. We fish out of Garibaldi, Oregon. We do this primarily to supplement our Social Security.
We have a 200lb Daily limit and a variable monthly quota. The quota is stretched out over 12 months. We only fish from April to September, because of the Ocean conditions being unsafe and unreliable the other 6 months of the year. Why can't our quota be adjusted accordingly. Also, why is it that Salmon Trollers can catch 100lbs of Black rockfish after catching one salmon. These fish go on our quota. They don't catch these fish on salmon gear- they Hook and Line fish like we do. I can honestly say there are as many or more Black Rockfish in my area as were in 1994 when I started fishing for them commercially. I may be wasting my time in writing this letter, but I will any way.

Jack and Dee McGeever (503)322-0256
P.O. Box 102
Garibaldi, Oregon 97118
F/V MUK-MUK

Washington Trollers Association
PO Box 7431
Bellevue WA 98008
(360) 533 2069; Fax (360) 5380466
Doug Fricke, President

Washington Trollers Association

October 2, 2005

Mr. Don Hansen, Chairman
Pacific Fisheries Management Council
7700 NE Ambassador Place, Suite 200
Portland, OR. 97220

Subject: Incidental Ling Cod Allowance

Dear Don and Council Members:

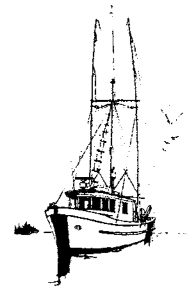
It has come to the attention of the Washington Trollers Association that the coastal ling cod resource is recovering to a status that will allow increasing the total allowable catch (TAC) of ling cod in the EEZ along the Washington coast. It is well documented that the salmon Trollers, while targeting 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 troll fisherman does not become a groundfish directed fishery.

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. Please do not think of this request as a targeted ling cod fishery because the allowance will be small as is the situation with the incidental landing allowance for yellowtail rockfish. A review of the yellowtail rockfish landings by the salmon trollers as an incidental by-catch will show that the individual salmon troller seldom lands his full allowance of yellowtail rockfish. This indicates that the salmon troller did not target yellowtail after completing his salmon targeting, but is merely retaining the yellowtail rockfish that he is incidentally encountering. We know that there is a Coast wide concern for the impacts on canary rockfish, but again, the landing allowance is tied to salmon targeting and will be small enough that there will be negligible incentive to target ling cod if in fact there is a correlation of canary rockfish to ling cod harvest. Thank you in advance for your consideration.

Sincerely,

Douglas H. Fricke
Doug Fricke, President



Cc: PFMC Executive Director – Don McIsaac
WDFW – Phil Anderson
WDFW – Michele Culver
WDFW- Brian Culver
Mark Cedergreen
Bob Alverson
Jim Harp
Don Stevens
Kathy Fosmark

MANAGEMENT RECOMMENDATIONS FOR 2007-2008 GROUNDFISH FISHERIES-PART II

This meeting marks the initiation of the Council management specifications and management measures decision-making process for 2007-2008 fisheries. The last stock assessments and rebuilding analyses were adopted for management use under agenda item H.2 and a range of optimum yields for each stock and stock complex was adopted under agenda item H.3 allowing for analysis of 2007-2008 harvest specifications. Under this agenda item, the Council should adopt or give guidance on a range of management measures designed to stay within the harvest specifications adopted under agenda item H.3.

The Council should attempt to give as much specific guidance on management measures as possible to facilitate informative impact analysis and preparation of a draft Environmental Impact Statement (DEIS) over the winter. The DEIS will help the Council develop a preferred suite of 2007-2008 management measures by next April, when a preferred EIS alternative needs to be decided. Helpful guidance would be a range of recreational and commercial allocations for key species such as canary rockfish; a range of season and area restrictions for the primary fishing sectors; a range of trip limits, daily-bag-limits, and other harvest control measures for key target and constraining bycatch species; a range of geographic or sector-specific harvest guidelines; and a sense of how far fisheries should be restricted in 2007-2008 to rebuild depleted species more quickly. The Council could give this specific direction under this agenda item or otherwise delegate the structuring of alternatives to the Groundfish Allocation Committee, which is tentatively scheduled to meet later in November and next January.

Council Action:

Adopt, or give guidance on, a preliminary range of management measures, including initial allocations.

Reference Materials:

None.

Agenda Order:

a. Agenda Item Overview — John DeVore
b. Report of the GMT — Susan Ashcraft
c. Reports and Comments of Advisory Bodies
d. Public Comment
e. **Council Action:** Adopt, or Give Guidance on, a Preliminary Range of Management Measures, Including Initial Allocations

PFMC
10/14/05

GROUNDFISH ADVISORY SUBPANEL REPORT ON FINAL CONSIDERATION OF INSEASON ADJUSTMENTS

2005

Petrale Sole

As an alternative to a complete closure of the trawl fishery in December to reduce impacts on Petrale, the Groundfish Advisory Subpanel (GAP) recommends eliminating all December trawl opportunities with the exception of the Dover sole, thornyheads, and sablefish deepwater complex (DTS) from 36º N. latitude to the US/Canada boder. The GAP believes that the net effect of this approach will be a greater reduction of impacts on Petrale than a complete December closure. South of 36º N. latitude the GAP recommends the same closure as above with the exception of the shoreward side of the 50 fathom line.

Closing all trawl opportunity in December would create an incentive for vessels to take all of their DTS landings and slope rockfish in November and incur the attendant incidental catch of Petrale sole. By leaving December open for DTS only, some of this effort would be shifted into December. With the Petrale and slope rockfish closure in place, Petrale impacts may be reduced as vessels fishing in December would have little incentive to fish near the seaward line of the Rockfish Conservation Area (RCA), where Petrale impacts would be greater than they would be at greater depths. If that same effort occurred in November, it is likely that more of the fishing would occur closer to the seaward line of the RCA. November impacts on Petrale could be mitigated with voluntary plant limits of zero on Petrale landings.

Safety is an additional issue. An early closure may cause safety concerns as vessels may be forced to fish in undesirable weather conditions in order to take their full DTS limits prior to the end of November.

2006

The GAP supports Groundfish Management Team (GMT) Option 3 for 2006. If the Council wishes to limit the limited entry bottom trawl fishery to stay within 8 mt of canary rockfish, the GAP recommends shifting the shoreward RCA boundary north of 40º 10’ N. latitude to 75 fm in Period 3.

The trawl members of the GAP urge that, if the final scorecard estimate for canary rockfish is below 8 mt, this does not set a precident leading to further erosion of the trawl canary rockfish management target.

PFMC
11/04/05

GROUNDFISH MANAGEMENT TEAM REPORT ON
FINAL CONSIDERATION OF INSEASON ADJUSTMENTS

In response to Council guidance, the Groundfish Management Team (GMT) examined several inseason management issues for the remainder of 2005 and for 2006. Management issues for 2005 focused on an analysis of fisheries that are projected to take petrale sole during December 2005. Management issues for 2006 are petrale sole and canary rockfish harvest in the limited entry trawl fishery, harvest level of darkblotched rockfish, and bycatch scorecard. Discussion of these management issues and recommendations for Council consideration are outlined below.

<u>FISHERIES PROJECTED TO TAKE PETRALE SOLE IN DECEBER 2005</u>

The GMT reviewed Pacific Fisheries Information Network (PacFIN) data to evaluate which fisheries are projected to have a take of petrale sole in December 2005.

The GMT believes that the following fisheries are projected to take petrale sole during December of 2005:

1. Limited entry bottom trawl seaward of the RCA

The GMT believes that the following fisheries are projected to take trace (less than 0.1 mt) amounts of petrale sole in December 2005:

1. Limited entry fixed gear and open access coastwide
2. California halibut, ridgeback prawn, sea cucumber (open access trawl)
3. Limited entry trawl south of 36º N. latitude shoreward of 50 fm

All other fisheries are projected to have a zero impact on petrale sole.

The GMT cautions that the expectation of a total fishery closure in December may result in a race for fish, which has the potential to increase the catch of petrale sole catch in November in excess of that would otherwise occur.

<u>LIMITED ENTRY TRAWL FISHERIES IN 2006</u>

Petrale Sole Limit in January and February

It is the GMT's goal to begin 2006 with sufficiently conservative management measures to avoid drastic harvest reductions and/or closures in the later part of the year. There is a possibility that the 2007 – 2008 Biennial Specifications and Management Measures may not be effective on January 1, 2007. Should this occur, conservative management measures for January and February of 2006 would facilitate any necessary harvest reductions that may be necessary in 2007 until the biennial specifications become effective. Dividing the current two-month cumulative period into two one-month periods would provide for implementation of less restrictive measures in February should that be warranted by the data. The GMT notes that the two one-month limits would be substantially higher than the one two-month limit.

The GMT analyzed additional options which would keep period 1 as one two-month limit in 2006 in case 2007 regulations are not in place beginning January 1, 2007. These two options can be characterized as 1) having the same amount of risk as the GMT's original preferred option (option 5 below) and 2) as having slightly more risk than the GMT's original preferred option

(option 4 below). In this case, risk is mostly characterized by the amount of petrale expected to be taken. The following tables show the predicted take in period 1 under these two new options.

TABLES 1 AND 2: PERIOD 1 IMPACTS UNDER LE TRAWL OPTIONS 4 AND 5

Period 1 Impacts for Option 5

species	North	South	Total
Arrowtooth	542.3	1.4	543.7
Dover	601.4	67.3	668.7
English	100.5	43.9	144.4
Longspine	24.4	49.7	74.0
Other flat	121.1	75.0	196.1
Petrale	348.8	26.4	375.2
Sablefish	341.8	69.8	411.6
Slope Rock	38.7	31.3	70.0
Shortspine	71.6	25.5	97.1
Canary	0.3	0.1	0.4
POP	16.2	0.0	16.2
Darkbltch	21.1	1.9	23.0
Widow	0.3	0.0	0.3
Yelloweye	0.0	0.0	0.0
Bocaccio	0.0	1.2	1.2
Cowcod	0.0	0.1	0.1

Period 1 Impacts for Option 4

Species	North	South	Total
Arrowtooth	542.3	1.4	543.7
Dover	847.8	103.2	951.0
English	100.5	43.9	144.4
Longspine	24.4	52.3	76.7
Other flat	121.1	75.0	196.1
Petrale	406.1	26.4	432.5
Sablefish	341.8	69.8	411.6
Slope Rock	38.7	31.3	70.0
Shortspine	71.6	28.4	100.0
Canary	0.4	0.1	0.5
Pop	19.3	0.0	19.3
Darkblotch	25.1	2.2	27.3
Widow	0.4	0.0	0.4
Yelloweye	0.0	0.0	0.0
Bocaccio	0.0	1.3	1.3
Cowcod	0.0	0.1	0.1

The GMT continues to support the original option 3 (as detailed in the Supplemental GMT Report H.4.b.) which splits period 1 into two one-month limits. The GMT believes this option provides management flexibility which would allow the Council to effectively prosecute 2006 OYs, while hedging against the risk of attaining catch levels in early 2007, which could negatively impact the 2007 fishery later in the year. If the Council wishes to keep the limited entry bottom trawl fishery projection within 8.0 mt, then the GMT recommends a modified option 3 which adjusts the shoreward boundary of the RCA north of 40º 10' latitude to 75 fathoms in period 3.

Option 4 Cumulative limits and RCA boundaries

		RCA Config		Cumulative Limits							
Subarea	Period	INLINE	OUTLINE	Sable	Lspine	Sspine	Dover	O'flat	Petrale	Arrowtth	Slope Rock
N 40 10	1	75	200*	16,000	15,000	4,000	50,000	110,000	45,000	100,000	4,000
	2	75	200	16,000	15,000	4,000	50,000	110,000	30,000	100,000	4,000
	3	75	200	20,000	23,000	6,000	35,000	110,000	30,000	100,000	4,000
	4	100	200	20,000	23,000	6,000	35,000	110,000	30,000	100,000	4,000
	5	75	200	20,000	23,000	6,000	35,000	110,000	30,000	100,000	4,000
	6	75	200*	16,000	15,000	4,000	35,000	110,000	80,000	100,000	4,000
	1	75	200*	5,000	3,000	3,000	28,000	110,000	25,000	60,000	4,000
N 40 10:	2	75	200	10,000	3,000	3,000	28,000	110,000	30,000	60,000	4,000
If SFFT	3	75	200	10,000	3,000	3,000	28,000	110,000	30,000	60,000	4,000
gear used	4	100	200	10,000	3,000	3,000	28,000	110,000	30,000	60,000	4,000
during	5	75	200	10,000	3,000	3,000	28,000	110,000	30,000	60,000	4,000
period	6	75	200*	5,000	3,000	3,000	28,000	110,000	25,000	60,000	4,000
38 - 40 10	1	75	150	18,000	20,000	5,000	50,000	110,000	45,000	10,000	8,000
	2	100	150	18,000	20,000	5,000	50,000	110,000	30,000	10,000	8,000
	3	100	150	18,000	20,000	5,000	35,000	110,000	30,000	10,000	8,000
	4	100	150	18,000	20,000	5,000	35,000	110,000	30,000	10,000	8,000
	5	100	150	18,000	20,000	5,000	35,000	110,000	30,000	10,000	8,000
	6	75	150	18,000	20,000	5,000	35,000	110,000	80,000	10,000	8,000
S 38	1	75	150	18,000	20,000	5,000	50,000	110,000	45,000	10,000	40,000
	2	100	150	18,000	20,000	5,000	50,000	110,000	30,000	10,000	40,000
	3	100	150	18,000	20,000	5,000	35,000	110,000	30,000	10,000	40,000
	4	100	150	18,000	20,000	5,000	35,000	110,000	30,000	10,000	40,000
	5	100	150	18,000	20,000	5,000	35,000	110,000	30,000	10,000	40,000
	6	75	150	18,000	20,000	5,000	35,000	110,000	80,000	10,000	40,000

Option 5 Cumulative limits and RCA boundaries

Subarea	Period	RCA Config INLINE	OUTLINE	Cumulative Limits Sable	Lspine	Sspine	Dover	O'flat	Petrale	Arrowtth	Slope Rock
N 40 10	1	75	200*	16,000	15,000	4,000	30,000	110,000	30,000	100,000	4,000
	2	75	200	16,000	15,000	4,000	28,000	110,000	30,000	100,000	4,000
	3	75	200	20,000	23,000	5,000	28,000	110,000	30,000	100,000	4,000
	4	100	200	20,000	23,000	5,000	30,000	110,000	30,000	100,000	4,000
	5	75	200	20,000	23,000	5,000	30,000	110,000	30,000	100,000	4,000
	6	75	200*	16,000	15,000	4,000	80,000	110,000	100,000	100,000	4,000
N 40 10: If SFFT gear used during period	1	75	200*	5,000	3,000	3,000	30,000	110,000	30,000	60,000	4,000
	2	75	200	10,000	3,000	3,000	28,000	110,000	30,000	60,000	4,000
	3	75	200	10,000	3,000	3,000	28,000	110,000	30,000	60,000	4,000
	4	100	200	10,000	3,000	3,000	30,000	110,000	30,000	60,000	4,000
	5	75	200	10,000	3,000	3,000	30,000	110,000	30,000	60,000	4,000
	6	75	200*	5,000	3,000	3,000	30,000	110,000	30,000	60,000	4,000
38 - 40 10	1	75	150	18,000	19,000	4,500	30,000	110,000	30,000	10,000	8,000
	2	100	150	18,000	19,000	4,500	28,000	110,000	30,000	10,000	8,000
	3	100	150	18,000	19,000	4,500	28,000	110,000	30,000	10,000	8,000
	4	100	150	18,000	19,000	4,500	30,000	110,000	30,000	10,000	8,000
	5	100	150	18,000	19,000	4,500	30,000	110,000	30,000	10,000	8,000
	6	75	150	18,000	19,000	4,500	80,000	110,000	100,000	10,000	8,000
S 38	1	75	150	18,000	19,000	4,500	30,000	110,000	30,000	10,000	40,000
	2	100	150	18,000	19,000	4,500	30,000	110,000	30,000	10,000	40,000
	3	100	150	18,000	19,000	4,500	30,000	110,000	30,000	10,000	40,000
	4	100	150	18,000	19,000	4,500	30,000	110,000	30,000	10,000	40,000
	5	100	150	18,000	19,000	4,500	30,000	110,000	30,000	10,000	40,000
	6	75	150	18,000	19,000	4,500	80,000	110,000	100,000	10,000	40,000

DARKBLOTCHED ROCKFISH IN 2006

The GMT recognizes that a proposed OY of 200 mt for 2006 represents a status-quo approach to current management measures for darkblotched rockfish (based on the most recent bycatch scorecard estimate of 185 mt for 2005, with a small buffer to account for uncertainty). The 2005 assessment for darkblotched rockfish suggests that the spawning output has more than doubled since 1999 (from 8% to 17% of the unfished level). The most recent rebuilding analysis suggests that the median time to rebuild the stock under status quo management (based on the harvest rate associated with the 2005 bycatch scorecard catch estimate) is by 2010.2. The projected median time to rebuild associated with the 2005 OY harvest rate (269 mt in 2005; 294 mt in 2006 with the increase in 2006 based on current stock assessment projections) is by 2010.5. The addition of the fraction of a year is important, as the difference between rebuilding with no harvest (2009.5) and rebuilding by these median times is one year or less.

Ttarget in the FMP	Median Time to Rebuild	Fraction of time between Tmin and Tmax (re-est)	2006 OY (mt)	Comment
2030	2009.5	0.00	0	Tmin
	2009.9	0.02	130	The 2001 OY value
	2010.2	0.03	219	Status quo (bycatch scorecard) harvest rate
	2010.5	0.04	294	Current (2005 OY) harvest rate
	2033	1.00	696	Pmax of 50%

BYCATCH SCORECARD

The attached scorecard represents best estimate of mortality prior to the November inseason action and will be updated to reflect actions taken under this agenda item.

GMT RECOMMENDATIONS UNDER H.13:

1. Provide guidance to address overfishing on petrale sole for December 2005

2. Adopt changes to management measures for limited entry trawl (including RCA boundaries and cumulative trip limits) for 2006
3. Consider establishing a reserve in the scorecard for canary rockfish in the limited entry bottom trawl fishery, and specify the amount.

GMT RECOMMENDATIONS FOR FINAL ADOPTION BASED ON ACTIONS TAKEN UNDER H.4:

For 2005:

4. Implement adjustments in the Oregon recreational ocean and estuary boat fisheries (40 fm seaward boundary of the recreational RCA, prohibit retention of black rockfish) to conform with state adjustments implemented in October, effective through December 31, 2005.
5. Adopt corrected recreational regulations for California (as detailed in H.4.b Supplemental GMT Report)

For 2006:

6. Increase limits for lingcod in the coastwide for the limited entry trawl fishery to 1,200 lbs per two months (for all gear types).
7. Adjust limited entry fixed gear and open access non-trawl gear DTL fishery for sablefish north of 36º N. latitude contained in Option 1 (H.4.b Supplemental GMT Report) to 300 lb per day, 1,000 lb per week, and 5,000 lb per month.
8. Adjust shelf rockfish, shortbelly, and widow rockfish limits south of 34º27' N lat. as follows: 3,000 lb per two months for limited entry fixed gear, and 750 lb per two months for open access non-trawl gear
9. Increase limited entry fixed gear and open access fixed gear black rockfish limits between 40º10' N lat. and 42º to 6,000 lb per two months
10. Remove the 30 fm depth closure in the Washington recreational fishery, beginning January 1, 2006.
11. Adopt recreational regulations for Oregon and California (as detailed in H.4.b Supplemental GMT Report)

GMT RECOMMENDATIONS

1. Provide guidance to address overfishing on petrale sole for 2005.
2. Adopt changes to trawl RCA boundaries
3. Adopt changes to trawl cumulative limits for sablefish, thornyheads, Dover sole, petrale sole, other flatfish, arrowtooth, slope rockfish, and splitnose
4. Consider establishing a reserve in the scorecard for canary rockfish in the limited entry bottom trawl fishery, and specify the amount.

PFMC
11/04/05

TRIBAL REPORT ON FINAL CONSIDERATION OF INSEASON ADJUSTMENTS

The Makah Tribe met with National Marine Fisheries Service and the Washington Department of Fish and Wildlife and determined that their anticipated additional catch would not constitute a conservation concern for the stock. The Tribe anticipates no more than 20 mt of additional catch for the months of November and December. This represents an upper bound based on estimated effort from three vessels and accounting for weather concerns. The amount of catch that would approximate an equal treaty/non-treaty sharing is hard to quantify for this species given the diversity of the fleet, seasonal targeting strategies, and ports of landing. The Tribe notes, however, that 19%-20 % of the optimum yield (OY) was landed into Washington in the last two years. Estimated catch for 2005 would be less than 1.5 % of the OY.

For 2006 the Makah Tribe will work with the Groundfish Allocation Committee and Groundfish Management Team to estimate impacts pre-season. The tribes are not seeking a specific set aside or harvest guideline at this time.

PFMC
11/04/05

Agenda Item H.13
Situation Summary
November 2005

FINAL CONSIDERATION OF INSEASON ADJUSTMENTS, IF NECESSARY

Consideration of inseason adjustments to ongoing and upcoming groundfish fisheries is a two-step process at this meeting. The Council will meet on Wednesday, November 2, 2005 and consider advisory body and public advice on inseason adjustments under Agenda Item H.4. If the Council elects to make final inseason adjustments under Agenda Item H.4, then the Council task under this agenda item is to clarify and/or confirm these decisions. Otherwise, the Council task under this agenda item is to consider advisory body advice and public comment on the status of ongoing 2005 groundfish fisheries and recommended inseason adjustments for the ongoing 2005 or upcoming 2006 groundfish fisheries prior to adopting final 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. Agenda Item Overview — John DeVore
b. Report of the GMT — Susan Ashcraft
c. Reports and Comments of Advisory Bodies
d. Public Comment
e. **Council Action:** If Necessary, Adopt or Confirm Final Inseason Adjustments for the 2005 and 2006 Groundfish Fisheries

PFMC
10/12/05

Assessment of Lingcod
(*Ophiodon elongatus*)

for the

Pacific Fishery Management Council

in 2005

by

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October 2005

Executive Summary

Stock

This assessment applies to lingcod (*Ophiodon elongatus*) in the full Pacific Fishery Management Council (PFMC) management zone (the US-Vancouver, Columbia, Eureka, Monterey, and Conception INPFC areas). Separate assessment models were constructed to describe population trends in the northern (LCN: US-Vancouver, Columbia) and southern (LCS: Eureka, Monterey, Conception) areas.

Catches

Commercial Landings

Commercial lingcod catch history in California waters is available beginning 1916 (personal communication Brenda Erwin, PSMFC) and averaged 428 mt between 1916 and 1955 (Table 4). Commercial lingcod landings in Oregon were first reported in 1950 (Mark Freeman, personal communication) and averaged 264 mt between 1950 and 1953. Washington commercial lingcod landings were first reported in 1937 (anonymous, 1956, WDFW report) and averaged 106 mt until 1955.

Catch data were compiled from agency reports and personal communication for all years preceding 1981 (Table 5). The PacFIN database was queried for catch information in subsequent years and catch detail is presented by gear and INPFC area in Table 6.

Commercial landings peaked in 1985 at 3,129 mt in northern waters (Columbia and Vancouver INPFC areas) and in 1974 at 1,735 mt in southern waters (Eureka, Monterey and Conception INPFC Areas)(Table 5). Average catch between 1990-1997 declined 40 % and 35% since the 1980's in northern and southern waters, respectively. Under rebuilding management, commercial fishery restrictions in recent years (1998-present) reduced coastwide catches to an annual average of less than 225 mt (Figure 3).

From 1981-1997, trawl gear has made up the majority of commercial landings for the northern (83%) and southern (63%) coast. In recent years (1998-2004), commercial fishery restrictions constrained the trawl portion of the commercial catch to 65% and 40% for the northern and southern coast, respectively. In 2004, coastwide commercial landings totaled 174 mt and were distributed as follows by INPFC area: U.S.-Vancouver (41.7 mt), Columbia (44.6 mt) , Eureka 39.5 mt), Monterey (33.2 mt), Conception (14.8 mt).

Recreational Landings

Recreational fishers in California have targeted lingcod since the early 1940's. Catch averaged 65.3 mt annually between 1947-1954 (Leet et al., 1992). Recreational lingcod catch information is not available until 1977 for Oregon waters and averaged 52.3 mt annually between 1977 and 1979. Recreational lingcod catch in Washington was first estimated in 1967 to be 25.3 mt and annual catch estimates have been provided since 1975.

Recreational catch estimates were extracted from the RecFIN database for years 1980–1989 and 1993 to present for California waters. California recreational catch estimates for all other years were previously compiled in the 2000 lingcod assessment (Jagielo et al., 2000). Oregon recreational catch data were provided by ODFW (Don Bodenmiller personal communication). The recreational catch in Washington was provided by the WDFW Ocean Sampling Program.

Recreational catch in southern waters has declined since catch peaked in 1980 at 2,226 mt (Table 5, Figure 4). In contrast, recreational catch in northern waters peaked at 236 mt in 1994. Estimated coastwide recreational landings averaged 500 mt. from 1998-2004 and were 1175 mt. and 316 mt. in 2003 and 2004, respectively.

Historically, recreational landings have comprised a larger proportion of the total landings for the southern area, compared to the northern area. In recent years, the recreational portion of the total landings has increased substantially in both the southern and northern areas. In 2004 recreational fisheries harvested 65% of the total lingcod catch coastwide (Figure 5).

Data and Assessment

Present Modeling Approach and Assessment Program

The present assessment updates the previous coastwide assessment (Jagielo et al. 2003) and is implemented in Stock Synthesis II using the executable code SS2 version 1.19d (Methot 2005).

As in the previous assessment, separate age structured models were constructed to analyze stock dynamics for the northern (LCN: US-Vancouver, Columbia) and southern (LCS: Eureka, Monterey, Conception) areas.

The LCN model incorporated the following likelihood components, which are described mathematically in Methot 2005). Input data sources are specified by Table number in the body of the 2003 assessment document which follows:

1) Commercial Catch-At-Age: 1979-2004 (Table 9, Table 15).
2) Recreational Catch-At-Age: 1980, 1986-2004 (Table 10, Table 15).
3) Commercial Catch-At-Length: 1975-1978 (Table 13).
4) Recreational Catch-At-Length: 1981-1983 (Table 13).
5) NMFS Trawl Survey Catch-At-Age: 1992, 1995, 1998, 2001, and 2004 (Table 11).
6) NMFS Trawl Survey Catch-At-Length: 1986 and 1989 (Table 12).
7) WDFW Tag Survey Catch-At-Age: 1994-1997 (Table 11).
8) WDFW Tag Survey Catch-At-Length: 1986-1993 (Table 12).
9) NMFS Trawl Survey Biomass (mt): 1977, 1980, 1983, 1986, 1989, 1992, 1995, 1998, 2001 (Table20) and 2004 (Table 21).
10) WDFW Tag Survey Abundance (Numbers of Fish): 1986-1992 (Table 22).

NOTE: THIS DATASET WAS OMITTED IN FINAL BASE MODEL AT THE REQUEST OF THE STAR PANEL CONDUCTED AUGUST 15-19, 2005.

11) Trawl Fishery Logbook CPUE Index: Washington and Oregon lingcod CPUE estimates (lbs/hr) derived from a Delta GLM analysis of trawl logbook information, 1976-1997 (Table 24).

The LCS model incorporated the following likelihood components:

1) Commercial Catch-At-Age: 1992-1998, 2000-2004 (Table 14, Table 15).
2) Recreational Catch-At-Age: 1992-1998, 2000-2004 (Table 14, Table 15).
3) NMFS Trawl Survey Catch-At-Age: 1995, 1998, 2001, and 2004 (Table 14, Table 15).
4) NMFS Trawl Survey Biomass (mt): 1977, 1980, 1983, 1986, 1989, 1992, 1995, 1998, 2001 (Table20) and 2004 (Table 20, Table 21).
5) Trawl Fishery Logbook CPUE Index: Oregon and California lingcod CPUE estimates (lbs/hr) derived from a Delta GLM analysis of trawl logbook information, 1978-1997 (Table 25).

Unresolved Problems and Major Uncertainties

At the STAR Panel review (August 15-19, 2005) concern was raised regarding the apparent lack of evidence in the data for the northern (LCN) model estimates of high 1999 and 2000 year class strength. In particular, doubts were raised concerning the reliability of the 2001 and 2004 NMFS triennial survey estimates, in which these two year classes were abundant. Furthermore, the STAR Panel did not find compelling evidence from the fishery age composition data to corroborate the high year classes seen in those two surveys. As a result of these uncertainties, the lingcod assessment was recommended for further review at the follow-up STAR Panel meeting (September 26-30, 2005).

At the follow-up STAR Panel meeting, additional analyses and information were provided to document the LCN model estimates of high 1999 and 2000 year class strength. Additional model runs with sequential removal of the 2001 and 2004 NMFS trawl surveys, and age compositions from the commercial and recreational fisheries from 2000-2004 indicted that both survey and commercial data supported the two strong year classes. As a result, the STAT Team recommended and the STAR Panel approved the base LCN model for management.

The STAT team very much appreciated the constructive August 15-19, 2005 and September 26-30 STAR Panel reviews, which resulted in improved LCN and LCS models for fisheries management.

The STAT team additionally notes that:

1) Uncertainty regarding stock status is higher for the southern area relative to the northern area, primarily because historical data from the southern area were sparse relative to the northern area. The time series of fishery age data available for the southern (LCS) model is short and samples sizes are small, resulting in greater uncertainty in the estimation of assessment parameters and stock productivity for the southern area. Age data for the NMFS trawl survey were sparse for both regions in early years, but particularly for the southern region. Recreational fishery catch at age data were not available for the southern region in 2003.

2) Management-implemented minimum size limits have resulted in limiting the utility of fishery information for estimation of recent stock recruitment in both regions, and fishery trip limits have compromised the utility of recent fishery CPUE data as viable indices of abundance.

Management Reference Points

Management reference points derived from the 2005 lingcod stock assessment are summarized in Table ES-1. The estimates of unfished spawning biomass (Bzero) were determined as the product of mean recruitment from 1956-2005 and the estimated Spawners Per Recruit. On a coastwide basis the lingcod population is fully rebuilt; estimated spawning biomass was 34,017 mt in 2005, which is 0.60 of the unfished spawning biomass estimate (52,850 mt). The estimated ratio of 2005 spawning biomass to unfished spawning biomass is higher in the north (0.87) compared to the south (0.24).

Spawning Stock Biomass

SS2 estimates of the coastwide female spawning stock biomass declined from 60,106 mt in 1956 to 6,004 mt in 1994, and subsequently increased to 34017 mt in 2005 (Table ES-2, Figure ES1-Top). Female spawning biomass depletion (B_0/B_t) fell to 0.11 in 1994 and subsequently increased to 0.64 in 2005 (Table ES-2, Figure ES1-Bottom).

Recruitment

The model estimate of virgin recruitment was higher for the northern area (3750 thousand age 0 fish) compared to the southern area (2503 thousand age 0 fish). Recruitments were generally similar in magnitude in both the north and south from 1972-1992, averaging 2008 in the north, and 2071 in the south (Table ES-2. Figure ES-1, bottom). Subsequently, from 1993-2005, recruitments tended to be higher in the north, and averaged 4503 compared to 1309 for the same period in the south. Recent, historically strong, 1999 and 2000 year classes were estimated in the north.

Exploitation Status

In the northern area, the exploitation rate (catch/available biomass) peaked at 0.20 in 1991 and averaged 0.03 from 1956-1980, 0.12 from 1981-1997, and 0.02 from 1998-2005 (Table ES-3). Exploitation rates were generally higher in the southern area, peaking at 0.26 in 1989 and averaging 0.05 from 1956-1980, 0.20 from 1981-1997, and 0.10 from 1998-2005.

Management Performance

The first lingcod ABC's based on a quantitative assessment were implemented in 1995. A comparison of reported landings and ABC values shows good correspondence through 2001, when landings were typically at or below the target ABC values (Figure ES2). In 2002, landings exceeded the coastwide ABC by 17% and the coastwide OY was exceeded by 51%.

Forecasts and Decision Table

Projected yield was forecasted using the SS2 software for the northern (LCN) and southern (LCS) base models (Table ES-4). Coastwide yield forecasts (sum of LCN and LCS) are summarized in Table ES-5. Forecasts were run with and without the 40:10 adjustment option. These forecasts assumed that fishery removals in 2005 and 2006 were taken at the level projected by the Groundfish Management Team for 2005 (970mt) (John Devore, Personal Communication).

Additional model forecast runs were made for a set of alternative conditions to establish decision tables. For LCN, the decision table was constructed with the base model and one alternate model in which both: 1) the NMFS 2001 and 2004 shelf triennial trawl survey data were omitted, and 2) the age composition data for the recreational and commercial fishery were omitted for the years 2000 through 2004 (Table ES-6). For LCS, the decision table was constructed with the base model and two alternate models (Table ES-7). The first "low" alternate model assumed that spawning biomass in 2005 was approximately 1.25 standard deviations below the base model estimate of spawning biomass in 2005 (3375 mt); the second "high" alternate model assumed that spawning biomass in 2005 was approximately 1.25 standard deviations above the base model estimate of spawning biomass in 2005 (5827 mt).

In both decision tables (Table ES-6 and Table ES-7), the base case model using the base case catch projection is highlighted with a bold outline. The additional cells in the decision tables contrast the results obtained when the models are run with catch projections from the alternate (State of Nature) models. For instance, in the northern area, when base model projected catches are used with the alternate State of Nature model, a depletion level of 0.27 is predicted in the year 2016 (Table ES-6). In the southern area, the predicted depletion level of 0.39 in the year 2016 results when the "high" ending biomass model catches are applied to the "low" ending biomass State of Nature model (Table ES-7).

Recommendations: Research and Data Collection Needs

Emphasis should be placed on improving fishery age structure sampling size and geographical coverage in both regions. More frequent and synoptic fishery independent surveys should be conducted in both regions to aid in determination of stock status and recent recruitment.

Table ES1. Management reference points derived from the 2005 lingcod stock assessment.

Northern (LCN)	Base model
B2005 (mt)	29416
Rinit (Thousands)	3750
Spawners Per Recruit	10.52
Rmean56-05 (Thousands)	3207
Bzero (mt)	33749
Depletion	0.87
Southern (LCS)	**Base model**
B2005 (mt)	4601
Rinit (Thousands)	2503
Spawners Per Recruit	9.43
Rmean56-05 (Thousands)	2025
Bzero (mt)	19101
Depletion	0.24
Coastwide	**Base models-Pooled**
B2005 (mt)	34017
Bzero (Thousands)	52850
Depletion	0.64

Table ES2. Estimates of lingcod spawning biomass, depletion, and recruitment (1956-2005), derived from the 2005 lingcod stock assessment.

	Spawning Biomass (mt)			Depletion			Recruitment-Age 0 (Thousands)		
Bzero:	33749	19101	52850						
Year	LCN	LCS	Coastwide	LCN	LCS	Coastwide	LCN	LCS	Coastwide
1956	38357	21749	60106	1.14	1.14	1.14	3747	2497	6244
1957	37696	21500	59196	1.12	1.13	1.12	3745	2496	6241
1958	36979	20998	57977	1.10	1.10	1.10	3743	2494	6237
1959	36181	20480	56660	1.07	1.07	1.07	3740	2493	6233
1960	34816	20046	54862	1.03	1.05	1.04	3736	2491	6227
1961	33381	19675	53057	0.99	1.03	1.00	3731	2489	6220
1962	32166	19304	51470	0.95	1.01	0.97	3726	2488	6214
1963	31513	19065	50578	0.93	1.00	0.96	3724	2487	6210
1964	31280	18854	50134	0.93	0.99	0.95	3723	2486	6208
1965	30866	18781	49647	0.91	0.98	0.94	3721	2485	6206
1966	30281	18737	49018	0.90	0.98	0.93	3719	2485	6204
1967	29522	18700	48221	0.87	0.98	0.91	3715	2485	6200
1968	29283	18639	47922	0.87	0.98	0.91	3714	2485	6199
1969	28785	18539	47324	0.85	0.97	0.90	3712	2484	6196
1970	28723	18458	47181	0.85	0.97	0.89	3711	2484	6195
1971	28946	18228	47174	0.86	0.95	0.89	3712	2483	6195
1972	29065	17758	46823	0.86	0.93	0.89	3375	2480	5855
1973	29236	16829	46065	0.87	0.88	0.87	1176	2475	3652
1974	29073	15671	44744	0.86	0.82	0.85	2706	2468	5174
1975	28628	14435	43063	0.85	0.76	0.81	1515	2460	3975
1976	27545	13407	40952	0.82	0.70	0.77	1326	3967	5293
1977	26402	12480	38882	0.78	0.65	0.74	2318	1099	3417
1978	24918	12195	37113	0.74	0.64	0.70	2477	1227	3704
1979	23504	11994	35498	0.70	0.63	0.67	6619	5522	12141
1980	21260	11539	32800	0.63	0.60	0.62	1539	1403	2942
1981	19384	9664	29049	0.57	0.51	0.55	955	586	1541
1982	18112	8393	26505	0.54	0.44	0.50	1442	483	1925
1983	17140	7626	24766	0.51	0.40	0.47	1244	928	2172
1984	15700	7063	22763	0.47	0.37	0.43	1972	5487	7459
1985	13790	6212	20002	0.41	0.33	0.38	1298	1124	2422
1986	11454	5108	16562	0.34	0.27	0.31	2576	4621	7198
1987	10562	4512	15074	0.31	0.24	0.29	282	514	796
1988	9524	4384	13908	0.28	0.23	0.26	986	578	1563
1989	8615	4270	12885	0.26	0.22	0.24	1610	1581	3191
1990	7296	3934	11230	0.22	0.21	0.21	1357	1664	3021
1991	6328	3397	9725	0.19	0.18	0.18	2589	2015	4604
1992	4796	2720	7515	0.14	0.14	0.14	2806	800	3605
1993	4266	2255	6522	0.13	0.12	0.12	1120	1500	2620
1994	3864	2141	6004	0.11	0.11	0.11	3841	1067	4908
1995	3924	2226	6150	0.12	0.12	0.12	3607	985	4592
1996	4449	2215	6664	0.13	0.12	0.13	1694	2606	4300
1997	5034	2145	7179	0.15	0.11	0.14	1666	314	1979
1998	5886	2075	7961	0.17	0.11	0.15	4601	860	5462
1999	7245	2331	9576	0.21	0.12	0.18	11733	2016	13750
2000	8675	2630	11306	0.26	0.14	0.21	12945	1587	14532
2001	10702	3099	13801	0.32	0.16	0.26	3320	1750	5070
2002	13758	3558	17316	0.41	0.19	0.33	3552	1106	4658
2003	18370	3859	22229	0.54	0.20	0.42	3434	788	4221
2004	24077	3919	27996	0.71	0.21	0.53	3318	1075	4393
2005	29416	4601	34017	0.87	0.24	0.64	3715	1362	5076

Table ES3. Estimates of exploitation rate derived from the 2005 lingcod stock assessment.

Year	LCN Exploitation Rate	LCS Exploitation Rate
1956	0.016	0.018
1957	0.018	0.029
1958	0.021	0.029
1959	0.035	0.026
1960	0.039	0.024
1961	0.037	0.026
1962	0.027	0.021
1963	0.020	0.022
1964	0.027	0.017
1965	0.033	0.018
1966	0.039	0.019
1967	0.028	0.021
1968	0.036	0.023
1969	0.026	0.023
1970	0.020	0.031
1971	0.023	0.043
1972	0.022	0.068
1973	0.031	0.083
1974	0.037	0.093
1975	0.050	0.088
1976	0.043	0.090
1977	0.046	0.055
1978	0.040	0.066
1979	0.065	0.092
1980	0.063	0.193
1981	0.064	0.164
1982	0.079	0.178
1983	0.115	0.151
1984	0.128	0.139
1985	0.149	0.171
1986	0.074	0.152
1987	0.098	0.195
1988	0.109	0.226
1989	0.161	0.262
1990	0.146	0.261
1991	0.204	0.252
1992	0.130	0.256
1993	0.156	0.233
1994	0.131	0.191
1995	0.092	0.198
1996	0.097	0.198
1997	0.085	0.206
1998	0.049	0.125
1999	0.037	0.131
2000	0.011	0.062
2001	0.009	0.057
2002	0.009	0.103
2003	0.006	0.158
2004	0.008	0.039

Table ES4. Projected yield for the LCN Base Model (Top) and LCS Base Model (Bottom).

LCN Base Model

FORECAST:_Without_40:10

year	4010	bio-all	SpawnBio	recruit-0	Yield	ABC
2007	1	56321	36250	3741	5830	5830
2008	1	52212	34135	3734	5025	5025
2009	1	48734	31802	3725	4473	4473
2010	1	45743	29533	3715	4058	4058
2011	1	43170	27454	3705	3741	3741
2012	1	40976	25614	3694	3484	3484
2013	1	39145	24046	3684	3259	3259
2014	1	37670	22768	3675	3059	3059
2015	1	36525	21776	3667	2903	2903
2016	1	35653	21023	3661	2810	2810

FORECAST:__with_40:10

year	4010	bio-all	SpawnBio	recruit-0	Yield	ABC
2007	1	56321	36250	3741	5830	5830
2008	1	52212	34135	3734	5025	5025
2009	1	48734	31802	3725	4473	4473
2010	1	45743	29533	3715	4058	4058
2011	1	43170	27454	3705	3741	3741
2012	1	40976	25614	3694	3484	3484
2013	1	39145	24046	3684	3259	3259
2014	1	37670	22768	3675	3059	3059
2015	1	36525	21776	3667	2903	2903
2016	1	35653	21023	3661	2810	2810

LCS Base Model

FORECAST:_Without_40:10

year	4010	bio-all	SpawnBio	recruit-0	Yield	ABC
2007	1	9123	5451	1390	876	876
2008	1	9260	5398	2289	828	828
2009	1	9524	5374	2287	805	805
2010	1	10013	5419	2290	771	771
2011	1	10715	5609	2298	794	794
2012	1	11519	5973	2313	907	907
2013	1	12279	6429	2330	1025	1025
2014	1	12945	6884	2345	1134	1134
2015	1	13503	7291	2357	1218	1218
2016	1	13966	7643	2366	1275	1275

FORECAST:__with_40:10

year	4010	bio-all	SpawnBio	recruit-0	Yield	ABC
2007	0.756	9123	5451	1390	662	876
2008	0.767	9475	5558	2296	658	857
2009	0.778	9906	5667	2301	664	853
2010	0.792	10529	5819	2307	656	828
2011	0.817	11332	6091	2318	698	855
2012	0.85	12214	6517	2333	824	969
2013	0.885	13035	7022	2349	965	1090
2014	0.914	13736	7509	2362	1097	1200
2015	0.936	14299	7928	2373	1200	1282
2016	0.953	14743	8273	2381	1269	1332

Table ES-5. Projected coastwide yield (Sum of LCN and LCS).

Coastwide-Pooled (Sum of LCN and LCS)					
FORECAST:_Without_40:10					
year	**bio-all**	**SpawnBio**	**recruit-0**	**Yield**	**ABC**
2007	65445	41701	5130	6706	6706
2008	61471	39533	6022	5853	5853
2009	58257	37175	6012	5278	5278
2010	55756	34952	6005	4829	4829
2011	53885	33062	6003	4535	4535
2012	52495	31587	6008	4390	4390
2013	51424	30474	6014	4284	4284
2014	50615	29652	6020	4193	4193
2015	50028	29067	6024	4121	4121
2016	49619	28665	6026	4085	4085
FORECAST:__with_40:10					
year	**bio-all**	**SpawnBio**	**recruit-0**	**Yield**	**ABC**
2007	65445	41701	5130	6493	6706
2008	61686	39693	6030	5683	5883
2009	58640	37468	6026	5136	5326
2010	56271	35352	6022	4714	4886
2011	54502	33544	6023	4440	4597
2012	53190	32131	6027	4308	4453
2013	52181	31067	6033	4224	4349
2014	51405	30277	6037	4156	4259
2015	50824	29704	6040	4103	4184
2016	50396	29295	6041	4080	4142

Table ES6. Decision table for the northern (LCN) area.

LCN			State of Nature			
B0: 33749			Base Case		Alternate Case	
	Year	Catch	SSB	Depletion	SSB	Depletion
Management Decision						
			RUN BB		RUN AB	
Base Case Catch (With 40:10)	2007	5830	36250	1.07	20327	0.60
Full Model	2008	5025	34135	1.01	17713	0.52
	2009	4473	31802	0.94	15461	0.46
	2010	4058	29533	0.88	13614	0.40
	2011	3741	27454	0.81	12167	0.36
	2012	3484	25614	0.76	11067	0.33
	2013	3259	24046	0.71	10257	0.30
	2014	3059	22768	0.67	9695	0.29
	2015	2903	21776	0.65	9346	0.28
	2016	2810	21023	0.62	9159	0.27
			RUN BA		RUN AA	
Alternate Case Catch (With 40:10)	2007	3267	36250	1.07	20327	0.60
Delete:	2008	3042	36057	1.07	19584	0.58
2001, 2004 Survey	2009	2869	35277	1.05	18845	0.56
2000-2004 Fishery Age Comps.	2010	2729	34157	1.01	18170	0.54
	2011	2625	32927	0.98	17594	0.52
	2012	2555	31650	0.94	17116	0.51
	2013	2500	30396	0.90	16720	0.50
	2014	2456	29224	0.87	16396	0.49
	2015	2424	28171	0.83	16139	0.48
	2016	2402	27238	0.81	15933	0.47

Table ES7. Decision table for the southern (LCS) area.

LCS			Base Case		Alternate Case-Low		Alternate Case-High	
B0: 19101	Year	Catch	SSB	Depletion	SSB	Depletion	SSB	Depletion
Management Decision								
			RUN BB		RUN LB		RUN HB	
Base Case Catch (With 40:10)	2007	662	5451	0.29	4251	0.22	6568	0.34
Full Model	2008	658	5558	0.29	4420	0.23	6653	0.35
	2009	664	5667	0.30	4607	0.24	6713	0.35
	2010	656	5819	0.30	4839	0.25	6796	0.36
	2011	698	6091	0.32	5189	0.27	6988	0.37
	2012	824	6517	0.34	5694	0.30	7325	0.38
	2013	965	7022	0.37	6280	0.33	7739	0.41
	2014	1097	7509	0.39	6850	0.36	8135	0.43
	2015	1200	7928	0.42	7354	0.38	8464	0.44
	2016	1269	8273	0.43	7784	0.41	8722	0.46
			RUN BL		RUN LL		RUN HL	
Alternate Case Catch (With 40:10)	2007	414	5451	0.29	4251	0.22	6568	0.34
Ending Biomass-Low	2008	491	5745	0.30	4600	0.24	6840	0.36
	2009	557	5984	0.31	4920	0.26	7031	0.37
	2010	602	6218	0.33	5237	0.27	7195	0.38
	2011	672	6525	0.34	5627	0.29	7421	0.39
	2012	808	6959	0.36	6144	0.32	7764	0.41
	2013	956	7459	0.39	6732	0.35	8171	0.43
	2014	1096	7936	0.42	7297	0.38	8554	0.45
	2015	1203	8337	0.44	7788	0.41	8862	0.46
	2016	1280	8660	0.45	8201	0.43	9095	0.48
			RUN BH		RUN LH		RUN HH	
Alternate Case Catch (With 40:10)	2007	853	5451	0.29	4251	0.22	6568	0.34
Ending Biomass-High	2008	799	5415	0.28	4280	0.22	6509	0.34
	2009	761	5412	0.28	4357	0.23	6458	0.34
	2010	706	5490	0.29	4512	0.24	6467	0.34
	2011	740	5727	0.30	4823	0.25	6626	0.35
	2012	849	6131	0.32	5302	0.28	6943	0.36
	2013	979	6628	0.35	5874	0.31	7351	0.38
	2014	1101	7116	0.37	6441	0.34	7752	0.41
	2015	1195	7545	0.39	6949	0.36	8094	0.42
	2016	1258	7908	0.41	7393	0.39	8374	0.44

Figure ES1. Female spawning biomass (top) depletion (middle), and recruitment (bottom) 1956-2005.

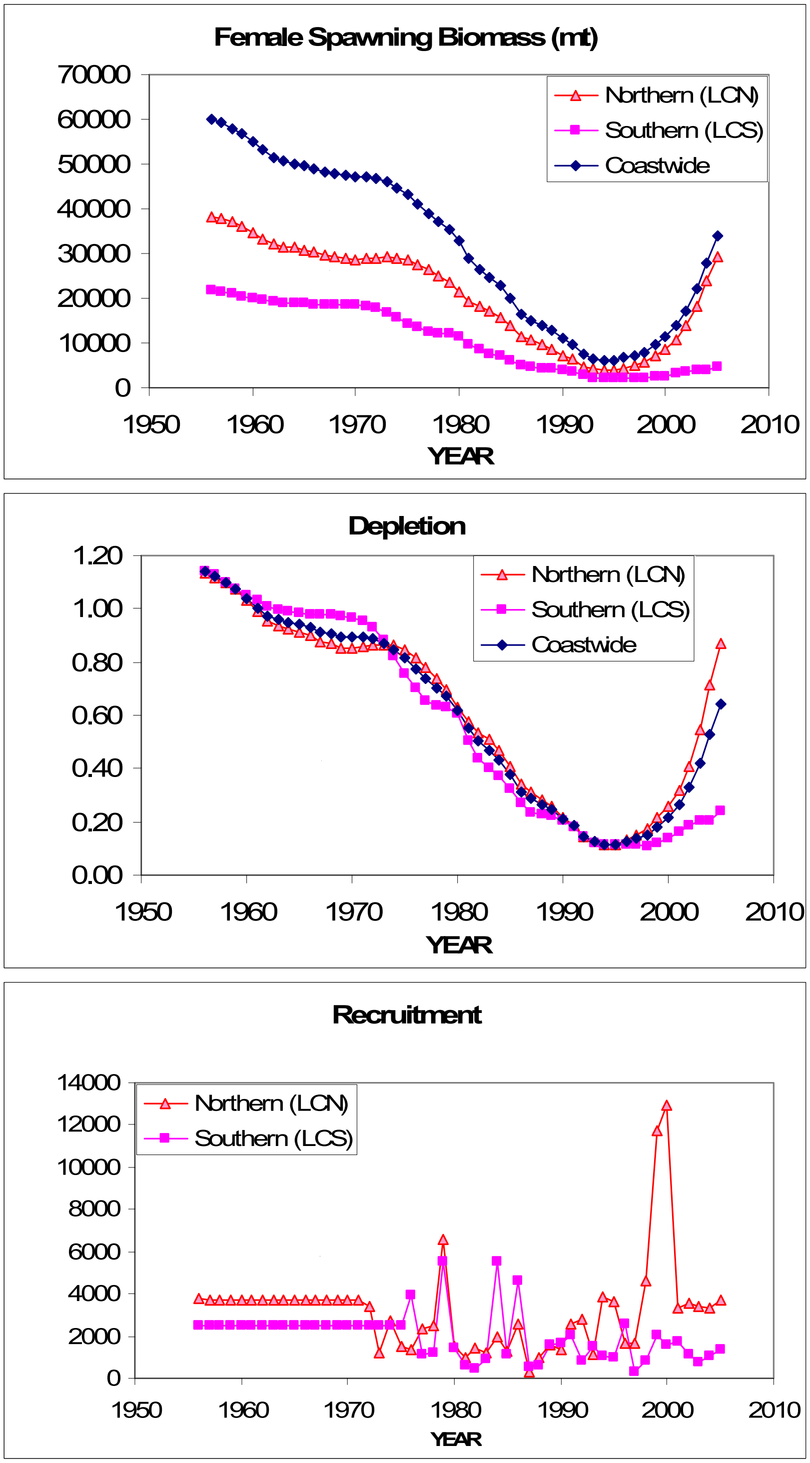
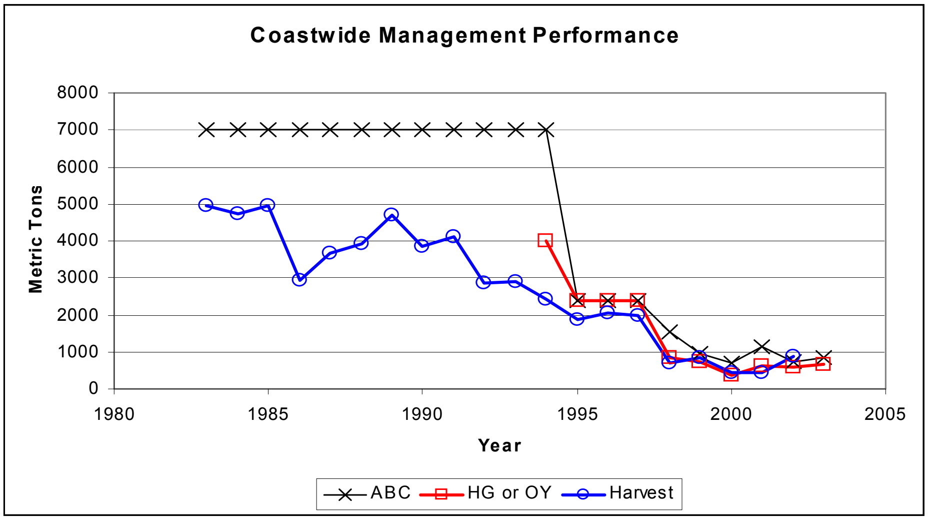


Figure ES2 Comparison of lingcod ABC, OY and landings (mt) between 1983 and 2003.



Introduction

Stock Structure and management Units

This document provides an updated coastwide assessment of the lingcod population in 2005 for the full PFMC management zone. Evidence from genetics analysis (Jagielo et al. 1996) and tagging studies (Cass et al. 1990, Jagielo 1995, Jagielo 1999a) suggest that the fish found within this entire area are of one intermingling stock unit. However, because of regional differences in data sources and data availability, the assessment was divided into two separately modeled units: Lingcod-North (LCN) and Lingcod-South (LCS), as it was in recent previous assessments (Jagielo et al. 2000, Jagielo et al. 2003) (Figure 1).

Life History

Lingcod (*Ophiodon elongatus*) are top order predators of the family *Hexagrammidae*. The species ranges from Kodiak Island in the Gulf of Alaska to Baja California, and its center of abundance is near British Columbia and Washington (Hart 1973). An analysis of genetic variation indicates that lingcod are genetically similar throughout the range (Jagielo et al. 1996). Among the *Hexagrammidae*, the genus *Ophiodon* is ecologically intermediate between the more littoral genera *Hexagrammos*, *Agrammus*, and *Oxylebius* and the more pelagic *Pleurogrammus* (Rutenberg 1962). Lingcod are demersal on the continental shelf, most abundant in waters less than 200 m deep, and patchily distributed among areas of hard bottom and rocky relief (Smith and Forrester 1973; Jagielo 1988). Lingcod are considered non-migratory, though some tagged individuals have moved exceptional distances and indirect evidence suggests a seasonal onshore movement associated with spawning (Jagielo 1995, 1999). Larval lingcod hatch in late winter and become epipelagic. When about 3 months old, juveniles settle on sandy bottom near eelgrass or kelp beds. By age 1 or 2, lingcod move into rocky habitats similar to those occupied by adults, but shallower. Fishery and survey data indicate that male lingcod tend to be more abundant than females in shallow waters, and the size of both sexes increases with depth (Jagielo 1994). In late fall, male lingcod aggregate and become territorial in areas suitable for spawning. Mature females are rarely seen at the spawning grounds and it is assumed that they move into spawning areas for only a brief time to deposit eggs. Following egg nest deposition, males assume a guardian role through the period of hatch-out. Hatch out is typically complete by April in Washington but has been reported as early as January and as late as June throughout the species range (Jagielo 1994). A more detailed review of lingcod life history can be found in Jagielo (1994), Adams and Hardwick (1992), and Cass et al. (1990).

History of the fishery

Lingcod have been a target of commercial fisheries since the early 1900's in California (CDFG Reports), and since the late 1930's in Oregon (Unpublished, ODFW Report, 1950) and Washington (Anonymous WDF Report, 1955) waters (Table 4). Recreational fishers have targeted lingcod since the 1920's in California. A modest recreational fishery (less than 20 mt annually) has taken place in Washington and Oregon since at least the 1970's.

Management

History

From 1983 through 1994, a coastwide ABC of 7,000 mt was in effect with the INPFC area components: US Vancouver (1000 mt), Columbia (4,000 mt), Eureka (500 mt), Monterey (1,100 mt) and Conception (400 mt) (Table 1). In 1994 a coastwide harvest guideline (HG) of 4,000 mt was established. Following an assessment for the northern area (Jagielo 1994), the coastwide ABC and Harvest Guideline were reduced for 1995 through 1997 to 2,400 mt with separate ABC's for the US Vancouver-Columbia (1,300 mt), Eureka (300 mt), Monterey (700 mt), and Conception (100 mt) areas. In 1998, following an updated assessment for the northern area (Jagielo et al.1997), the coastwide ABC was reduced to 1,532 mt with a Harvest Guideline of 838 mt. Separate ABC's by area were: Vancouver (including a portion of Canadian waters)-Columbia (1,021 mt), Eureka (139 mt), Monterey (325 mt), and Conception (46 mt). For 1999, the Council established a coastwide ABC of 960 mt and a Harvest Guideline of 730 mt, with area specific ABC's of US Vancouver-Columbia (450 mt), Eureka (139 mt), Monterey (325 mt), and Conception (46 mt). Following a new assessment for the southern area (Adams et al.1999) and a rebuilding analysis (Jagielo 1999b), the coastwide ABC for 2000 was reduced to 700 mt which included area values of US Vancouver-Columbia (450 mt) and Eureka-Monterey-Conception (250 mt). Subsequently, a coastwide stock assessment (Jagielo et al. 2000) provided a northern ABC was of 610 mt and a southern ABC of 509 mt. Based on a revised rebuilding analysis (Jagielo and Hastie 2001) the 2001-coastwide lingcod OY was set at 611 mt, which is the harvest level derived from a constant exploitation rate that was expected to have a 60-percent probability of rebuilding the stock to B_{msy} within 9 years. The coastwide lingcod OY was similarly set at 577 mt in 2002 and 651 mt in 2003.

Regulations

A history of lingcod commercial trawl trip limits is summarized in Table 2. No trip limits were in effect prior to 1995, and trip limits have become increasingly restrictive since then as annual harvest guidelines have decreased.

A history of PFMC enacted recreational size and bag limits is summarized in Table 3. In California, a 5 fish bag limit was enacted in 1980 followed by a 22 inch size limit in 1981. These regulations remained in effect for 17 years. In March 1998, the bag limit was reduced from 5 to 3 fish and concurrently the size limit was increased to 24 inches. The bag limit was lowered again from 3 fish to 2 fish with in January 1999. In January 2000, the size limit increased from 24 to 26 in. and a seasonal closure (January through February) was implemented from the U.S.-Mexico border north to Lopez Point (36 deg 00 min N., Monterey County), and for March through April from Lopez Point north to Cape Mendocino (40 deg 10 min N., Humboldt County) The bag limit remained at 2 fish. A gear restriction was also enacted at this time limiting the number of hooks to 3, although this was primarily directed toward rockfish effort.

Performance

The first lingcod ABC's based on a quantitative assessment were implemented in 1995. A comparison of reported landings and ABC values shows good correspondence through 2001, when landings were typically at or below the target ABC values (Figure 2). In 2002, landings exceeded the coastwide ABC by 17% and the coastwide OY was exceeded by 51%.

DATA

Catch

Commercial Landings

Commercial lingcod catch history in California waters is available beginning 1916 (personal communication Brenda Erwin, PSMFC) and averaged 428 mt between 1916 and 1955 (Table 4). Commercial lingcod landings in Oregon were first reported in 1950 (Mark Freeman, personal communication) and averaged 264 mt between 1950 and 1953. Washington commercial lingcod landings were first reported in 1937 (anonymous, 1956, WDFW report) and averaged 106 mt until 1955.

Catch data were compiled from agency reports and personal communication for all years preceding 1981 (Table 5). The PacFIN database was queried for catch information in subsequent years and catch detail is presented by gear and INPFC area in Table 6.

Commercial landings peaked in 1985 at 3,129 mt in northern waters (Columbia and Vancouver INPFC areas) and in 1974 at 1,735 mt in southern waters (Eureka, Monterey and Conception INPFC Areas)(Table 5). Average catch between 1990-1997 declined 40 % and 35% since the 1980's in northern and southern waters, respectively. Under rebuilding management, commercial fishery restrictions in recent years (1998-present) reduced coastwide catches to an annual average of less than 225 mt (Figure 3).

From 1981-1997, trawl gear has made up the majority of commercial landings for the northern (83%) and southern (63%) coast. In recent years (1998-2004), commercial fishery restrictions constrained the trawl portion of the commercial catch to 65% and 40% for the northern and southern coast, respectively. In 2004, coastwide commercial landings totaled 174 mt and were distributed as follows by INPFC area: U.S.-Vancouver (41.7 mt), Columbia (44.6 mt) , Eureka 39.5 mt), Monterey (33.2 mt), Conception (14.8 mt).

Recreational Landings

Recreational fishers in California have targeted lingcod since the early 1940's. Catch averaged 65.3 mt annually between 1947-1954 (Leet et al., 1992). Recreational lingcod catch information is not available until 1977 for Oregon waters and averaged 52.3 mt annually between 1977 and 1979. Recreational lingcod catch in Washington was first estimated in 1967 to be 25.3 mt and annual catch estimates have been provided since 1975.

Recreational catch estimates were extracted from the RecFIN database for years 1980–1989 and 1993 to present for California waters. California recreational catch estimates for all other years were previously compiled in the 2000 lingcod assessment (Jagielo et al., 2000). Oregon recreational catch data were provided by ODFW (Don Bodenmiller personal communication). The recreational catch in Washington was provided by the WDFW Ocean Sampling Program.

Recreational catch in southern waters has declined since catch peaked in 1980 at 2,226 mt (Table 5, Figure 4). In contrast, recreational catch in northern waters peaked at 236 mt in 1994. Estimated coastwide recreational landings averaged 500 mt. from 1998-2004 and were 1175 mt. and 316 mt. in 2003 and 2004, respectively.

Historically, recreational landings have comprised a larger proportion of the total landings for the southern area, compared to the northern area. In recent years, the recreational portion of the total landings has increased substantially in both the southern and northern areas. In 2004 recreational fisheries harvested 65% of the total lingcod catch coastwide (Figure 5).

Discard

There are three sources of discard information for lingcod. These include the federal Marine Recreational Fisheries Statistical Survey (MRFSS), and both the Washington Department of Fish and Wildlife (WDFW) and the NMFS West-Coast Groundfish Observer Programs. MRFSS have collected B1 (reported by angler to be dead) and B2 (reported by angler to be alive) catches since 1980. Estimates of lingcod discarded alive have increased substantially in response to 1) management changes in 1998 (the size limit increased from 22 to 24 inches), and 2) a seasonal closure in California waters beginning in 2000 (Table 7). It is interesting to note that estimates of fish discarded dead have decreased over time. Estimated live lingcod discarded in southern California was 306,000 fish in 2002. This compares to a total landed catch of 25,000 fish. WDFW began collecting discard information from the recreational fishery in 2002 and estimated that 57% of the catch was discarded. WDFW does not collect information on the portion of the catch discarded live or dead.

Based on an earlier study (Ricky, WDFW unpublished report), the PFMC Groundfish Management Team used a 20% inflation factor to adjust landed catch to account for unobserved lingcod mortality (personal communication, PFMC) in the commercial fishery beginning in 2002. Data collected by the Groundfish Observer program in 2001-2004 estimated that the percent discard of total observed catch ranged from 60-85% (Table 8). Because lingcod lack a swim bladder, it is likely that there is a relatively good survival rate for these fish.

Based on the advice provided by the STAR Panel conducted August 15-19, 2005, a catch dataset incorporating discard assumptions was prepared (Table 5a). The discard-adjusted data were used in the base models for both the northern (LCN) and southern (LCS) models.

Age and Size Composition

Age composition data from the northern area are summarized for the commercial fishery in Table 9. These data were derived by weighting the raw age frequencies from each WDFW vessel sample by the total landed weight of lingcod from that vessel. The recreational fishery age composition data, compiled from WDFW and ODFW recreational fishery samples, are summarized in Table 10. Age compositions derived from samples taken on board the NMFS Triennial Trawl shelf survey and age compositions obtained from sub-samples of lingcod taken for aging as part of the WDFW Cape Flattery Tag survey are summarized in Table 11. Northern area age composition data new to the present assessment are summarized in Table 15. Survey and fishery size composition data (cm) used in the northern model, with associated sample sizes, are summarized by data source in Tables 12 and 13, respectively.

Age composition data and sample size information for the southern area are summarized for the commercial and recreational fisheries, and the NMFS Triennial Trawl shelf survey in Table 14. Southern area age composition data new to the present assessment are summarized in Table 15.

Natural Mortality, Length, Weight, and Maturity at Age

Vectors of length, weight, and maturity-at-age by sex are summarized for the northern area in Table 16. Parameter estimates for these relationships, and natural mortality estimates used in the LCN model are summarized in Table 17. Comparable information for the southern area is summarized in Tables 18 and 19. Figure 6 shows the fit of female and male LCS and LCN lingcod to the von Bertalanffy growth equation.

Abundance Indices

NMFS Triennial Shelf Trawl Survey

Survey estimates of biomass (metric tons) and the associated coefficients of variation (CV's) from the triennial survey for 1977, 1980, 1983, 1986, 1989, 1992, 1995, 1998, and 2001 are summarized in Table 20. Results from the 2004 survey are summarized in Table 21. The total sum of lingcod abundance estimates from the US Vancouver and Columbia area for all depth strata (55-183 m, 184-366 m and 367-500 m) was incorporated into the LCN model. The total sum of the Eureka and Monterey biomass estimates for each year and depth strata was used in the LCS model.

Biomass estimates have been revised using a filtered dataset that excluded "water hauls". A complete description of the tow analysis and identification procedures of "water hauls" can be found in AFSC Processed Report 2001-03 (Zimmermann et al., 2001). Generally, lingcod biomass estimates from the filtered dataset increased with one exception. The 1980 Columbia INPFC lingcod biomass estimate was reduced from 8,699 mt to 3,219 mt, a difference of 5,480 mt (Table 18 and Figure 10). The difference resulted from a single large lingcod tow that was identified as a "water haul" and excluded from the dataset.

WDFW Cape Flattery Tag Survey

Annually, from 1986-1992, WDFW sampled lingcod from an established survey area in a consistent manner using bottomfish troll (dingle bar) hook and line gear. This sampling was initiated for the purpose of capturing fish for release as part of a multiple-year mark-recapture experimental design (Jagielo 1991, 1995). From 1986-1992, estimates of lingcod abundance in the Cape Flattery survey area were derived using external tags (Table 22). Voluntary tag returns from the recreational lingcod fishery at Neah Bay, Washington were used as the method for obtaining tag recaptures. Annual sampling with bottomfish troll gear continued beyond 1992 to extend the length composition time series, which had shown value as a recruitment index for previous lingcod stock assessments (Jagielo 1994, Jagielo et al.1997, Jagielo et al. 2000). **NOTE: THIS DATASET WAS OMITTED IN FINAL BASE MODEL AT THE REQUEST OF THE STAR PANEL CONDUCTED AUGUST 15-19, 2005.**

Trawl Fishery Logbook Catch-Per-Unit-Effort (CPUE) Index

As was the case in the previous two lingcod assessments (Jagielo et al 2000, Jagielo et al. 2003) two independently estimated trawl fishery CPUE indices were incorporated into the northern and southern assessment models. They were constructed from Washington, Oregon and California trawl fishery logbook and fish ticket data dating back to 1976 (Table 23). Skipper's tow-by-tow estimates of retained catch were reconciled with fish ticket data (landing receipts). The adjusted catch and the skipper's estimate of tow duration was used to compute lingcod CPUE (lbs/hour).

The bathymetric and geographic distribution of trawl logbook CPUE is shown in Figures 7 and 8, respectively.

Following data verification and screening, a total of 490,971 tows in the northern area and 474,946 tows in the southern area were used in the analysis (Table 23). Because of significant changes in management beginning in 1998 both the northern and southern time series were truncated after 1997. Furthermore, the 1976 and 1977 tow data from the southern area were deemed of insufficient sample size and were dropped from the time series used in the assessment model. Tow-by-tow catch rates (CPUE) were fitted in a two-stage model process using Delta-Lognormal GLM procedure to predict abundance indices across the time series for each area. The model included a year, month, depth, and location (PFMC area) effect. A bootstrap procedure was previously used to estimate the standard errors of the year by year index values; however, the previous STAT Star Panel concluded that the bootstrap estimates of standard errors were unrealistically low and recommended using an assumed annual CV of 0.20 in both the southern and northern index in the 2003 assessment (Jagielo et al. 2003).

The northern trawl logbook index trend shows a sharply declining stock since 1976, and the southern trawl logbook index indicates a declining stock since 1979 (Table 24, Table 25, Figure 9).

Ageing error

Age reading error was modeled by incorporation of an age error transition matrix, which was developed from estimates of between-reader (within-lab) variability obtained from repeat age readings by two WDFW lingcod age readers (Figure 10). This age error transition matrix has not been modified since the last assessment.

Assessment
History of Modeling Approaches
The first assessment of lingcod provided to PFMC consisted of a yield-per-recruit analysis Adams (1986). Subsequently, an age structured assessment was prepared for a portion the northern area (PMFC areas 3A, 3B, and 3C-including Canada) by Jagielo (1994), using the Stock Synthesis model (Methot 1990). The assessment was subsequently updated to include the full Columbia INPFC area through 3C-N in Canada (Jagielo et al. 1997). Adams et al. (1999) subsequently conducted a length-based, age-structured assessment for the southern area (Eureka, Monterey, and Conception INPFC areas), using AD Model Builder (Fournier 1996). The first coastwide assessment of lingcod for the full PFMC management zone was conducted by Jagielo et al. 2000; that assessment (implemented in AD Model Builder) employed two age-structured models, conceptually and mathematically similar to the previous Stock Synthesis assessments of the northern area (Jagielo 1994, Jagielo et al. 1997). The 2003 assessment updated the previous coastwide assessment (Jagielo et al. 2000) and was implemented in Coleraine using the executable code COLERA20.EXE (Hilborn et al. 2000).

Present Modeling Approach and Assessment Program
The present assessment updates the previous coastwide assessment (Jagielo et al. 2003) and is implemented in Stock Synthesis II using the executable code SS2 ver. 1.19d (Methot 2005).

As in the previous assessment, separate age structured models were constructed to analyze stock dynamics for the northern (LCN: US-Vancouver, Columbia) and southern (LCS: Eureka, Monterey, Conception) areas.

The following discussion covers the modeled data, model structure, and base model results; first for the northern area (LCN), followed by a discussion of the same topics for the southern area (LCS).

Lingcod-North (LCN): US-Vancouver and Columbia INPFC Areas

Model Description

List and Description of Likelihood Components in the LCN Model

The LCN model incorporated the following likelihood components; input data sources are specified by Table number:

1) Commercial Catch-At-Age: 1979-2004 (Table 9, Table 15).
2) Recreational Catch-At-Age: 1980, 1986-2004 (Table 10, Table 15).
3) Commercial Catch-At-Length: 1975-1978 (Table 13).
4) Recreational Catch-At-Length: 1981-1983 (Table 13).
5) NMFS Trawl Survey Catch-At-Age: 1992, 1995, 1998, 2001, and 2004 (Table 11).
6) NMFS Trawl Survey Catch-At-Length: 1986 and 1989 (Table 12).
7) WDFW Tag Survey Catch-At-Age: 1994-1997 (Table 11). **NOTE: THIS DATASET WAS OMITTED IN FINAL BASE MODEL AT THE REQUEST OF THE STAR PANEL CONDUCTED AUGUST 15-19, 2005.**
8) WDFW Tag Survey Catch-At-Length: 1986-1993 (Table 12).
9) NMFS Trawl Survey Biomass (mt): 1977, 1980, 1983, 1986, 1989, 1992, 1995, 1998, 2001 (Table20) and 2004 (Table 21).
10) WDFW Tag Survey Abundance (Numbers of Fish): 1986-1992 (Table 22).
11) Trawl Fishery Logbook CPUE Index: Washington and Oregon lingcod CPUE estimates (lbs/hr) derived from a Delta GLM analysis of trawl logbook information, 1976-1997 (Table 24).

The NMFS Trawl Survey Biomass and Trawl Fishery Logbook CPUE Index likelihood components were fit under a lognormal error structure; fishery and survey catch-at-age and catch-at-length likelihood components were fit assuming a multinomial distribution (Methot 2005). In addition to the likelihood components listed above, a likelihood penalty component was included which constrained the maximum annual instantaneous fishing mortality (F) to be less than or equal to 0.9 (Methot 2005).

Base Model Configuration

The LCN base model employed a Beverton-Holt stock-recruitment relationship with lognormal error structure (with a steepness parameter h = 0.9 and SD = 1.0) to constrain wide variations in recruitment, with an emphasis factor (lambda=1.0). Selectivity for the commercial and recreational fisheries and the NMFS and WDFW surveys was parameterized by a curve formed from two logistic distributions referred to as “SS2 Type 18: double logistic with defined peak and smooth joiners” (Methot 2005). Twelve parameters are used in this formulation, including eight parameters for female selectivity and four parameters to characterize male selectivity as offsets to female selectivity. The model used a catch dataset adjusted to account for discards (Table 5a).

Model Selection and Evaluation

A summary of negative log likelihood values, and both estimated and fixed model parameters of the LCN base model are provided in Appendix I (Tables 1-4).

Base-Run Results

Base run model results are presented in Appendix I (Tables 1-4 and Figures 1-14). Base run SS2 files including the control file (LCNCTL05.ctl), the data file (LCNData05.dat), the names file (SS2names.nam) and the forecast file (Forecast.ss2) are presented in Appendix Ia).

Uncertainty and Sensitivity Analyses

The results of model profiling over selected fixed values used in the assessment are included in Appendix I (Figures 4-6a).

A series of base model runs were conducted to examine the effect of different values of the assumed standard deviation of recruitment (SD-r) (Appendix I, Figure 4). SD-r was varied from 0.7 to 1.0. Little sensitivity was observed near the end of the time series, where data were available to estimate recruitments; more sensitivity was noted early in the time series where recruitment was primarily a function of the spawner-recruit curve assumptions. The value of SD-r=1.0 was selected for the final base model.

The base model was also profiled over different fixed values of the Beverton-Holt stock-recruitment steepness parameter (*h*) (Appendix I, Figure 5). The profile over *h* ranged from 0.8 to 1.0. Little sensitivity was observed near the end of the time series, where data were available to estimate recruitments; more sensitivity was noted early in the time series where recruitment was primarily a function of the spawner-recruit curve assumptions. This parameter was set at the fixed value of 0.9 for the final base model. Spawner-recruit emphasis was set at (lambda=1.0) in the base model.

The base model was also profiled over different fixed values of natural mortality (M) (Appendix I, Figure 6). The profile over M ranged from 0.14 and 0.26 (females and males, respectively) to 0.22-0.38). The values of 0.18 (females) and 0.32 (males), as used in previous assessments, were chosen for use in the 2005 final base model.

An historic analysis was conducted by plotting the estimates of recruitment and spawning biomass from the 2003 assessment (Jagielo et al. 2003) with the same from the present assessment (Appendix I Figure 1). The 2003 assessment time series started in 1973. The present assessment extended the time series of spawning biomass and recruitment back to 1956. The time series trend of spawning biomass follows generally the same shape for both assessments; however, the present assessment estimates of spawning biomass are consistently higher than those from the 2003 assessment for the entire time series.

A retrospective analysis was conducted by sequentially decrementing the end-year of the assessment from 2004 to 2000 (Appendix I, Figure 6b). No obvious model pathologies were detected. Curiously, the 1999 year class of recruits was anomalously high for the run ending in 2001 compared to the other retrospective runs. This can be explained in part by the large proportion of age 2 fish in the 2001 NMFS trawl survey.

An analysis of model stability was conducted by running the base model 30 times, using an SS2 jitter factor of 0.01 (Appendix I, Figure 6a). The SS2 jitter factor is applied as a multiplier to the minimum and maximum parameter bounds specified in the LCNCTL05.ctl file to vary the parameter seed values. The model appeared to be stable at this level of imposed "jitter"; of the 30 model runs, 25 returned to the same total likelihood (648.675) and depletion (0.612) values. The remaining 5 runs did not differ substantially from the most common solution.

Lingcod South (LCS): Eureka, Monterey, and Conception INPFC Areas

Model Description

List and Description of Likelihood Components in the LCS Model

The LCS model incorporated the following likelihood components; input data sources are specified by Table number:

1) Commercial Catch-At-Age: 1992-1998, 2000-2004 (Table 14, Table 15).
2) Recreational Catch-At-Age: 1992-1998, 2000-2004 (Table 14, Table 15).
3) NMFS Trawl Survey Catch-At-Age: 1995, 1998, 2001, and 2004 (Table 14, Table 15).
4) NMFS Trawl Survey Biomass (mt): 1977, 1980, 1983, 1986, 1989, 1992, 1995, 1998, 2001 (Table20) and 2004 (Table 20, Table 21).
5) Trawl Fishery Logbook CPUE Index: Oregon and California lingcod CPUE estimates (lbs/hr) derived from a Delta GLM analysis of trawl logbook information, 1978-1997 (Table 25).

The NMFS Trawl Survey Biomass, and Trawl Fishery Logbook CPUE Index likelihood components were fit under a lognormal error structure; fishery and survey catch-at-age and catch-at-length likelihood components were fit assuming a multinomial distribution (Methot 2005). In addition to the likelihood components listed above, a likelihood penalty component was included which constrained the maximum annual instantaneous fishing mortality (F) to be less than or equal to 0.9 (Methot 2005).

Base Model Configuration

The LCS base model employed a Beverton-Holt stock-recruitment relationship with lognormal error structure (with a steepness parameter h = 0.9 and SD = 1.0) to constrain wide variations in recruitment, with an emphasis factor (lambda=1.0). Selectivity for the commercial and recreational fisheries and the NMFS survey was parameterized by a curve formed from two logistic distributions referred to as "SS2 Type 18: double logistic with defined peak and smooth joiners" (Methot 2005). Twelve parameters are used in this formulation, including eight parameters for female selectivity and four parameters to characterize male selectivity as offsets to female selectivity. The model did not incorporate an explicit treatment of discards.

Model Selection and Evaluation

A summary of negative log likelihood values, and both estimated and fixed model parameters of the LCS base model is provided in Appendix II (Tables 1-4).

Base-Run Results

Base run model results are presented in Appendix II (Tables 1-4 and Figures 1-11). Base run SS2 files including the control file (LCSCTL05.ctl), the data file (LCSData05.dat), the names file (SS2names.nam) and the forecast file (Forecast.ss2) are presented in Appendix IIa).

Uncertainty and Sensitivity Analyses

The results of model profiling over selected fixed values used in the assessment are included in Appendix II (Figures 4-6).

A series of base model runs were conducted to examine the effect of different values of the assumed standard deviation of recruitment (SD-r) (Appendix II, Figure 4). SD-r was varied from 0.7 to 1.0. Little sensitivity was observed near the end of the time series, where data were available to estimate recruitments; more sensitivity was noted early in the time series where recruitment was primarily a function of the spawner-recruit curve assumptions. The value of SD-r=1.0 was selected for the final base model.

The base model was also profiled over different fixed values of the Beverton-Holt stock-recruitment steepness parameter (*h*) (Appendix II, Figure 5). The profile over *h* ranged from 0.8 to 1.0. Little sensitivity was observed near the end of the time series, where data were available to estimate recruitments; more sensitivity was noted early in the time series where recruitment was primarily a function of the spawner-recruit curve assumptions. This parameter was set at the fixed value of 0.9 for the final base model. Spawner-recruit emphasis was set at (lambda=1.0) in the base model.

The base model was also profiled over different fixed values of natural mortality (M) (Appendix II, Figure 6). The profile over M ranged from 0.14 and 0.26 (females and males, respectively) to 0.22-0.38). The values of 0.18 (females) and 0.32 (males), as used in previous assessments, were chosen for use in the 2005 final base model.

An historic analysis was conducted by plotting the estimates of recruitment and spawning biomass from the 2003 assessment (Jagielo et al. 2003) with the same from the present assessment (Appendix II, Figure 1). The 2003 assessment time series started in 1973. The base model from the current assessment extended the time series of spawning biomass and recruitment back to 1956 and suggests historically less depletion in the population relative to the 2003 assessment. The correspondence in spawning biomass is close for the two assessments near the end of the time series, and diverges going back to the beginning of the time series.

A retrospective analysis was conducted by sequentially decrementing the end-year of the assessment from 2004 to 2000 (Appendix II, Figure 6b). No obvious model pathologies were detected.

An analysis of model stability was conducted by running the base model 30 times, using an SS2 jitter factor of 0.01 (Appendix II, Figure 6a). The SS2 jitter factor is applied as a multiplier to the minimum and maximum parameter bounds specified in the LCSCTL05.ctl file to vary the parameter seed values. The model appeared to be stable at this level of imposed “jitter”; of the 30 model runs, 17 returned to the same total likelihood (170.275) and depletion (0.177) values. The remaining 13 runs did not differ substantially from the most common solution.

Coastwide Summary

Management Reference Points

Management reference points derived from the 2005 lingcod stock assessment are summarized in Table ES-1. The estimates of unfished spawning biomass (Bzero) were determined as the product of mean recruitment from 1956-2005 and the estimated Spawners Per Recruit. On a coastwide basis the lingcod population is fully rebuilt; estimated spawning biomass was 34,017 mt in 2005, which is 0.60 of the unfished spawning biomass estimate (52,850 mt). The estimated ratio of 2005 spawning biomass to unfished spawning biomass is higher in the north (0.87) compared to the south (0.24).

Spawning Stock Biomass

SS2 estimates of the coastwide female spawning stock biomass declined from 60,106 mt in 1956 to 6,004 mt in 1994, and subsequently increased to 34017 mt in 2005 (Table ES-2, Figure ES1-Top). Female spawning biomass depletion (B_0/B_t) fell to 0.11 in 1994 and subsequently increased to 0.64 in 2005 (Table ES-2, Figure ES1-Bottom).

Recruitment

The model estimate of virgin recruitment was higher for the northern area (3750 thousand age 0 fish) compared to the southern area (2503 thousand age 0 fish). Recruitments were generally similar in magnitude in both the north and south from 1972-1992, averaging 2008 in the north, and 2071 in the south (Table ES-2. Figure ES-1, bottom). Subsequently, from 1993-2005, recruitments tended to be higher in the north, and averaged 4503 compared to 1309 for the same period in the south. Recent, historically strong, 1999 and 2000 year classes were estimated in the north.

Exploitation Status

In the northern area, the exploitation rate (catch/available biomass) peaked at 0.20 in 1991 and averaged 0.03 from 1956-1980, 0.12 from 1981-1997, and 0.02 from 1998-2005 (Table ES-3). Exploitation rates were generally higher in the southern area, peaking at 0.26 in 1989 and averaging 0.05 from 1956-1980, 0.20 from 1981-1997, and 0.10 from 1998-2005.

Management Performance

The first lingcod ABC's based on a quantitative assessment were implemented in 1995. A comparison of reported landings and ABC values shows good correspondence through 2001, when landings were typically at or below the target ABC values (Figure ES2). In 2002, landings exceeded the coastwide ABC by 17% and the coastwide OY was exceeded by 51%.

Forecasts and Decision Table

Projected yield was forecasted using SS2 for the northern (LCN) and southern (LCS) base models (Table ES-4). Coastwide yield forecasts (sum of LCN and LCS) are summarized in Table ES-5. Forecasts were run with and without the 40:10 adjustment option. These forecasts assumed that fishery removals in 2005 and 2006 were taken at the level projected by the Groundfish Management Team for 2005 (970mt) (John Devore, Personal Communication).

Additional model forecast runs were made for a set of alternative conditions to establish decision tables. For LCN, the decision table was constructed with the base model and one alternate model in which both: 1) the NMFS 2001 and 2004 shelf triennial trawl survey data were omitted, and 2) the age composition data for the recreational and commercial fishery were omitted for the years 2000 through 2004 (Table ES-6). For LCS, the decision table was constructed with the base model and two alternate models (Table ES-7). The first "low" alternate model assumed that spawning biomass in 2005 was approximately 1.25 standard deviations below the base model estimate of spawning biomass in 2005 (3375 mt); the second "high" alternate model assumed that spawning biomass in 2005 was approximately 1.25 standard deviations above the base model estimate of spawning biomass in 2005 (5827 mt).

In both decision tables (Table ES-6 and Table ES-7), the base case model using the base case catch projection is highlighted with a bold outline. The additional cells in the decision tables contrast the results obtained when the models are run with catch projections from the alternate (State of Nature) models. For instance, in the northern area, when base model projected catches are used with the alternate State of Nature model, a depletion level of 0.27 is predicted in the year 2016 (Table ES-6). In the southern area, the predicted depletion level of 0.39 in the year 2016 results when the "high" ending biomass model catches are applied to the "low" ending biomass State of Nature model (Table ES-7).

Recommendations: Research and Data Needs

1) Emphasis should be placed on improving fishery age structure sampling size and geographical coverage in both regions.

2) More frequent and synoptic fishery independent surveys should be conducted in both regions to aid in determination of stock status and recent recruitment. Surveys of areas inaccessible to trawl survey gear should be conducted to address the issue of the habitat bias of trawl surveys.

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Table 1. History of PFMC lingcod Acceptable Biological catches (ABC's), Harvest guidelines or Optimum yields (OT's) and landings. Source:PFMC SAFE 2001 document and personal communication with the PFMC Groundfish Management Team for most recent year's information.

	US Vancouver	Columbia	US Vancouver-Columbia		Eureka	Monterey	Conception	Eureka-Monterey-Conception		Coastwide		
Year	ABC	ABC	ABC	Landings	ABC	ABC	ABC	ABC	Landings	ABC	HG or OY	Harvest
1983	1,000	4,000	5,000	3,155	500	1,100	400	2,000	1,691	7,000		4,971
1984	1,000	4,000	5,000	3,163	500	1,100	400	2,000	1,555	7,000		4,719
1985	1,000	4,000	5,000	3,215	500	1,100	400	2,000	1,726	7,000		4,945
1986	1,000	4,000	5,000	1,396	500	1,100	400	2,000	1,517	7,000		2,934
1987	1,000	4,000	5,000	1,724	500	1,100	400	2,000	1,922	7,000		3,667
1988	1,000	4,000	5,000	1,763	500	1,100	400	2,000	2,044	7,000		3,930
1989	1,000	4,000	5,000	2,373	500	1,100	400	2,000	2,316	7,000		4,705
1990	1,000	4,000	5,000	1,868	500	1,100	400	2,000	1,966	7,000		3,845
1991	1,000	4,000	5,000	2,437	500	1,100	400	2,000	1,647	7,000		4,095
1992	1,000	4,000	5,000	1,391	500	1,100	400	2,000	1,467	7,000		2,870
1993	1,000	4,000	5,000	1,659	500	1,100	400	2,000	1,374	7,000		2,907
1994	1,000	4,000	5,000	1,449	500	1,100	400	2,000	1,091	7,000	4,000	2,424
1995			1,300	971	300	700	100	1,100	1,067	2,400	2,400	1,882
1996			1,300	1,120	300	700	100	1,100	937	2,400	2,400	2,070
1997			1,300	1,049	300	700	100	1,100	912	2,400	2,400	1,981
1998			1,021	225	139	325	46	510	496	1,532	838	707
1999			450	262	139	325	46	510	545	960	730	831
2000			450					250		700	378	446
2001			610					510		1,120	611	445
2002										745	577	873
2003										841	651	

Table 2. History of lingcod commercial trawl trip limits (thousand lbs) Source:PFMC SAFE 2001 document and personal communication with the PFMC Groundfish Management Team for most recent year's information. Note: Exception to commercial size limits: starting in 1996, trawl gear was allowed retention of 100 lb. at size less than minimum size limit.

Year	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
< 1995	No trip limit regulations											
1995	20	20	20	20	20	20	20	20	20	20	20	20
1996	40		40		40		40		40		40	
1997	40		40		40		40		40		40	
1998	1		1		1		1		1		1	
1999	1.5			1.5			1			0.5	0.5	0.5
2000	Prohibited				0.4	0.4	0.4	0.4	0.4	0.4	Prohibited	
2001	Prohibited				0.4	0.4	0.4	0.4	0.4	0.5	Prohibited	
2002 [1/]	0.8		0.8		1		1		0.5	0.5	0.5	0.5
2003	0.8		0.8		1		1		0.8		0.8	

Prohibited Periods

Commercial size limit 0f 22" `1995-1997 then 24" thereafter

Gear restrictions for rockfish retention beginning in 2001

1/ South of 40^0 10' lingcod prohibited beginning July 1st

Table 3. History of lingcod size limits (inches) and recreational bag limits (number of fish): Source: PFMC SAFE 2001 document and personal communication with the PFMC Groundfish Management Team for most recent year's information.

State	1994	1995	1996	1997	1998	1999	2000	2001	2002	2003
				Daily Bag Limits						
Washington	3	3	3	3	3	2	2	2	2	2
Oregon	3	3	3	3	3	2	2	2	2	2
California	5	5	5	5	5	2	2	2	2	2
				Size Limits (inches)						
Washington	none	22	22	22	24	24	24	24	24	24
Oregon	none	22	22	22	24	24	24	24	24	24
California 1/	none	22	22	22	24	24	26	26	22	22

1/ Beginning in 2000; South of 34^{0} 27' N. Lat lingcod prohibited January-February and South of Cape Mendencino and north of 34^{0} 27' N. Lat lingcod prohibited March-June

Table 4. Estimated commercial lingcod catch (mt) for California (1916-1955), Oregon (1950-1953) and Washington ()1935-1955).

Historical Commercial lingcod landings

Year	California [1/] Total (mt)	Oregon 2/ Total (mt)	Washington [3/] Total (mt)
1916	280		
1917	422		
1918	415		
1919	482		
1920	312		
1921	193		
1922	258		
1923	212		
1924	182		
1925	310		
1926	295		
1927	252		
1928	387		
1929	529		
1930	584		
1931	558		
1932	408		
1933	494		
1934	389		
1935	462		0
1936	344		0
1937	439		1
1938	293		0
1939	262		0
1940	314		10
1941	240		51
1942	143		41
1943	326		162
1944	338		523
1945	344		237
1946	524		229
1947	880		65
1948	933		132
1949	751		109
1950	869	312	92
1951	758	379	106
1952	620	224	93
1953	432	139	40
1954	430		66
1955	438		63
	428	264	106

[1/] Leet et al. 1992. California's living marine resources and their utilization

[1/] Forrester, 1973.

[2/] "Fisheries Statistics for Oregon 1950-1953" author Harrison S. Smith

[3/] Anonymous, 1955 WDF Commercial Fishing Statistical Report.

Table 5. Estimated commercial and recreational lingcod catch (mt) for northern (1916-1955) and southern areas (Eureka, Monterey and Conception), 1956 to 2004

	Northern Area			Southern Area			
	U.S. Vancouver - Columbia			Eureka-Monterrey-Conception			Coastwide
Year	Commercial [1]	Recreation [2]	Total (mt)	Commercial [3]	Recreation [4]	Total (mt)	Total (mt)
1956	920		920	422	113	536	1,455
1957	1,000		1,000	744	114	858	1,858
1958	1,133		1,133	726	120	845	1,979
1959	1,863		1,863	638	94	732	2,594
1960	2,028		2,028	593	85	678	2,706
1961	1,875		1,875	653	70	724	2,599
1962	1,323		1,323	504	76	581	1,904
1963	938		938	514	83	597	1,534
1964	1,257		1,257	379	76	455	1,712
1965	1,538		1,538	369	100	469	2,006
1966	1,813		1,813	363	134	497	2,311
1967	1,244		1,244	426	131	557	1,800
1968	1,626		1,626	496	128	624	2,250
1969	1,148		1,148	505	98	603	1,751
1970	851		851	695	-	695	1,546
1971	1,009		1,009	952	-	952	1,961
1972	952		952	1,472	-	1,472	2,425
1973	1,326		1,326	1,615	403	2,018	3,344
1974	1,549		1,549	1,735	399	2,134	3,683
1975	2,019	85	2,104	1,447	429	1,876	3,981
1976	1,662	69	1,731	1,415	422	1,837	3,568
1977	1,671	76	1,747	769	284	1,053	2,799
1978	1,346	70	1,416	914	334	1,248	2,664
1979	2,211	82	2,292	1,434	340	1,774	4,066
1980	2,004	93	2,097	1,275	2,226	3,501	5,598
1981	1,905	128	2,033	1,404	1,169	2,572	4,605
1982	2,241	128	2,368	1,599	877	2,476	4,844
1983	3,051	114	3,165	1,221	586	1,807	4,972
1984	3,005	156	3,161	1,047	509	1,555	4,716
1985	3,127	90	3,217	753	974	1,726	4,943
1986	1,305	95	1,399	602	928	1,531	2,930
1987	1,620	111	1,731	982	950	1,932	3,663
1988	1,646	115	1,760	1,141	1,036	2,177	3,938
1989	2,231	146	2,377	1,358	964	2,322	4,699
1990	1,746	125	1,871	1,188	785	1,973	3,844
1991	2,320	121	2,441	844	807	1,651	4,092
1992	1,207	210	1,417	676	795	1,471	2,888
1993	1,429	252	1,681	778	469	1,247	2,928
1994	1,214	255	1,469	691	283	974	2,443
1995	858	117	975	610	291	901	1,876
1996	999	129	1,128	559	381	940	2,068
1997	933	120	1,053	636	289	924	1,978
1998	155	73	228	198	269	466	694
1999	169	101	270	190	357	547	817
2000	73	75	148	71	206	277	425
2001	70	86	156	88	178	266	422
2002	97	140	237	108	526	634	871
2003 [5]	104	144	247	78	1,031	1,109	1,356
2004 [5]	86	168	254	88	148	236	490

1/ Early catch estimates from Forrest (1973) and Lynde (1983) then PacFIN estimates beginning 1981.
2/ Revised catch estimates for this assessment provided by ODFW for 1990-2004 and WDFW catch revised to exclude catch taken in Canadian waters.
3/ Early catch estimates from CDF&G Fish Bulletins and then PacFIN estimates beginning 1981.
4/ Early catch estimates from Leet et.al. (1982) and MRFSS estimates used from 1980-2004, Oregon catches south of Cape Blanco provided by ODFW.
5/ MRFSS estimates in 2003 and CRFS estimates from 2004 are not standardized and not comparable.

Table 5a. Estimated commercial and recreational lingcod catch (mt) for northern (1916-1955) and southern areas (Eureka, Monterey and Conception), 1956 to 2004, **with adjustment for catch discarded.**

	Northern Area			Southern Area			
	U.S. Vancouver - Columbia			Eureka-Monterey-Conception			Coastwide
Year	Commercial [1]	Recreation [2]	Total (mt)	Commercial [3]	Recreation [4]	Total (mt)	Total (mt)
1956	920	0	920	422	113	536	1,455
1957	1,000	5	1,005	744	114	858	1,863
1958	1,133	9	1,143	726	120	845	1,988
1959	1,863	14	1,876	638	94	732	2,608
1960	2,028	18	2,046	593	85	678	2,724
1961	1,875	23	1,897	653	70	724	2,621
1962	1,323	27	1,350	504	76	581	1,931
1963	938	32	969	514	83	597	1,566
1964	1,257	36	1,293	379	76	455	1,748
1965	1,538	40	1,578	369	100	469	2,047
1966	1,813	45	1,858	363	134	497	2,355
1967	1,244	49	1,293	426	131	557	1,850
1968	1,626	54	1,680	496	128	624	2,304
1969	1,148	58	1,206	505	98	603	1,809
1970	851	63	914	695	119	814	1,728
1971	1,009	67	1,076	952	179	1,131	2,207
1972	952	72	1,024	1,472	269	1,741	2,765
1973	1,326	76	1,402	1,615	403	2,018	3,420
1974	1,549	81	1,630	1,735	399	2,134	3,763
1975	2,019	85	2,104	1,447	429	1,876	3,981
1976	1,662	69	1,731	1,415	422	1,837	3,568
1977	1,671	76	1,747	769	284	1,053	2,799
1978	1,346	70	1,416	914	334	1,248	2,664
1979	2,211	82	2,292	1,434	340	1,774	4,066
1980	2,004	93	2,097	1,275	2,229	3,504	5,601
1981	1,905	128	2,033	1,404	1,173	2,577	4,610
1982	2,241	128	2,368	1,599	882	2,481	4,849
1983	3,051	114	3,165	1,221	589	1,810	4,975
1984	3,005	156	3,161	1,047	514	1,561	4,722
1985	3,127	90	3,217	753	981	1,733	4,950
1986	1,305	95	1,399	602	950	1,552	2,951
1987	1,620	111	1,731	982	969	1,950	3,682
1988	1,646	115	1,760	1,141	1,054	2,195	3,955
1989	2,231	146	2,377	1,358	980	2,338	4,715
1990	1,746	125	1,871	1,188	799	1,987	3,857
1991	2,320	121	2,441	844	820	1,665	4,106
1992	1,207	210	1,417	676	808	1,484	2,901
1993	1,429	252	1,681	778	479	1,257	2,939
1994	1,214	255	1,469	691	289	980	2,449
1995	1,018	117	1,135	705	300	1,005	2,139
1996	1,186	129	1,315	648	391	1,039	2,354
1997	1,106	120	1,226	736	299	1,035	2,262
1998	718	73	791	349	279	629	1,420
1999	665	101	766	347	375	722	1,487
2000	223	75	298	120	240	360	658
2001	206	86	292	151	226	377	669
2002	226	140	366	152	608	759	1,125
2003	147	144	291	100	1,125	1,226	1,516
2004	208	168	376	107	188	295	671

1/ Early catch estimates from Forrest (1973) and Lynde (1983) then PacFIN estimates beginning 1981.
2/ Revised catch estimates for this assessment provided by ODFW for 1990-2004 and WDFW catch revised to exclude catch taken in Canadian waters.
3/ Early catch estimates from CDF&G Fish Bulletins and then PacFIN estimates beginning 1981.
4/ Early catch estimates from Leet et.al. (1982) and MRFSS estimates used from 1980-2004, Oregon Catches South of Blanco provided by ODFW
5/ MRFSS estimates in 2003 and CRFS estimates from 2004 are not standardized and not comparable. Awaiting explaination from CDFG?
6/ Catch estimates beginning in 1995 are expanded to include regulatory discard mortality

Table 6. Estimated commercial lingcod catch (mt) by gear and INPFC area, 1981 to 2004.

U.S Vancouver INPFC Area - lingcod landings in metric tons

Year	Hook&Line	Other	Net	Pot	Trolls	Trawls	Shrimp Trawl	Total
1981	65.3	0.0	26.6	0.0	53.5	367.5	1.3	514.2
1982	67.6	0.0	76.6	0.4	115.3	336.3	0.2	596.4
1983	36.6	0.0	119.7	0.0	201.3	802.0	18.4	1178.0
1984	63.9	0.0	131.3	3.0	201.5	1344.4	2.1	1746.2
1985	100.2	0.0	247.2	0.5	178.0	1324.7	1.5	1852.1
1986	50.3	0.0	0.0	0.0	70.8	441.7	6.1	568.9
1987	94.5	0.0	0.2	0.0	43.6	584.9	4.3	727.5
1988	69.0	0.0	0.2	0.0	74.9	478.3	0.4	622.8
1989	91.2	0.0	0.1	0.0	119.1	789.0	0.2	999.6
1990	139.9	0.0	0.0	0.0	85.0	761.9	0.5	987.3
1991	80.9	0.0	0.0	0.0	26.0	1344.9	0.3	1452.1
1992	54.6	0.0	0.0	0.0	31.4	469.5	0.1	555.6
1993	35.9	0.0	0.0	0.0	20.3	594.2	0.8	651.2
1994	34.8	0.0	0.0	0.0	21.2	471.3	1.4	528.7
1995	21.3	0.0	0.0	0.0	8.8	257.2	2.8	290.1
1996	35.2	0.0	0.0	0.0	5.8	314.8	4.7	360.5
1997	35.5	0.0	0.0	0.0	12.1	253.1	0.2	300.9
1998	8.4	0.0	0.0	0.0	2.2	39.4	0.0	50.0
1999	15.1	0.0	0.0	0.0	1.8	29.8	0.1	46.8
2000	10.5	0.0	0.0	0.0	3.3	8.1	0.0	21.9
2001	12.4	0.0	0.0	0.0	1.7	10.9	0.1	25.1
2002	10.4	0.0	0.0	0.0	1.9	30.2	0.0	42.5
2003	11.4	0.0	0.0	0.0	1.5	35.5	0.0	48.4
2004	8.7	0.0	0.0	0.0	2.3	30.7	0.0	41.7

Columbia INPFC Area - lingcod landings in metric tons

Year	Hook&Line	Other	Net	Pot	Trolls	Trawls	Shrimp Trawl	Total
1981	27.2	0.0	45.5	3.5	29.0	1208.4	76.8	1390.4
1982	47.8	0.0	0.2	3.2	24.2	1497.9	71.0	1644.3
1983	37.0	0.0	10.8	2.1	31.5	1706.9	84.4	1872.7
1984	34.7	0.0	3.0	0.8	17.3	1154.2	49.1	1259.1
1985	54.0	0.0	0.0	1.4	43.3	1131.8	44.2	1274.7
1986	53.0	0.0	0.0	0.6	43.8	556.3	82.3	736.0
1987	81.1	0.1	0.0	0.7	20.3	721.7	68.5	892.4
1988	70.8	0.0	0.0	0.7	16.4	904.6	30.6	1023.1
1989	100.0	0.0	0.0	0.2	28.8	1056.4	45.7	1231.1
1990	62.5	0.0	0.0	0.1	11.6	663.5	21.1	758.8
1991	32.2	0.0	0.0	0.5	4.1	814.0	16.7	867.5
1992	55.1	0.0	0.0	0.1	8.8	573.3	14.1	651.4
1993	59.0	0.3	0.0	0.3	12.1	680.1	25.9	777.7
1994	102.4	0.0	0.0	1.0	5.8	535.2	40.7	685.1
1995	39.3	0.0	0.0	0.3	4.4	483.2	40.8	568.0
1996	48.4	0.0	0.0	0.2	5.9	555.3	28.6	638.4
1997	58.0	0.0	0.0	0.5	9.0	546.2	18.3	632.0
1998	10.7	0.0	0.0	0.3	3.0	83.7	6.9	104.6
1999	12.0	0.0	0.0	0.2	4.8	77.8	27.3	122.1
2000	6.9	0.0	0.0	0.1	6.3	24.0	14.0	51.3
2001	10.7	0.0	0.0	1.3	5.3	20.8	6.5	44.6
2002	8.4	0.0	0.0	0.9	2.9	36.6	6.0	54.8
2003	12.4	0.0	0.0	1.1	1.8	40.0	0.0	55.3
2004	13.1	0.0	0.0	2.4	3.3	25.8	0.0	44.6

Note: Assumes that OR-Wa "Unknown" catch area is Columbia

Table 6 (continued). Estimated commercial lingcod catch (mt) by gear and INPFC area, 1981 to 2004.

Eureka INPFC Area - lingcod landings in metric tons							Shrimp	
Year	Hook&Line	Other	Net	Pot	Trolls	Trawls	Trawl	Total
1981	13.8	0.3	0.0	0.0	8.4	349.2	8.8	380.5
1982	15.9	0.9	0.0	0.4	13.6	510.9	12.8	554.5
1983	27.8	12.1	0.0	1.3	3.5	364.5	0.5	409.7
1984	5.4	13.7	0.0	0.2	4.7	262.4	1.6	288.0
1985	47.8	2.6	0.1	0.9	1.3	183.2	2.2	238.1
1986	85.6	5.3	0.0	1.8	8.6	98.4	7.4	207.1
1987	107.4	3.7	0.0	0.3	0.6	202.4	7.2	321.6
1988	117.8	0.8	0.0	0.3	3.4	196.9	6.6	325.8
1989	189.7	0.6	0.0	1.5	1.1	190.8	5.5	389.2
1990	179.9	0.8	0.0	0.3	4.1	228.2	8.5	421.8
1991	65.9	0.0	0.0	0.0	0.0	139.0	7.8	212.7
1992	60.1	0.0	0.0	0.1	0.0	105.8	3.8	169.8
1993	39.0	0.0	0.2	0.1	0.3	154.4	3.3	197.3
1994	53.9	0.1	0.3	0.2	0.2	160.3	12.9	227.9
1995	91.4	0.0	0.7	0.2	0.2	133.5	6.1	232.1
1996	73.9	0.0	0.0	0.2	2.8	117.4	9.1	203.4
1997	109.1	0.0	0.1	0.2	0.1	149.6	5.1	264.2
1998	40.4	0.1	0.0	0.2	0.6	56.7	1.1	99.1
1999	43.3	0.1	0.0	0.3	1.1	56.7	3.8	105.3
2000	21.6	0.0	0.0	0.5	0.3	19.6	0.5	42.5
2001	32.4	0.0	0.0	0.3	0.2	19.4	0.4	52.7
2002	38.3	0.0	0.0	1.1	0.1	23.6	0.1	63.2
2003	33.4	0.0	0.0	0.8	0.4	5.4	0.0	40.0
2004	32.3	0.0	0.0	0.5	0.1	6.6	0.0	39.5

Monterey INPFC Area - lingcod landings in metric tons							Shrimp	
Year	Hook&Line	Other	Net	Pot	Trolls	Trawls	Trawl	Total
1981	39.2	2.5	9.7	2.7	22.8	771.7	0.3	848.9
1982	24.8	7.3	55.1	1.3	16.1	737.6	0.1	842.3
1983	13.9	48.4	112.7	0.7	5.2	581.1	0.6	762.6
1984	4.6	126.3	43.7	0.0	4.2	558.0	0.4	737.2
1985	18.4	97.1	144.3	1.7	6.1	222.0	0.1	489.7
1986	60.7	31.9	118.6	2.1	0.8	152.9	0.3	367.3
1987	69.3	26.4	175.3	0.9	1.2	343.4	0.8	617.3
1988	102.5	19.1	289.9	2.8	1.4	333.0	1.3	750.0
1989	218.3	9.7	235.5	2.2	0.5	434.7	2.6	903.5
1990	162.3	6.6	189.3	1.1	8.9	339.1	0.6	707.9
1991	135.8	4.2	106.3	0.9	0.7	311.0	0.3	559.2
1992	133.4	2.2	87.3	0.7	1.0	216.7	0.0	441.3
1993	111.5	0.1	107.6	0.3	2.6	277.5	0.2	499.8
1994	85.7	0.3	72.5	0.3	12.5	224.3	1.3	396.9
1995	74.4	0.2	48.9	0.9	9.2	185.2	0.4	319.2
1996	92.8	0.0	7.6	1.2	4.8	205.4	1.8	313.6
1997	89.8	0.0	27.4	2.0	1.9	218.1	1.6	340.8
1998	30.4	0.0	3.8	8.9	0.4	35.8	0.4	79.7
1999	24.3	0.1	0.8	1.6	0.6	42.1	0.5	70.0
2000	10.3	0.0	3.3	0.2	0.4	10.7	0.2	25.1
2001	14.8	0.0	0.4	0.6	1.2	9.4	0.1	26.5
2002	18.3	0.1	0.0	0.2	0.7	15.8	0.1	35.2
2003	13.7	0.1	0.0	0.8	2.1	8.5	0.0	25.2
2004	21.3	0.0	0.9	0.7	1.2	8.9	0.2	33.2

Table 6 (continued). Estimated commercial lingcod catch (mt) by gear and INPFC area, 1981 to 2004.

Conception INPFC Area - lingcod landings in metric tons							Shrimp	
Year	Hook&Line	Other	Net	Pot	Trolls	Trawls	Trawl	Total
1981	11.1	0.0	10.4	0.5	1.4	144.6	6.3	174.3
1982	4.5	0.0	27.5	0.1	0.2	159.8	10.0	202.1
1983	0.9	0.4	4.8	0.0	0.1	41.4	0.8	48.4
1984	0.6	0.3	3.9	0.0	0.0	11.8	4.7	21.3
1985	1.3	0.1	12.4	0.0	0.0	9.0	2.0	24.8
1986	3.3	0.3	15.1	0.2	0.3	8.3	0.2	27.7
1987	6.5	0.8	19.2	0.2	0.7	15.2	0.0	42.6
1988	5.3	0.3	40.3	0.0	0.0	19.5	0.0	65.4
1989	4.7	0.3	37.7	0.5	0.0	21.8	0.0	65.0
1990	5.9	0.5	26.8	0.3	0.0	24.4	0.1	58.0
1991	12.1	0.2	44.6	0.1	0.0	15.4	0.1	72.5
1992	21.5	0.3	25.6	0.2	0.0	17.3	0.1	65.0
1993	24.3	0.0	46.5	0.1	0.0	9.3	0.7	80.9
1994	18.9	0.0	21.7	1.5	0.2	20.8	3.2	66.3
1995	27.9	0.2	8.1	3.1	0.2	16.0	3.3	58.8
1996	24.2	0.6	4.8	6.7	0.2	4.1	1.6	42.2
1997	17.4	0.0	2.4	5.2	0.1	4.4	1.1	30.6
1998	10.2	0.0	1.4	3.0	0.1	3.2	1.0	18.9
1999	10.3	0.0	0.4	2.1	0.0	1.5	0.2	14.5
2000	2.9	0.0	0.0	0.6	0.0	0.1	0.1	3.7
2001	5.8	0.0	0.3	1.2	0.0	0.8	0.2	8.3
2002	8.3	0.0	0.1	1.4	0.1	0.1	0.0	10.0
2003	9.7	0.0	0.1	2.1	0.0	0.2	0.2	12.3
2004	10.6	0.0	0.1	1.8	0.0	2.3	0.0	14.8

Table 7. Estimates of lingcod discard, live and dead, in the recreational fishery by State.

MRFSS estimates of % lingcod catch (#'s of fish) that was discarded dead (B1 catches)

YEAR	SOUTHERN CALIFORNIA	NORTHERN CALIFORNIA	OREGON	WASHINGTON	ALL SUBREGIONS
1980	2%	36%	37%	40%	21%
1981	11%	23%	18%	140%	31%
1982	12%	10%	14%	126%	23%
1983	13%	7%	43%	57%	19%
1984	8%	6%	7%	33%	8%
1985	18%	6%	8%	45%	10%
1986	5%	12%	17%	150%	13%
1987	25%	16%	18%	106%	23%
1988	60%	44%	3%	1100%	45%
1989	5%	24%	2%	100%	17%
1993	50%	12%	na	na	9%
1994	13%	6%	na	na	3%
1995	14%	6%	na	na	4%
1996	0%	12%	na	na	8%
1997	0%	1%	na	na	1%
1998	0%	9%	na	na	6%
1999	0%	7%	na	na	5%
2000	0%	10%	na	na	6%
2001	0%	14%	na	na	7%
2002	20%	5%	na	na	14%
2003	0%	0%	na	na	7%

MRFSS estimates of % lingcod catch (#'s of fish) that was discarded live (B2 catches)

YEAR	SOUTHERN CALIFORNIA	NORTHERN CALIFORNIA	OREGON	WASHINGTON	SUBREGIONS
1980	6%	4%	0%	0%	5%
1981	35%	7%	4%	37%	12%
1982	16%	14%	6%	23%	12%
1983	31%	12%	17%	10%	14%
1984	27%	13%	0%	22%	13%
1985	59%	10%	0%	9%	16%
1986	162%	35%	0%	0%	59%
1987	107%	38%	2%	29%	46%
1988	122%	39%	3%	0%	52%
1989	70%	39%	2%	0%	38%
1993	117%	57%	57%	na	52%
1994	88%	61%	41%	na	45%
1995	157%	65%	58%	na	60%
1996	400%	46%	83%	na	68%
1997	75%	78%	477%	na	163%
1998	250%	81%	767%	na	220%
1999	378%	73%	76%	na	89%
2000	1867%	428%	253%	na	397%
2001	1733%	590%	147%	na	514%
2002	1224%	271%	95%	57%	374%
2003	3100%	167%	200%		387%

Note: the 2002 Washington estimate is derived from data collected by WDFW.

Table 8. Estimates of lingcod discards using trawl gear from onboard observer data. (Source: Jim Hastie, NWFSC - July 2005).

Estimated annnual trawl discard and discard rate for lingcod by INPFC area groups

Year	Area	Landed catch (mt)	Estimated Discard[1] (mt)	Discard/Catch	Discard mortality (with 50% survival) mt	Discard mortality (with 50% survival) % of total mortality
2000	Col-Van	24.3	220.9	90%	110.4	82%
	Eureka	23.6	54.4	70%	27.2	54%
	Mon-Con	10.5	46.5	82%	23.2	69%
	Coastwide	58.4	321.7	85%	160.9	73%
2001	Col-Van	21.0	176.1	89%	88.0	81%
	Eureka	25.5	72.5	74%	36.2	59%
	Mon-Con	9.3	62.8	87%	31.4	77%
	Coastwide	55.8	311.4	85%	155.7	74%
2002	Col-Van	50.4	189.2	79%	94.6	65%
	Eureka	33.2	60.1	64%	30.1	48%
	Mon-Con	15.0	29.0	66%	14.5	49%
	Coastwide	98.6	278.3	74%	139.2	59%
2003	Col-Van	38.6	41.5	52%	20.8	35%
	Eureka	11.4	22.1	66%	11.1	49%
	Mon-Con	7.7	22.9	75%	11.4	60%
	Coastwide	57.6	86.5	60%	43.3	43%
2004	Col-Van	33.0	139.0	81%	69.5	68%
	Eureka	10.7	11.1	51%	5.5	34%
	Mon-Con	9.7	17.7	65%	8.9	48%
	Coastwide	53.4	167.8	76%	83.9	61%

1 Amounts in this column represent gross amounts of estimated discard, not mortality due to discards. The GMT currently assumes a 50% mortality rate for trawl lingcod discards.

Note: Discard estimates for 2002-04 are based on year-specific observer data. For 2000-01, observer data from September 2001 to August 2004 were pooled. Caution should be used in interpreting the 2000-01 estimates, particularly if there has been a high degree of recruitment variability over the past 10 years.

Bycatch of lingcod in the fixed-gear sablefish fishery was projected to be less than 10 mt for the 2005 fishery, based on the model used by the GMT. It is unlikely that discard mortality would amount to more than 3 mt.

Table 9. Commercial fishery lingcod age composition used in the northern (LCN) model (1979-2002).

Fishery	Year	Tot. No.Fish	Female Proportion-at-age 1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16	17	18	19	20
Com	1979	694	0.000	0.003	0.004	0.015	0.031	0.052	0.094	0.207	0.236	0.145	0.050	0.018	0.017	0.017	0.030	0.031	0.006	0.000	0.000	0.000
Com	1980	1853	0.000	0.004	0.019	0.029	0.051	0.113	0.120	0.128	0.134	0.087	0.049	0.038	0.025	0.015	0.015	0.008	0.006	0.002	0.000	0.001
Com	1981	1325	0.000	0.007	0.053	0.070	0.067	0.059	0.073	0.073	0.085	0.119	0.050	0.013	0.012	0.006	0.009	0.000	0.000	0.000	0.000	0.000
Com	1982	469	0.000	0.013	0.039	0.093	0.124	0.160	0.136	0.067	0.037	0.052	0.054	0.010	0.030	0.000	0.009	0.009	0.000	0.001	0.000	0.000
Com	1983	443	0.000	0.019	0.110	0.137	0.161	0.085	0.052	0.044	0.021	0.018	0.037	0.039	0.020	0.014	0.011	0.008	0.014	0.005	0.003	0.003
Com	1984	339	0.000	0.000	0.036	0.121	0.206	0.196	0.080	0.048	0.022	0.016	0.010	0.018	0.013	0.001	0.001	0.001	0.001	0.000	0.000	0.000
Com	1985	312	0.000	0.000	0.002	0.040	0.101	0.235	0.285	0.078	0.077	0.040	0.016	0.009	0.016	0.000	0.008	0.000	0.000	0.000	0.000	0.000
Com	1986	663	0.000	0.003	0.026	0.069	0.106	0.147	0.160	0.156	0.084	0.054	0.043	0.018	0.006	0.012	0.018	0.004	0.005	0.006	0.000	0.000
Com	1987	741	0.000	0.008	0.046	0.085	0.127	0.172	0.137	0.104	0.102	0.041	0.015	0.005	0.001	0.003	0.001	0.003	0.004	0.000	0.001	0.000
Com	1988	821	0.000	0.031	0.144	0.064	0.097	0.101	0.079	0.094	0.058	0.045	0.022	0.013	0.007	0.000	0.000	0.000	0.000	0.005	0.003	0.000
Com	1989	786	0.000	0.004	0.120	0.309	0.161	0.075	0.048	0.024	0.022	0.017	0.008	0.000	0.008	0.000	0.001	0.000	0.000	0.000	0.001	0.000
Com	1990	887	0.000	0.013	0.041	0.179	0.167	0.088	0.072	0.049	0.032	0.021	0.036	0.004	0.003	0.000	0.000	0.000	0.000	0.000	0.000	0.000
Com	1991	999	0.000	0.034	0.082	0.119	0.199	0.157	0.099	0.057	0.032	0.028	0.011	0.013	0.006	0.000	0.007	0.000	0.001	0.002	0.000	0.000
Com	1992	1140	0.000	0.175	0.142	0.119	0.085	0.071	0.083	0.042	0.026	0.010	0.015	0.009	0.000	0.004	0.008	0.001	0.000	0.000	0.000	0.000
Com	1993	1022	0.000	0.116	0.173	0.100	0.102	0.071	0.135	0.032	0.010	0.073	0.004	0.015	0.006	0.002	0.005	0.000	0.001	0.000	0.000	0.000
Com	1994	1034	0.000	0.107	0.308	0.194	0.095	0.039	0.019	0.025	0.011	0.006	0.002	0.003	0.001	0.001	0.004	0.000	0.000	0.000	0.000	0.000
Com	1995	1093	0.000	0.021	0.187	0.347	0.144	0.055	0.018	0.004	0.007	0.003	0.003	0.002	0.000	0.000	0.001	0.006	0.000	0.000	0.000	0.000
Com	1996	820	0.000	0.058	0.124	0.266	0.276	0.058	0.043	0.027	0.012	0.008	0.008	0.000	0.000	0.000	0.010	0.000	0.000	0.000	0.000	0.000
Com	1997	673	0.000	0.028	0.165	0.200	0.159	0.135	0.041	0.032	0.020	0.033	0.024	0.001	0.002	0.003	0.008	0.002	0.000	0.002	0.000	0.000
Com	1998	706	0.000	0.023	0.224	0.269	0.155	0.081	0.041	0.018	0.007	0.004	0.001	0.001	0.003	0.000	0.001	0.000	0.001	0.000	0.000	0.000
Com	1999	750	0.000	0.011	0.087	0.247	0.223	0.105	0.064	0.049	0.027	0.007	0.002	0.000	0.001	0.001	0.000	0.000	0.000	0.000	0.000	0.000
Com	2000	310	0.000	0.003	0.057	0.136	0.273	0.147	0.064	0.035	0.030	0.015	0.004	0.009	0.005	0.000	0.003	0.000	0.000	0.000	0.000	0.000
Com	2001	548	0.000	0.031	0.079	0.151	0.142	0.155	0.099	0.027	0.026	0.015	0.003	0.003	0.003	0.000	0.000	0.000	0.000	0.000	0.000	0.000
Com	2002	694	0.000	0.021	0.135	0.138	0.098	0.091	0.060	0.050	0.022	0.026	0.004	0.002	0.002	0.000	0.000	0.000	0.000	0.000	0.000	0.000
			Male Proportion-at-age																			
Com	1979	694	0.000	0.001	0.003	0.005	0.018	0.007	0.008	0.002	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000
Com	1980	1853	0.000	0.000	0.009	0.014	0.031	0.053	0.018	0.016	0.009	0.001	0.005	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000
Com	1981	1325	0.000	0.001	0.010	0.045	0.048	0.060	0.064	0.050	0.020	0.006	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000
Com	1982	469	0.000	0.004	0.013	0.016	0.044	0.025	0.032	0.019	0.010	0.004	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000
Com	1983	443	0.000	0.005	0.034	0.061	0.077	0.015	0.002	0.000	0.000	0.006	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000
Com	1984	339	0.000	0.000	0.003	0.030	0.034	0.094	0.052	0.003	0.006	0.000	0.007	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000
Com	1985	312	0.000	0.000	0.000	0.016	0.015	0.015	0.044	0.001	0.001	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000
Com	1986	663	0.000	0.005	0.005	0.013	0.019	0.025	0.004	0.006	0.006	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000
Com	1987	741	0.000	0.007	0.020	0.008	0.044	0.033	0.023	0.006	0.005	0.001	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000
Com	1988	821	0.000	0.020	0.050	0.050	0.033	0.008	0.005	0.004	0.004	0.030	0.008	0.016	0.000	0.000	0.008	0.000	0.000	0.000	0.000	0.000
Com	1989	786	0.000	0.001	0.066	0.076	0.024	0.019	0.010	0.000	0.001	0.000	0.001	0.000	0.001	0.000	0.000	0.000	0.000	0.000	0.000	0.000
Com	1990	887	0.000	0.006	0.041	0.106	0.066	0.026	0.026	0.004	0.013	0.000	0.008	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000
Com	1991	999	0.000	0.027	0.018	0.032	0.029	0.018	0.015	0.008	0.005	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000
Com	1992	1140	0.000	0.074	0.072	0.017	0.013	0.014	0.005	0.008	0.000	0.007	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000
Com	1993	1022	0.000	0.050	0.051	0.040	0.006	0.002	0.004	0.001	0.001	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000
Com	1994	1034	0.000	0.024	0.091	0.047	0.013	0.002	0.004	0.004	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000
Com	1995	1093	0.000	0.009	0.052	0.107	0.028	0.002	0.002	0.001	0.000	0.000	0.000	0.001	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000
Com	1996	820	0.000	0.011	0.038	0.025	0.018	0.011	0.000	0.003	0.001	0.000	0.002	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000
Com	1997	673	0.000	0.014	0.068	0.022	0.023	0.011	0.006	0.001	0.000	0.000	0.001	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000
Com	1998	706	0.000	0.005	0.064	0.045	0.018	0.019	0.013	0.003	0.001	0.000	0.000	0.002	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000
Com	1999	750	0.000	0.005	0.032	0.046	0.041	0.015	0.021	0.007	0.004	0.003	0.002	0.000	0.000	0.000	0.000	0.002	0.000	0.000	0.000	0.000
Com	2000	310	0.000	0.000	0.013	0.023	0.107	0.054	0.010	0.009	0.003	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000
Com	2001	548	0.000	0.014	0.015	0.069	0.062	0.048	0.028	0.017	0.011	0.003	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000
Com	2002	694	0.000	0.031	0.069	0.069	0.062	0.018	0.044	0.015	0.015	0.013	0.007	0.007	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000

Table 10. Recreational fishery lingcod age composition used in the northern (LCN) model (1980-2002).

Fishery	Year	Tot. No.Fish	Female Proportion-at-age 1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16	17	18	19	20
Rec	1980	226	0.000	0.004	0.022	0.022	0.018	0.031	0.049	0.009	0.013	0.013	0.009	0.000	0.004	0.013	0.004	0.000	0.000	0.000	0.000	0.000
Rec	1986	341	0.000	0.003	0.015	0.056	0.062	0.053	0.062	0.062	0.050	0.032	0.026	0.018	0.012	0.009	0.009	0.003	0.006	0.006	0.003	0.000
Rec	1987	274	0.000	0.018	0.018	0.062	0.077	0.036	0.033	0.036	0.018	0.015	0.004	0.000	0.007	0.004	0.004	0.000	0.000	0.000	0.000	0.004
Rec	1988	250	0.004	0.044	0.112	0.044	0.024	0.008	0.004	0.000	0.000	0.004	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000
Rec	1989	227	0.000	0.013	0.044	0.062	0.040	0.031	0.040	0.013	0.013	0.000	0.004	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000
Rec	1990	207	0.005	0.019	0.029	0.068	0.063	0.034	0.010	0.000	0.010	0.005	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000
Rec	1991	247	0.000	0.004	0.065	0.040	0.032	0.077	0.057	0.012	0.028	0.012	0.012	0.016	0.012	0.004	0.016	0.008	0.016	0.000	0.000	0.000
Rec	1992	499	0.000	0.048	0.070	0.068	0.048	0.044	0.030	0.024	0.014	0.010	0.004	0.006	0.004	0.002	0.002	0.000	0.000	0.000	0.000	0.000
Rec	1993	530	0.002	0.049	0.096	0.081	0.049	0.038	0.023	0.015	0.006	0.008	0.002	0.002	0.002	0.000	0.000	0.002	0.000	0.000	0.000	0.000
Rec	1994	449	0.000	0.009	0.076	0.114	0.085	0.085	0.024	0.011	0.007	0.009	0.009	0.004	0.011	0.000	0.000	0.002	0.002	0.000	0.000	0.000
Rec	1995	643	0.000	0.005	0.042	0.096	0.106	0.059	0.058	0.019	0.012	0.006	0.005	0.002	0.000	0.002	0.002	0.000	0.002	0.000	0.000	0.000
Rec	1996	461	0.000	0.007	0.098	0.143	0.117	0.069	0.048	0.015	0.013	0.007	0.004	0.002	0.000	0.002	0.004	0.000	0.000	0.000	0.000	0.000
Rec	1997	446	0.000	0.007	0.087	0.108	0.092	0.085	0.029	0.020	0.009	0.004	0.002	0.002	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000
Rec	1998	416	0.002	0.007	0.067	0.147	0.127	0.079	0.067	0.024	0.019	0.002	0.002	0.007	0.000	0.002	0.000	0.000	0.000	0.000	0.000	0.000
Rec	1999	609	0.000	0.000	0.053	0.138	0.149	0.085	0.053	0.033	0.011	0.003	0.003	0.002	0.002	0.000	0.002	0.000	0.000	0.000	0.000	0.000
Rec	2000	610	0.000	0.002	0.036	0.110	0.159	0.098	0.079	0.028	0.011	0.005	0.007	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000
Rec	2001	961	0.000	0.000	0.019	0.087	0.149	0.134	0.083	0.040	0.020	0.011	0.007	0.002	0.001	0.000	0.000	0.000	0.000	0.000	0.000	0.000
Rec	2002	1098	0.000	0.001	0.054	0.160	0.147	0.095	0.074	0.036	0.015	0.015	0.011	0.001	0.001	0.001	0.001	0.000	0.000	0.000	0.000	0.000
			Male Proportion-at-age																			
Rec	1980	226	0.000	0.009	0.080	0.146	0.173	0.142	0.137	0.049	0.040	0.009	0.004	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000
Rec	1986	341	0.000	0.006	0.053	0.100	0.059	0.041	0.053	0.067	0.044	0.029	0.018	0.021	0.006	0.006	0.006	0.003	0.000	0.003	0.003	0.000
Rec	1987	274	0.000	0.091	0.113	0.109	0.109	0.073	0.073	0.044	0.015	0.015	0.000	0.015	0.007	0.000	0.000	0.000	0.000	0.000	0.000	0.000
Rec	1988	250	0.000	0.216	0.372	0.080	0.056	0.020	0.004	0.004	0.004	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000
Rec	1989	227	0.000	0.044	0.194	0.220	0.123	0.057	0.035	0.031	0.018	0.009	0.004	0.004	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000
Rec	1990	207	0.000	0.034	0.135	0.242	0.237	0.072	0.019	0.014	0.000	0.000	0.000	0.000	0.000	0.000	0.005	0.000	0.000	0.000	0.000	0.000
Rec	1991	247	0.000	0.028	0.113	0.109	0.069	0.126	0.028	0.065	0.012	0.012	0.012	0.004	0.004	0.000	0.000	0.000	0.000	0.000	0.004	0.000
Rec	1992	499	0.002	0.072	0.166	0.124	0.092	0.080	0.052	0.014	0.012	0.004	0.004	0.002	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000
Rec	1993	530	0.000	0.070	0.230	0.138	0.075	0.038	0.025	0.021	0.004	0.013	0.011	0.000	0.000	0.002	0.000	0.000	0.000	0.000	0.000	0.000
Rec	1994	449	0.002	0.024	0.151	0.156	0.078	0.049	0.029	0.027	0.013	0.004	0.011	0.002	0.004	0.000	0.000	0.000	0.000	0.000	0.000	0.000
Rec	1995	643	0.000	0.014	0.082	0.221	0.134	0.075	0.023	0.012	0.011	0.006	0.002	0.002	0.002	0.000	0.000	0.000	0.000	0.000	0.003	0.000
Rec	1996	461	0.000	0.007	0.087	0.111	0.121	0.078	0.028	0.024	0.002	0.002	0.007	0.000	0.002	0.000	0.002	0.000	0.000	0.000	0.000	0.000
Rec	1997	446	0.000	0.013	0.099	0.173	0.110	0.067	0.056	0.004	0.013	0.007	0.009	0.002	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000
Rec	1998	416	0.000	0.010	0.058	0.120	0.127	0.065	0.041	0.022	0.000	0.000	0.000	0.000	0.002	0.000	0.000	0.000	0.000	0.000	0.000	0.000
Rec	1999	609	0.000	0.000	0.048	0.128	0.123	0.087	0.043	0.021	0.010	0.000	0.005	0.002	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000
Rec	2000	610	0.000	0.002	0.034	0.077	0.148	0.108	0.054	0.026	0.007	0.003	0.003	0.002	0.002	0.000	0.000	0.000	0.000	0.000	0.000	0.000
Rec	2001	961	0.000	0.002	0.016	0.083	0.106	0.114	0.058	0.034	0.020	0.009	0.003	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000
Rec	2002	1098	0.000	0.000	0.028	0.100	0.118	0.066	0.045	0.020	0.006	0.004	0.004	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000

Table 11. NMFS Trawl Survey (1992-2001) and WDFW Cape Flattery Survey (1994-1997) age composition used in the northern (LCN) model.

Survey	Year	Tot. No.Fish	Female Proportion-at-age 1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16	17	18	19	20
NMFS	1992	74	0.068	0.149	0.149	0.135	0.014	0.054	0.014	0.000	0.000	0.014	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.014	0.000
NMFS	1995	208	0.091	0.101	0.207	0.130	0.058	0.043	0.019	0.005	0.005	0.000	0.000	0.000	0.005	0.000	0.000	0.000	0.000	0.000	0.000	0.000
NMFS	1998	367	0.114	0.101	0.120	0.112	0.109	0.090	0.049	0.014	0.003	0.003	0.003	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000
NMFS	2001	563	0.108	0.206	0.121	0.036	0.021	0.027	0.027	0.025	0.016	0.012	0.004	0.002	0.002	0.000	0.002	0.000	0.000	0.000	0.000	0.000
			Male Proportion-at-age																			
NMFS	1992	74	0.054	0.203	0.027	0.027	0.014	0.054	0.014	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000
NMFS	1995	208	0.043	0.067	0.077	0.058	0.034	0.029	0.014	0.005	0.000	0.000	0.005	0.000	0.000	0.000	0.005	0.000	0.000	0.000	0.000	0.000
NMFS	1998	367	0.065	0.068	0.084	0.030	0.019	0.005	0.005	0.005	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000
NMFS	2001	563	0.085	0.171	0.091	0.021	0.005	0.005	0.005	0.004	0.004	0.002	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000
			Female Proportion-at-age																			
WDFW	1994	100	0.000	0.000	0.000	0.040	0.150	0.020	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000
WDFW	1995	281	0.000	0.107	0.053	0.046	0.018	0.004	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000
WDFW	1996	511	0.022	0.147	0.104	0.051	0.012	0.002	0.000	0.000	0.002	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000
WDFW	1997	498	0.010	0.197	0.139	0.024	0.010	0.000	0.002	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000
			Male Proportion-at-age																			
WDFW	1994	100	0.000	0.000	0.000	0.280	0.420	0.080	0.000	0.010	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000
WDFW	1995	281	0.000	0.206	0.185	0.295	0.060	0.014	0.007	0.000	0.004	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000
WDFW	1996	511	0.031	0.319	0.225	0.070	0.012	0.004	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000
WDFW	1997	498	0.014	0.309	0.227	0.046	0.014	0.008	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000

Table12. NMFS Trawl Survey (1986-1989) and WDFW Cape Flattery Survey (1986-1993) size composition data (cm) used in the northern (LCN) model.

Survey	Year	Tot. No.Fish	28	30	32	34	36	38	40	42	44	46	48	50	52	54	56	58	60	62	64	66	68	70
			Female Proportion-at-size (cm)																					
NMFS	1986	220	0.000	0.000	0.000	0.001	0.007	0.005	0.014	0.002	0.006	0.010	0.000	0.000	0.000	0.001	0.017	0.000	0.010	0.053	0.011	0.029	0.108	0.010
NMFS	1989	470	0.001	0.000	0.003	0.038	0.019	0.020	0.003	0.000	0.008	0.039	0.006	0.020	0.002	0.002	0.012	0.009	0.026	0.061	0.034	0.061	0.060	0.013
			Male Proportion-at-size (cm)																					
NMFS	1986	220	0.000	0.001	0.000	0.022	0.003	0.009	0.002	0.001	0.000	0.000	0.012	0.001	0.000	0.005	0.006	0.031	0.066	0.022	0.003	0.012	0.028	0.051
NMFS	1989	470	0.020	0.000	0.002	0.003	0.008	0.002	0.001	0.000	0.000	0.025	0.016	0.039	0.004	0.005	0.008	0.012	0.009	0.040	0.043	0.039	0.012	0.003
			Female Proportion-at-size (cm)																					
WDFW	1986	484	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.006	0.006	0.006	0.004	0.008	0.008	0.010	0.014	0.008	0.025	0.000	0.006	0.002	0.004
WDFW	1987	542	0.000	0.000	0.000	0.000	0.000	0.000	0.002	0.011	0.022	0.013	0.022	0.006	0.006	0.006	0.011	0.009	0.011	0.011	0.006	0.011	0.004	0.006
WDFW	1988	978	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.001	0.003	0.002	0.009	0.015	0.028	0.028	0.021	0.009	0.005	0.005	0.006	0.004	0.000
WDFW	1989	964	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.001	0.002	0.006	0.004	0.001	0.001	0.008	0.012	0.007	0.007	0.016	0.018	0.012	0.010	0.003
WDFW	1990	971	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.018	0.020	0.041	0.014	0.014	0.004	0.011	0.028	0.028	0.009	0.007	0.005	0.009	0.007	0.009
WDFW	1991	1017	0.000	0.000	0.000	0.000	0.000	0.000	0.001	0.003	0.017	0.024	0.010	0.010	0.013	0.025	0.036	0.029	0.013	0.007	0.005	0.011	0.003	0.004
WDFW	1992	1003	0.000	0.000	0.000	0.000	0.000	0.000	0.006	0.015	0.027	0.038	0.011	0.008	0.014	0.034	0.024	0.021	0.013	0.017	0.009	0.005	0.003	0.005
WDFW	1993		0.000	0.000	0.000	0.000	0.000	0.000	0.004	0.015	0.024	0.040	0.030	0.012	0.013	0.019	0.025	0.026	0.012	0.005	0.006	0.003	0.003	0.003
			Male Proportion-at-size (cm)																					
WDFW	1986	484	0.002	0.000	0.000	0.000	0.000	0.000	0.000	0.017	0.029	0.017	0.045	0.056	0.089	0.085	0.066	0.103	0.058	0.074	0.074	0.029	0.029	0.019
WDFW	1987	542	0.000	0.000	0.000	0.000	0.000	0.006	0.020	0.042	0.046	0.031	0.015	0.018	0.054	0.066	0.055	0.089	0.083	0.089	0.057	0.042	0.031	0.028
WDFW	1988	978	0.000	0.000	0.000	0.000	0.000	0.000	0.001	0.002	0.004	0.017	0.045	0.102	0.137	0.131	0.072	0.043	0.049	0.044	0.049	0.040	0.021	0.021
WDFW	1989	964	0.000	0.000	0.000	0.001	0.000	0.000	0.001	0.004	0.015	0.017	0.015	0.015	0.032	0.058	0.141	0.150	0.150	0.103	0.054	0.025	0.025	0.022
WDFW	1990	971	0.000	0.000	0.000	0.000	0.000	0.000	0.002	0.024	0.037	0.039	0.020	0.019	0.036	0.050	0.044	0.025	0.062	0.080	0.115	0.071	0.051	0.016
WDFW	1991	1017	0.000	0.000	0.000	0.000	0.000	0.000	0.004	0.017	0.060	0.052	0.026	0.045	0.085	0.102	0.076	0.043	0.043	0.040	0.033	0.048	0.034	0.033
WDFW	1992	1003	0.000	0.000	0.001	0.000	0.000	0.011	0.028	0.080	0.103	0.060	0.029	0.044	0.074	0.077	0.067	0.039	0.027	0.021	0.022	0.013	0.013	0.012
WDFW	1993		0.000	0.000	0.000	0.000	0.000	0.002	0.027	0.084	0.114	0.107	0.062	0.059	0.069	0.076	0.047	0.032	0.017	0.022	0.014	0.007	0.003	0.003

Survey	Year	Tot. No.Fish	72	74	76	78	80	82	84	86	88	90	92	94	96	98	100	102	104	106	108	110
			Female Proportion-at-size (cm)																			
NMFS	1986	220	0.012	0.050	0.033	0.096	0.023	0.026	0.013	0.026	0.026	0.012	0.001	0.026	0.000	0.007	0.013	0.000	0.000	0.000	0.000	0.006
NMFS	1989	470	0.027	0.014	0.007	0.015	0.010	0.011	0.017	0.003	0.017	0.006	0.014	0.023	0.005	0.001	0.006	0.002	0.003	0.005	0.000	0.003
			Male Proportion-at-size (cm)																			
NMFS	1986	220	0.022	0.010	0.001	0.012	0.028	0.001	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000
NMFS	1989	470	0.018	0.052	0.000	0.003	0.007	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000
			Female Proportion-at-size (cm)																			
WDFW	1986	484	0.002	0.000	0.000	0.000	0.002	0.000	0.000	0.000	0.000	0.000	0.000	0.002	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000
WDFW	1987	542	0.007	0.006	0.000	0.002	0.000	0.004	0.000	0.000	0.000	0.002	0.002	0.002	0.000	0.002	0.000	0.000	0.000	0.000	0.000	0.000
WDFW	1988	978	0.004	0.006	0.005	0.006	0.002	0.003	0.000	0.001	0.000	0.001	0.001	0.000	0.000	0.000	0.000	0.001	0.000	0.000	0.000	0.000
WDFW	1989	964	0.002	0.002	0.002	0.003	0.001	0.003	0.001	0.000	0.001	0.000	0.000	0.001	0.000	0.001	0.000	0.000	0.001	0.000	0.000	0.001
WDFW	1990	971	0.014	0.012	0.014	0.004	0.002	0.000	0.002	0.000	0.000	0.000	0.002	0.002	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000
WDFW	1991	1017	0.004	0.001	0.001	0.002	0.003	0.001	0.002	0.000	0.002	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000
WDFW	1992	1003	0.002	0.003	0.001	0.001	0.000	0.001	0.000	0.000	0.001	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000
WDFW	1993		0.000	0.002	0.000	0.002	0.001	0.001	0.000	0.001	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000
			Male Proportion-at-size (cm)																			
WDFW	1986	484	0.029	0.019	0.019	0.010	0.010	0.000	0.004	0.002	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000
WDFW	1987	542	0.013	0.015	0.002	0.009	0.002	0.002	0.002	0.002	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000
WDFW	1988	978	0.024	0.011	0.007	0.007	0.001	0.002	0.000	0.001	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000
WDFW	1989	964	0.016	0.017	0.004	0.004	0.001	0.002	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000
WDFW	1990	971	0.009	0.009	0.012	0.004	0.000	0.001	0.001	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000
WDFW	1991	1017	0.020	0.005	0.006	0.001	0.000	0.000	0.001	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000
WDFW	1992	1003	0.011	0.009	0.002	0.000	0.000	0.001	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000
WDFW	1993		0.002	0.000	0.000	0.001	0.001	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000

Table 13. Commercial (1975-1978) and Recreational (1981-1983) fishery size composition data (cm) used in the northern (LCN) model.

Fishery	Year	Tot.	Female Proportion-at-size (cm)																					
		No.Fish	28	30	32	34	36	38	40	42	44	46	48	50	52	54	56	58	60	62	64	66	68	70
Com	1975	146	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.003	0.002	0.001	0.003	0.003	0.007	0.007	0.011	0.021	0.021	0.033
Com	1976	483	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.004	0.006	0.010	0.019	0.015	0.023	0.023	0.039
Com	1977	262	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000
Com	1978	223	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.006	0.000	0.000	0.001	0.006	0.000	0.018	0.091	0.041	0.037	0.035	0.014	0.011
			Male Proportion-at-size (cm)																					
Com	1975	146	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.001	0.003	0.002	0.003	0.003	0.008	0.011	0.017	0.037	0.053	0.069	0.053
Com	1976	483	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.002	0.000	0.004	0.004	0.002	0.013	0.010	0.023	0.037	0.043
Com	1977	262	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000
Com	1978	223	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.006	0.000	0.000	0.022	0.006	0.011	0.028	0.001	0.000	0.000
			Female Proportion-at-size (cm)																					
Rec	1981	98	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.010	0.010	0.000	0.000	0.000	0.010	0.010	0.000	0.000	0.000	0.010
Rec	1982	72	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.014	0.014	0.000	0.000	0.000	0.000	0.014	0.000	0.000	0.000	0.000	0.000	0.000
Rec	1983	39	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.026	0.000	0.051	0.000	0.000	0.026	0.000	0.000	0.000	0.026	0.000	0.000	0.000	0.000	0.000
			Male Proportion-at-size (cm)																					
Rec	1981	98	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.020	0.000	0.020	0.000	0.020	0.082	0.061	0.102	0.071	0.071	0.041	0.071	0.031	0.031	0.133
Rec	1982	72	0.000	0.000	0.000	0.000	0.000	0.014	0.000	0.000	0.014	0.014	0.000	0.014	0.069	0.069	0.097	0.097	0.111	0.083	0.014	0.069	0.042	0.069
Rec	1983	39	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.026	0.051	0.000	0.026	0.000	0.000	0.051	0.000	0.128	0.103	0.051	0.128	0.026	0.103	0.000

Fishery	Year	Tot.	Female Proportion-at-size (cm)																			
		No.Fish	72	74	76	78	80	82	84	86	88	90	92	94	96	98	100	102	104	106	108	110
Com	1975	146	0.058	0.075	0.078	0.049	0.038	0.030	0.027	0.017	0.012	0.014	0.017	0.012	0.013	0.011	0.009	0.003	0.005	0.002	0.002	0.003
Com	1976	483	0.042	0.076	0.065	0.083	0.060	0.069	0.047	0.043	0.033	0.016	0.014	0.008	0.025	0.021	0.008	0.004	0.002	0.002	0.004	0.008
Com	1977	262	0.008	0.008	0.011	0.004	0.023	0.053	0.069	0.088	0.038	0.073	0.050	0.042	0.023	0.050	0.073	0.042	0.061	0.061	0.050	0.172
Com	1978	223	0.011	0.025	0.014	0.030	0.002	0.032	0.023	0.025	0.055	0.099	0.037	0.055	0.051	0.032	0.022	0.054	0.023	0.037	0.004	0.017
			Male Proportion-at-size (cm)																			
Com	1975	146	0.052	0.033	0.022	0.016	0.009	0.008	0.002	0.002	0.002	0.002	0.000	0.001	0.000	0.001	0.000	0.000	0.000	0.000	0.000	0.000
Com	1976	483	0.039	0.017	0.014	0.012	0.004	0.000	0.004	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000
Com	1977	262	0.004	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000
Com	1978	223	0.000	0.006	0.011	0.000	0.000	0.001	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000
			Female Proportion-at-size (cm)																			
Rec	1981	98	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.010	0.000	0.000	0.010	0.000	0.000	0.000
Rec	1982	72	0.000	0.000	0.000	0.000	0.014	0.000	0.014	0.000	0.014	0.014	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000
Rec	1983	39	0.000	0.000	0.000	0.026	0.051	0.051	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000
			Male Proportion-at-size (cm)																			
Rec	1981	98	0.031	0.031	0.000	0.051	0.031	0.010	0.010	0.000	0.000	0.000	0.000	0.010	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000
Rec	1982	72	0.014	0.028	0.028	0.000	0.000	0.028	0.000	0.014	0.014	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000
Rec	1983	39	0.000	0.026	0.026	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000

Table 14. Age composition of fisheries (1992-2002) and surveys (1995-2001) used in the southern (LCS) model.

Fishery	Year	Tot. No.Fish	1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16	17	18	19	20
			Female Proportion-at-age																			
Com	1992	289	0.000	0.138	0.289	0.091	0.041	0.041	0.000	0.006	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000
Com	1993	787	0.000	0.267	0.301	0.083	0.034	0.012	0.009	0.005	0.005	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000
Com	1994	538	0.000	0.088	0.241	0.135	0.041	0.047	0.017	0.005	0.023	0.001	0.011	0.002	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000
Com	1995	267	0.000	0.016	0.079	0.261	0.107	0.068	0.033	0.014	0.003	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000
Com	1996	302	0.000	0.028	0.226	0.138	0.097	0.104	0.019	0.005	0.004	0.000	0.001	0.001	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000
Com	1997	728	0.000	0.031	0.173	0.198	0.160	0.053	0.055	0.033	0.009	0.008	0.001	0.001	0.000	0.012	0.000	0.000	0.000	0.000	0.000	0.000
Com	1998	287	0.000	0.053	0.253	0.142	0.055	0.000	0.145	0.073	0.000	0.000	0.019	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000
Com	2000	61	0.000	0.000	0.000	0.048	0.286	0.000	0.333	0.095	0.000	0.048	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000
Com	2001	262	0.000	0.000	0.111	0.250	0.083	0.167	0.000	0.028	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000
Com	2002	249	0.000	0.011	0.055	0.313	0.168	0.127	0.050	0.022	0.029	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000
			Male Proportion-at-age																			
Com	1992	289	0.000	0.092	0.120	0.079	0.063	0.040	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000
Com	1993	787	0.000	0.076	0.077	0.064	0.023	0.037	0.004	0.002	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000
Com	1994	538	0.000	0.082	0.147	0.081	0.032	0.024	0.012	0.001	0.007	0.003	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000
Com	1995	267	0.000	0.002	0.101	0.194	0.080	0.027	0.015	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000
Com	1996	302	0.000	0.038	0.126	0.075	0.056	0.048	0.021	0.009	0.000	0.004	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000
Com	1997	728	0.000	0.036	0.126	0.083	0.000	0.013	0.000	0.000	0.000	0.005	0.000	0.000	0.002	0.000	0.000	0.000	0.000	0.000	0.000	0.000
Com	1998	287	0.000	0.000	0.093	0.036	0.038	0.019	0.019	0.019	0.036	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000
Com	2000	61	0.000	0.000	0.000	0.048	0.095	0.048	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000
Com	2001	262	0.000	0.000	0.056	0.083	0.194	0.028	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000
Com	2002	249	0.000	0.000	0.024	0.037	0.066	0.032	0.033	0.033	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000
			Female Proportion-at-age																			
Rec	1992	49	0.000	0.000	0.020	0.061	0.020	0.082	0.000	0.041	0.041	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000
Rec	1993	294	0.000	0.024	0.156	0.173	0.099	0.065	0.041	0.037	0.024	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000
Rec	1994	196	0.000	0.010	0.107	0.133	0.117	0.082	0.051	0.046	0.015	0.010	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000
Rec	1995	525	0.000	0.006	0.053	0.215	0.114	0.040	0.029	0.013	0.002	0.002	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000
Rec	1996	545	0.002	0.007	0.110	0.110	0.180	0.101	0.040	0.020	0.013	0.004	0.002	0.002	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000
Rec	1997	212	0.000	0.000	0.052	0.151	0.118	0.085	0.038	0.024	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000
Rec	1998	70	0.000	0.000	0.014	0.114	0.214	0.086	0.100	0.014	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000
Rec	2000	48	0.000	0.000	0.000	0.083	0.125	0.104	0.063	0.021	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000
Rec	2001	396	0.000	0.000	0.000	0.040	0.114	0.149	0.093	0.056	0.043	0.028	0.008	0.005	0.003	0.000	0.000	0.000	0.000	0.000	0.000	0.000
Rec	2002	409	0.000	0.000	0.010	0.049	0.144	0.095	0.095	0.059	0.020	0.017	0.005	0.002	0.002	0.000	0.000	0.000	0.000	0.000	0.000	0.000
			Male Proportion-at-age																			
Rec	1992	49	0.000	0.082	0.102	0.184	0.122	0.082	0.061	0.082	0.020	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000
Rec	1993	294	0.000	0.020	0.136	0.116	0.054	0.031	0.014	0.007	0.000	0.000	0.003	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000
Rec	1994	196	0.000	0.010	0.082	0.184	0.082	0.046	0.020	0.000	0.005	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000
Rec	1995	525	0.002	0.010	0.091	0.261	0.080	0.055	0.013	0.008	0.004	0.002	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000
Rec	1996	545	0.000	0.002	0.095	0.088	0.138	0.055	0.022	0.007	0.002	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000
Rec	1997	212	0.000	0.000	0.075	0.222	0.123	0.104	0.009	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000
Rec	1998	70	0.000	0.000	0.014	0.129	0.129	0.100	0.057	0.000	0.014	0.000	0.014	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000
Rec	2000	48	0.000	0.000	0.000	0.104	0.167	0.146	0.083	0.042	0.042	0.021	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000
Rec	2001	396	0.000	0.000	0.003	0.040	0.111	0.162	0.073	0.040	0.020	0.013	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000
Rec	2002	409	0.000	0.000	0.017	0.071	0.178	0.115	0.081	0.032	0.005	0.002	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000

Survey	Year	Tot. No.Fish	1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16	17	18	19	20
			Female Proportion-at-age																			
NMFS	1995	208	0.260	0.168	0.048	0.034	0.024	0.014	0.005	0.000	0.010	0.005	0.000	0.005	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000
NMFS	1998	221	0.226	0.231	0.072	0.027	0.032	0.018	0.009	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000
NMFS	2001	197	0.183	0.274	0.056	0.005	0.036	0.010	0.010	0.010	0.005	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000
			Male Proportion-at-age																			
NMFS	1995	208	0.163	0.178	0.014	0.019	0.014	0.024	0.000	0.010	0.000	0.005	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000
NMFS	1998	221	0.122	0.149	0.036	0.036	0.018	0.018	0.005	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000
NMFS	2001	197	0.157	0.157	0.061	0.005	0.010	0.015	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.005	0.000	0.000	0.000	0.000	0.000	0.000

Table 15. Fishery (2003, 2004) and NMFS trawl survey (2001, 2004) age composition data, new to the 2005 stock assessment (LCN-Top; LCS-Bottom).

Source	Year	Tot. No. Fish	Female Proportion-at age 1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16	17	18	19	20
LCN Com	2003	779	0.000	0.017	0.131	0.246	0.128	0.058	0.044	0.017	0.018	0.008	0.015	0.005	0.006	0.001	0.000	0.000	0.001	0.000	0.000	0.000
LCN Com	2004	453	0.000	0.013	0.084	0.258	0.124	0.053	0.024	0.011	0.002	0.004	0.002	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000
LCN Rec	2003	1035	0.000	0.007	0.080	0.178	0.112	0.060	0.036	0.027	0.015	0.006	0.007	0.004	0.000	0.001	0.001	0.000	0.000	0.000	0.000	0.000
LCN Rec	2004	566	0.000	0.000	0.025	0.154	0.143	0.071	0.039	0.018	0.019	0.000	0.002	0.005	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000
LCN NMFS Survey	2001	618	0.120	0.211	0.140	0.031	0.021	0.034	0.045	0.032	0.016	0.007	0.004	0.000	0.002	0.000	0.001	0.000	0.000	0.000	0.000	0.000
LCN NMFS Survey	2004	408	0.004	0.063	0.097	0.152	0.147	0.051	0.029	0.019	0.022	0.017	0.014	0.014	0.000	0.001	0.000	0.000	0.000	0.000	0.000	0.000

Source	Year	Tot. No. Fish	Male Proportion-at-age 1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16	17	18	19	20
LCN Com	2003	779	0.000	0.014	0.069	0.122	0.049	0.026	0.004	0.013	0.003	0.003	0.003	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000
LCN Com	2004	453	0.000	0.011	0.049	0.126	0.148	0.053	0.011	0.007	0.000	0.009	0.007	0.002	0.002	0.000	0.000	0.000	0.000	0.000	0.000	0.000
LCN Rec	2003	1035	0.000	0.005	0.066	0.144	0.109	0.065	0.038	0.030	0.008	0.002	0.000	0.001	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000
LCN Rec	2004	566	0.000	0.000	0.027	0.155	0.175	0.097	0.048	0.011	0.005	0.002	0.004	0.002	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000
LCN NMFS Survey	2001	618	0.065	0.150	0.085	0.021	0.004	0.003	0.002	0.003	0.001	0.001	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000
LCN NMFS Survey	2004	408	0.004	0.031	0.103	0.126	0.068	0.019	0.003	0.004	0.010	0.001	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000

Source	Year	Tot. No. Fish	Female Proportion-at age 1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16	17	18	19	20
LCS Com	2003	98	0.000	0.000	0.041	0.184	0.133	0.082	0.082	0.020	0.041	0.000	0.000	0.010	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000
LCS Com	2004	138	0.014	0.014	0.181	0.210	0.138	0.043	0.065	0.014	0.000	0.007	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000
LCS Rec	2003	383	0.013	0.000	0.029	0.162	0.112	0.099	0.063	0.039	0.026	0.013	0.010	0.000	0.005	0.000	0.000	0.003	0.000	0.000	0.000	0.000
LCS NMFS Survey	2001	248	0.155	0.307	0.070	0.012	0.017	0.007	0.019	0.006	0.002	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000
LCS NMFS Survey	2004	384	0.096	0.094	0.107	0.099	0.119	0.066	0.027	0.015	0.032	0.004	0.000	0.001	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000

Source	Year	Tot. No. Fish	Male Proportion-at-age 1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16	17	18	19	20
LCS Com	2003	98	0.000	0.000	0.020	0.204	0.082	0.031	0.051	0.020	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000
LCS Com	2004	138	0.014	0.029	0.058	0.072	0.094	0.022	0.014	0.007	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000
LCS Rec	2003	383	0.008	0.000	0.016	0.162	0.097	0.060	0.044	0.018	0.013	0.005	0.000	0.003	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000
LCS NMFS Survey	2001	248	0.118	0.153	0.088	0.005	0.017	0.019	0.002	0.000	0.000	0.000	0.000	0.000	0.000	0.002	0.000	0.000	0.000	0.000	0.000	0.000
LCS NMFS Survey	2004	384	0.083	0.073	0.051	0.064	0.036	0.009	0.007	0.000	0.000	0.000	0.015	0.001	0.002	0.000	0.000	0.000	0.000	0.000	0.000	0.000

Table 16. Lingcod length, weight, and fraction mature at age data used in the northern (LCN) model.

Males						Females					
	Length		Weight		Fraction		Length		Weight		Fraction
Age	(Cm.)	(In.)	(Kg.)	(Lbs.)	Mature	Age	(Cm.)	(In.)	(Kg.)	(Lbs.)	Mature
1	42.0	16.5	0.65	1.4	0.17	1	43.0	16.9	0.62	1.4	0.04
2	48.9	19.3	1.07	2.4	0.37	2	51.6	20.3	1.16	2.6	0.09
3	54.9	21.6	1.54	3.4	0.63	3	59.4	23.4	1.87	4.1	0.21
4	60.0	23.6	2.06	4.5	0.83	4	66.4	26.1	2.73	6.0	0.42
5	64.4	25.4	2.58	5.7	0.93	5	72.7	28.6	3.72	8.2	0.66
6	68.2	26.8	3.11	6.8	0.98	6	78.4	30.9	4.80	10.6	0.84
7	71.5	28.1	3.61	8.0	0.99	7	83.5	32.9	5.95	13.1	0.93
8	74.3	29.2	4.09	9.0	1.00	8	88.1	34.7	7.15	15.8	0.97
9	76.7	30.2	4.54	10.0	1.00	9	92.3	36.3	8.36	18.4	0.99
10	78.8	31.0	4.95	10.9	1.00	10	96.0	37.8	9.57	21.1	1.00
11	80.6	31.7	5.32	11.7	1.00	11	99.4	39.1	10.77	23.7	1.00
12	82.2	32.4	5.66	12.5	1.00	12	102.4	40.3	11.93	26.3	1.00
13	83.5	32.9	5.96	13.1	1.00	13	105.2	41.4	13.05	28.8	1.00
14	84.7	33.3	6.23	13.7	1.00	14	107.7	42.4	14.12	31.1	1.00
15	85.7	33.7	6.46	14.3	1.00	15	109.9	43.3	15.14	33.4	1.00
16	86.5	34.1	6.67	14.7	1.00	16	111.9	44.1	16.10	35.5	1.00
17	87.2	34.3	6.86	15.1	1.00	17	113.7	44.8	17.00	37.5	1.00
18	87.9	34.6	7.02	15.5	1.00	18	115.3	45.4	17.85	39.3	1.00
19	88.4	34.8	7.16	15.8	1.00	19	116.8	46.0	18.63	41.1	1.00
20	88.9	35.0	7.28	16.1	1.00	20	118.1	46.5	19.36	42.7	1.00

Males: Growth Parameters:		Weight Parameters:		Maturity Parameters:		Females: Growth Parameters:		Weight Parameters:		Maturity Parameters:	
Linf	91.816869	a	0.003953	Alpha	1.060	Linf	130.18329	a	0.00176	Alpha	0.994
K	0.149260	b	3.214900	Beta	2.506	K	0.104103	b	3.397800	Beta	4.323
L1	41.999173					L1	42.98222				

Table 17. Lingcod biological parameters used in the northern (LCN) model.

Parameter	Male Estimate	Female Estimate
Growth[1]		
Linf	91.817	130.183
K	0.149	0.104
L1	41.999	42.982
T_0	-3.097	-2.850
n	6274	16884
Length-Weight[2]		
a	0.003953	0.001760
b	3.214900	3.397800
R sq	0.52	0.71
n	5149	12079
Maturity[3]		
Alpha	1.060	0.994
Beta	2.506	4.323
n	15	21
Natural Mortality[4]		
M	0.32	0.18
Fecundity[5]		
a		2.82406E-04
b		3.0011

[1] Growth Model: L = Linf + (L1-Linf) * exp(K * (1-Age))

[2] Length Weight Model: $W = a*L^b$

[3] Maturity Model: P = 1/(1+exp(-Alpha * (Age-Beta)))

[4] Natural Mortality: Data source: Jagielo (1994); derived from an average of values using methods of Hoenig (1983), Alverson and Carney (1975), and Pauly (1980).

Table 18. Mean length, weight and fraction of lingcod mature at age used in the LCS model. Survey data only were used for ages 1-3. Survey and fishery data were used for ages 4+.

Males						Females					
	Length		Weight		Fraction		Length		Weight		Fraction
Age	(Cm.)	(In.)	(Kg.)	(Lbs.)	Mature	Age	(Cm.)	(In.)	(Kg.)	(Lbs.)	Mature
1	34.3	13.5	0.34	0.7	0.06	1	35.1	13.8	0.31	0.7	0.04
2	43.7	17.2	0.75	1.6	0.18	2	45.6	18.0	0.76	1.7	0.11
3	51.3	20.2	1.25	2.7	0.43	3	54.7	21.5	1.41	3.1	0.29
4	57.4	22.6	1.79	3.9	0.72	4	62.5	24.6	2.23	4.9	0.55
5	62.3	24.5	2.32	5.1	0.90	5	69.3	27.3	3.16	7.0	0.79
6	66.2	26.0	2.82	6.2	0.97	6	75.2	29.6	4.17	9.2	0.92
7	69.3	27.3	3.27	7.2	0.99	7	80.2	31.6	5.20	11.5	0.97
8	71.8	28.2	3.66	8.1	1.00	8	84.6	33.3	6.24	13.7	0.99
9	73.7	29.0	3.99	8.8	1.00	9	88.4	34.8	7.24	16.0	1.00
10	75.3	29.7	4.28	9.4	1.00	10	91.7	36.1	8.20	18.1	1.00
11	76.6	30.2	4.51	10.0	1.00	11	94.6	37.2	9.09	20.0	1.00
12	77.6	30.6	4.71	10.4	1.00	12	97.0	38.2	9.92	21.9	1.00
13	78.4	30.9	4.87	10.7	1.00	13	99.2	39.0	10.68	23.5	1.00
14	79.1	31.1	5.00	11.0	1.00	14	101.0	39.8	11.37	25.1	1.00
15	79.6	31.3	5.11	11.3	1.00	15	102.6	40.4	11.99	26.4	1.00
16	80.0	31.5	5.20	11.5	1.00	16	104.0	40.9	12.55	27.7	1.00
17	80.4	31.6	5.27	11.6	1.00	17	105.2	41.4	13.04	28.8	1.00
18	80.6	31.7	5.32	11.7	1.00	18	106.2	41.8	13.48	29.7	1.00
19	80.8	31.8	5.37	11.8	1.00	19	107.1	42.2	13.87	30.6	1.00
20	81.0	31.9	5.40	11.9	1.00	20	107.9	42.5	14.22	31.3	1.00
Growth Parameters:		Weight Parameters:		Maturity Parameters:		Growth Parameters:		Weight Parameters:		Maturity Parameters:	
Linf	81.693959	a	0.003953	Alpha	1.240	Linf	112.81069	a	0.00176	Alpha	1.129
K	0.223233	b	3.214900	Beta	3.233	K	0.144902	b	3.397800	Beta	3.814
L1	34.252704					L1	35.113463				

Table 19. Lingcod biological parameters used in the southern (LCS) model.

Parameter	Male Estimate	Female Estimate
Growth[1]		
Linf	81.694	112.811
K	0.223	0.145
L1	34.253	35.113
T_0	-1.435	-1.573
n	986	1780
Length-Weight[2]		
a	0.003953	0.001760
b	3.214900	3.397800
R sq	0.52	0.71
n	5149	12079
Maturity[3]		
Alpha	1.240	1.129
Beta	3.233	3.814
R sq	0.989	0.994
Natural Mortality[4]		
M	0.32	0.18
Fecundity[5]		
a		2.82406E-04
b		3.0011

[1] Growth Model: L = Linf + (L1-Linf) * exp(K * (1-Age))

[2] Length Weight Model: $W = a*L^b$

[3] Maturity Model: P = 1/(1+exp(-Alpha * (Age-Beta)))

[4] Natural Mortality: Data source: Jagielo (1994); derived from an average of values using methods of Hoenig (1983), Alverson and Carney (1975), and Pauly (1980).

Table 20. NMFS trawl survey lingcod biomass estimates by INPFC area for combined depth strata. Note: The shallow depth strata was 50-100 fm. in 1977, and 30-100 fm. for all other years.

NMFS Trawl Survey lingcod biomass (mt) estimates for combined depth strata by INPFC

Standard analysis which includes all good perfromance hauls.

Year	Conception	Monterey	Eureka	Columbia	US Vancouver	Monterey + Eureka	CV	Columbia +US Vancouver	CV
1977	69	1,800	274	12,648	2,277	2,074	0.32	14,925	0.77
1980		671	431	8,699	1,281	1,102	0.29	9,979	0.65
1983		1,467	494	4,026	1,805	1,962	0.33	5,831	0.15
1986		611	316	1,828	988	926	0.21	2,816	0.12
1989	54	2,107	473	3,649	1,863	2,580	0.20	5,512	0.29
1992	27	484	148	3,071	1,069	632	0.24	4,140	0.49
1995	42	703	179	1,320	552	881	0.28	1,872	0.16
1998	34	651	219	2,002	1,018	871	0.27	3,020	0.26
2001	85	693	654	3,903	1,324	1,347	0.12	5,227	0.27

Including all good perfrmance hauls, but excluding tows identified as "water hauls"

Year	Conception	Monterey	Eureka	Columbia	US Vancouver	Monterey + Eureka	CV	Columbia +US Vancouver	CV
1977	74	2,368	624	12,773	2,270	2,993	0.14	15,043	0.77
1980		929	608	3,219	1,361	1,537	0.31	4,580	0.31
1983		1,523	556	4,306	1,962	2,079	0.33	6,268	0.16
1986		611	315	1,860	951	926	0.21	2,812	0.12
1989	54	2,168	540	3,933	1,922	2,708	0.20	5,856	0.30
1992	32	476	154	3,071	1,084	630	0.25	4,155	0.49
1995	46	703	199	1,329	555	901	0.27	1,884	0.16
1998	34	651	219	2,002	1,018	871	0.27	3,020	0.26
2001	85	693	654	3,903	1,324	1,347	0.12	5,227	0.27

Difference in estimated biomass (mt) by including and excluding "water hauls"

Year	Conception	Monterey	Eureka	Columbia	US Vancouver	Monterey + Eureka	Columbia +US Vancouver
1977	5	569	350	125	-7	919	118
1980	0	258	177	-5,480	81	435	-5,399
1983	0	55	61	280	157	117	437
1986	0	0	-1	33	-37	-1	-4
1989	1	61	67	284	60	128	344
1992	6	-8	6	0	15	-2	15
1995	3	0	20	9	3	20	12
1998	0	0	0	0	0	0	0
2001	0	0	0	0	0	0	0

Table 21. NMFS trawl survey lingcod biomass estimates by INPFC area for the 2004 Triennial Shelf Survey. (Source: Mark Wilkins, AFSC, July 2005).

INPFC Area	Depth Stratum	Biomass (mt)	CV (Biomass)
US Vancouver			
	55-183 m	2665	0.36
	184-366 m	450	0.73
	367-500 m	0	
	55-366 m	3115	0.32
	55-500 m	3115	0.32
Columbia			
	55-183 m	6793	0.42
	184-366 m	1458	0.74
	367-500 m	0	
	55-366 m	8251	0.37
	55-500 m	8251	0.37
North (LCN) Total		11366	0.35
Eureka			
	55-183 m	622	0.34
	184-366 m	802	0.49
	367-500 m	0	
	55-366 m	1424	0.31
	55-500 m	1424	0.31
Monterey			
	55-183 m	1628	0.33
	184-366 m	535	0.34
	367-500 m	129	0.68
	55-366 m	2163	0.27
	55-500 m	2292	0.25
Conception			
	55-183 m	40	0.34
	184-366 m	118	0.49
	367-500 m	0	
	55-366 m	159	0.37
	55-500 m	159	0.37
South (LCS) Total		3746	0.32

Table 22. WDFW Cape Flattery tag survey index used in the northern (LCN) assessment. Estimates for the years 1986-1992 were obtained from Jagielo (1995).

Year	Number of Fish	Standard Deviation
1986	119700	18800
1987	208500	31800
1988	165400	19000
1989	149000	13500
1990	123800	10300
1991	114400	9500
1992	127300	11000

Table 23. Number of logbook tows used to develop trawl logbook CPUE indices in southern and northern waters.

Total number of logbook tows by PMFC Area

Year	1A	1B	1C	2A	2B	2C	2C	3A	3B	3C
1976	0	0	0	673	2783	1433	1433	3966	0	0
1977	0	0	0	447	1290	1747	1747	2051	0	0
1978	2048	9495	8702	985	1951	1638	1638	3142	0	0
1979	2472	10552	12756	1764	3007	1981	1981	5583	0	0
1980	2036	8895	7958	1137	1101	1048	1048	4479	0	0
1981	5566	19492	16002	3701	3806	1396	1396	5270	0	0
1982	2412	10345	7970	2845	5267	4503	4503	8446	0	0
1983	1494	9416	7465	2330	5324	1195	1195	4912	0	0
1984	1683	6883	7629	1657	2320	1927	1927	5644	0	0
1985	2699	8366	7142	1140	2784	2928	2928	3606	0	0
1986	2865	9941	5151	770	1432	2053	2053	5520	4338	3816
1987	3030	6630	5070	1415	5016	2765	2765	10821	3520	3287
1988	3182	6847	6209	1456	5117	7490	3751	11027	4607	4077
1989	4338	8000	5777	1431	5232	12348	6183	12492	5711	5352
1990	3622	6483	5601	1504	4786	10598	5319	9211	4491	5759
1991	3296	8931	5197	1736	6713	14917	7504	12067	5630	6460
1992	3393	10158	4210	1487	5468	14288	7190	10485	4936	5905
1993	2450	9936	4205	1827	5674	8702	8702	8491	4797	5711
1994	2662	8995	3940	1531	3888	7176	7176	7130	3674	4951
1995	2721	8688	4986	1372	3699	9378	4696	7205	3825	3230
1996	2697	9568	4968	1424	3320	9388	4699	8199	3605	2643
1997	1867	8000	4763	1717	3550	9194	4603	5706	2072	2271
1998	2673	5792	3776	2184	3228	7516	3759	4236	2066	2262
1999	3403	5258	4064	1637	2712	6026	3014	4341	1809	1841
2000	1702	3692	3278	728	2095	5423	2716	4451	2045	1638
2001	2261	3090	3078	1161	2140	6376	3195	3574	2072	1935
2002	3310	4640	3114	726	1278	4345	2176	3337	2560	1577
	69,882	208,093	153,011	39,665	90,908	154,599	96,117	169,375	61,758	62,715

Table 24. Summary of estimated Delta GLM logbook index results in the northern region, indicating: 1) sample size (# of tows), 2) the percentage of tows with lingcod present (2003 index % positive), and 3) the computed index values used in the 2003 LCN stock assessment model. The logbook index values used in the 2000 assessment are provided for comparison.

Northern Area Trawl Logbook Index

	2000 Index	2003 Index		
Year	**Index Value**	**# of Tows**	**% Positive**	**Index Value**
1976		9,615	62%	20.33
1977		6,835	52%	16.16
1978		8,369	54%	10.79
1979		12,552	58%	11.37
1980		7,676	64%	11.32
1981		11,868	63%	13.33
1982		22,719	50%	9.29
1983	335.9	12,626	51%	9.32
1984	218.3	11,818	44%	6.99
1985	296.7	12,246	36%	6.26
1986	271.6	19,212	23%	3.58
1987	287.0	28,174	31%	4.24
1988	218.1	39,808	27%	4.56
1989	201.2	53,483	25%	5.45
1990	201.1	45,443	23%	4.36
1991	157.4	60,704	22%	3.94
1992	153.8	55,370	19%	2.23
1993	102.9	42,077	28%	2.74
1994	157.6	33,995	28%	2.82
1995	40.6	36,715	21%	2.47
1996	127.3	36,543	22%	2.54
1997	123.0	31,987	21%	2.36

Table 25. Summary of estimated Delta GLM logbook index results in the southern region, indicating: 1) sample size (# of tows), 2) the percentage of tows with lingcod present (2003 index % positive), and 3) the computed index values used in the 2003 LCS stock assessment model. The logbook index values used in the 2000 assessment are provided for comparison.

Southern Area Trawl Logbook Index

	2000 Index	2003 Index		
Year	**Index Value**	**# of Tows**	**% Positive**	**Index Value**
1978	44.51	21,230	34%	5.80
1979	49.23	27,544	47%	11.75
1980	45.79	20,026	47%	9.57
1981	49.65	44,761	46%	7.29
1982	45.62	23,572	47%	7.37
1983	29.16	20,705	43%	8.88
1984	25.46	17,852	39%	7.56
1985	15.53	19,347	31%	3.56
1986	17.41	18,727	24%	3.10
1987	27.25	16,145	33%	5.42
1988	26.32	17,694	31%	5.63
1989	28.99	19,546	32%	7.30
1990	29.97	17,210	28%	6.18
1991	22.27	19,160	31%	3.75
1992	18.58	19,248	27%	3.12
1993	20.51	18,418	28%	3.84
1994	21.56	17,128	25%	3.63
1995	20.35	17,767	25%	3.87
1996	16.65	18,657	26%	3.12
1997	18.81	16,347	28%	3.30

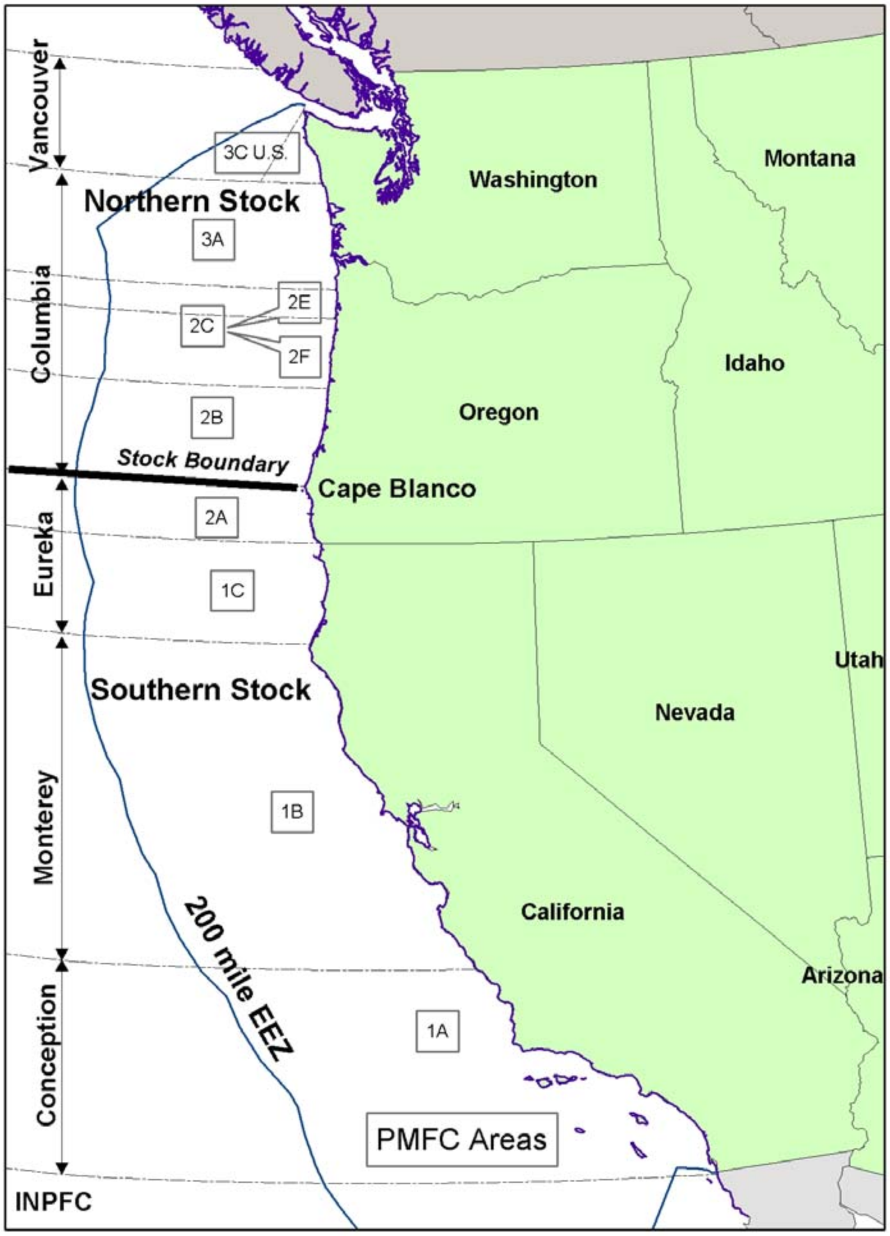


Figure 1. Lingcod stock boundaries and location of PMFC and INPFC Areas.

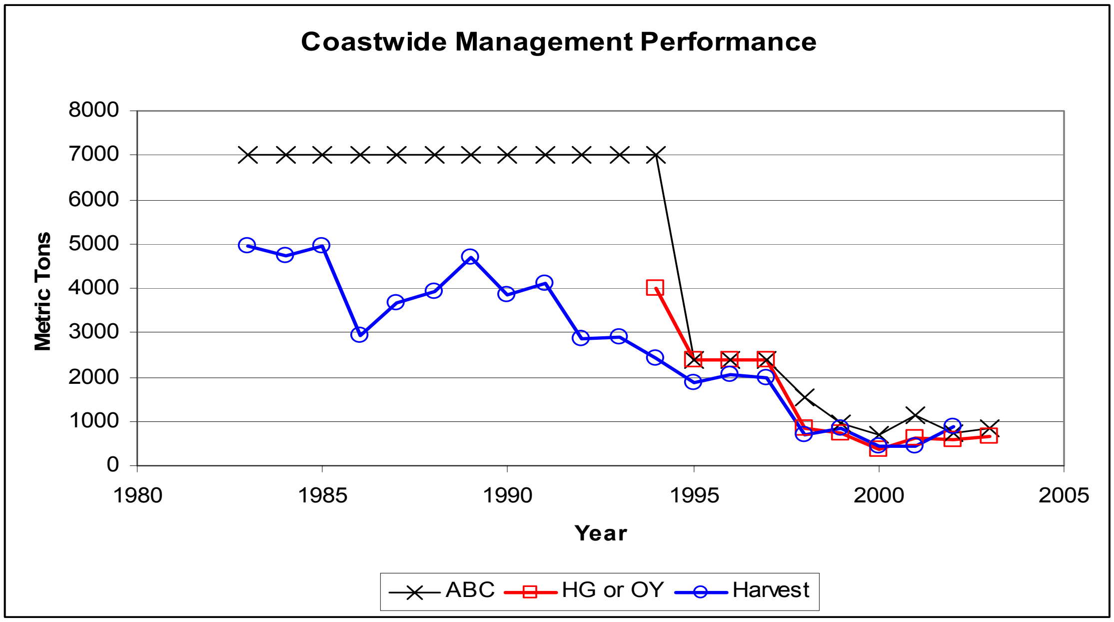


Figure 2. Comparison of lingcod ABC, OY and landings (mt).

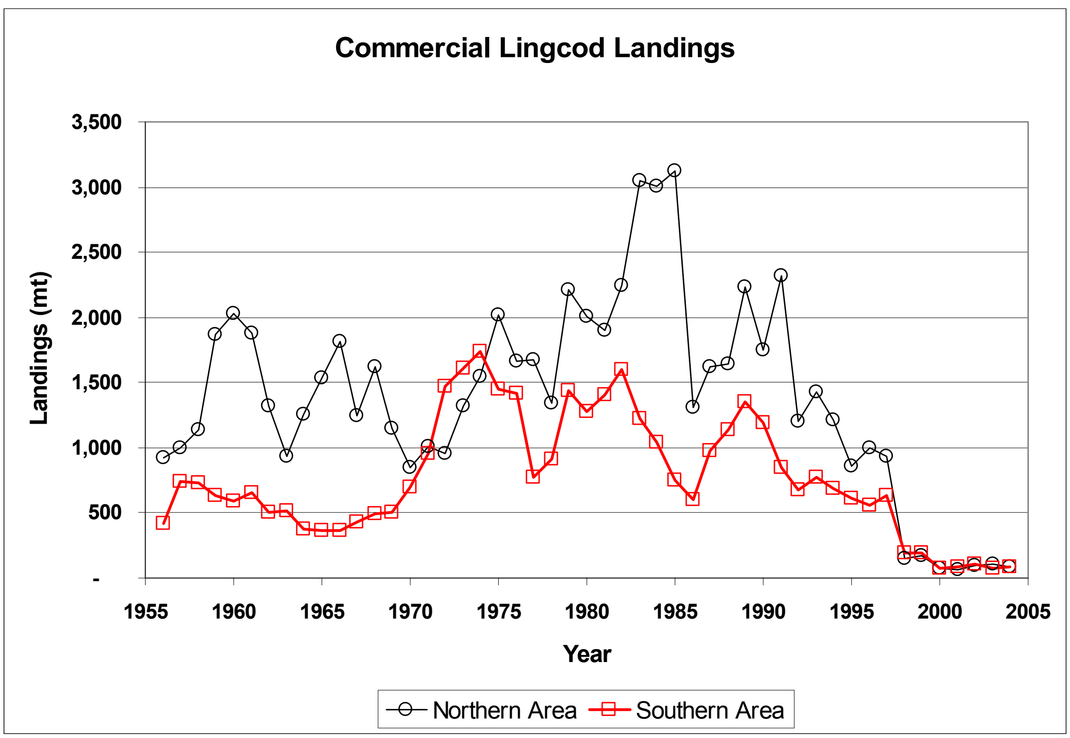


Figure 3. Comparison of commercial lingcod landings in the northern (U.S. Vancouver and Columbia) and southern (Eureka, Monterey and conception) areas.

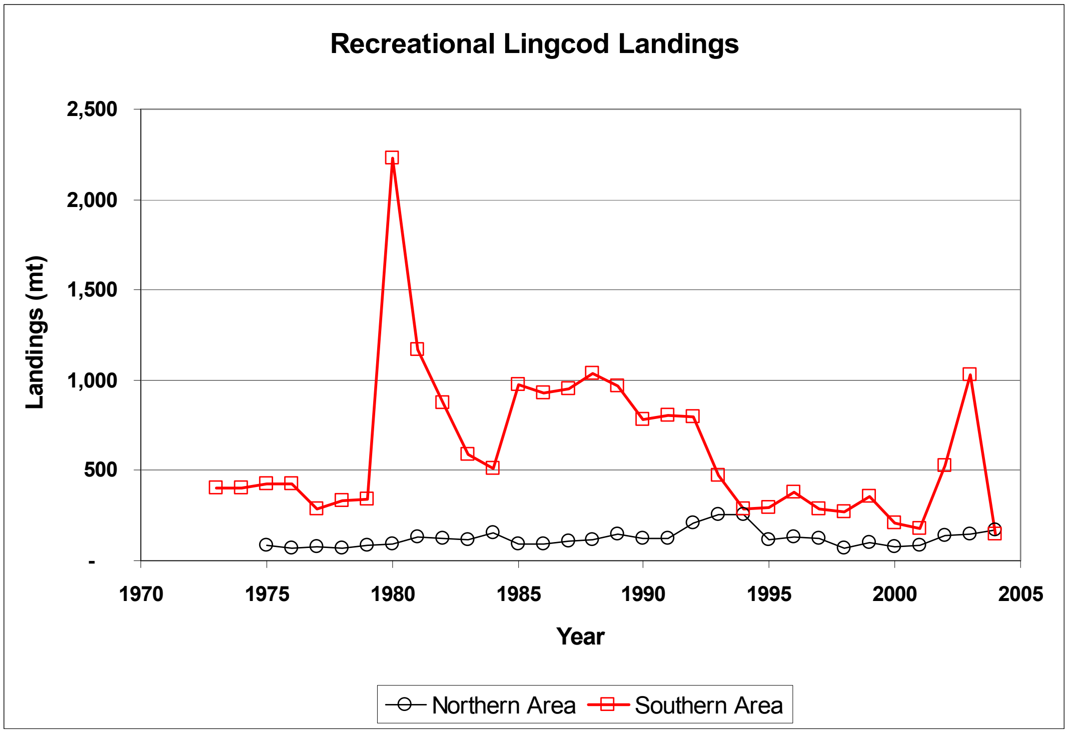


Figure 4. Comparison of recreational lingcod landings in the northern (U.S. Vancouver and Columbia) and southern (Eureka, Monterey and conception) areas.

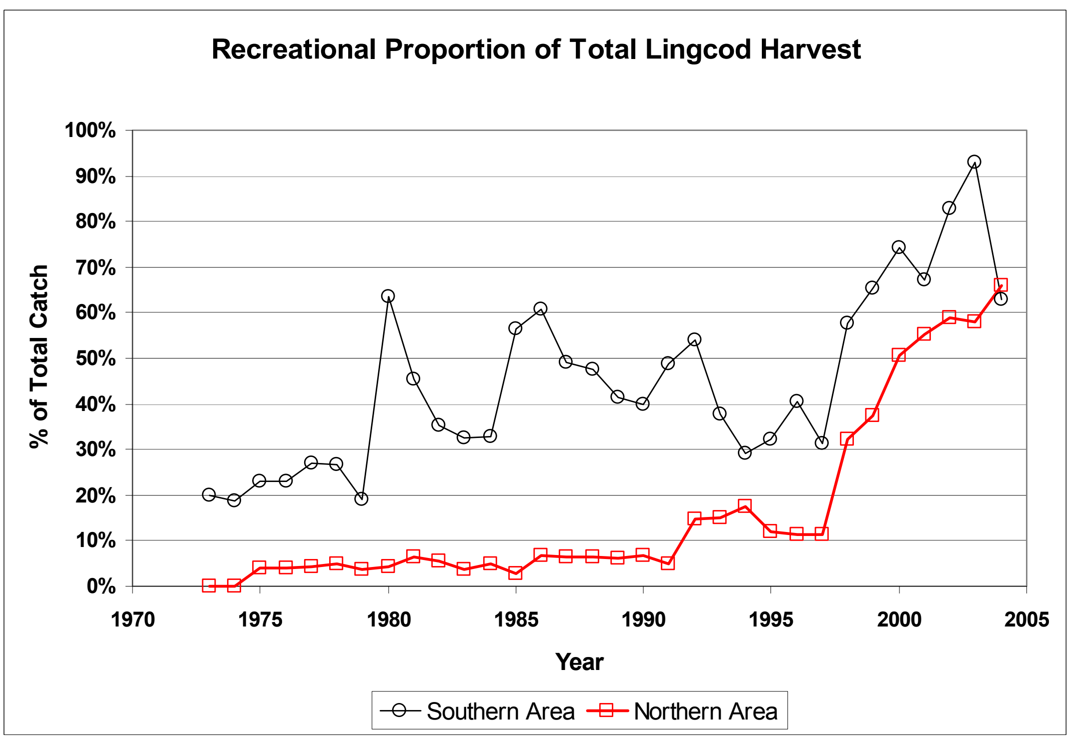


Figure 5. Recreational proportion of total lingcod harvest in the southern (Eureka, Monterey and Conception) and northern (Columbia and U.S. Vancouver) areas.

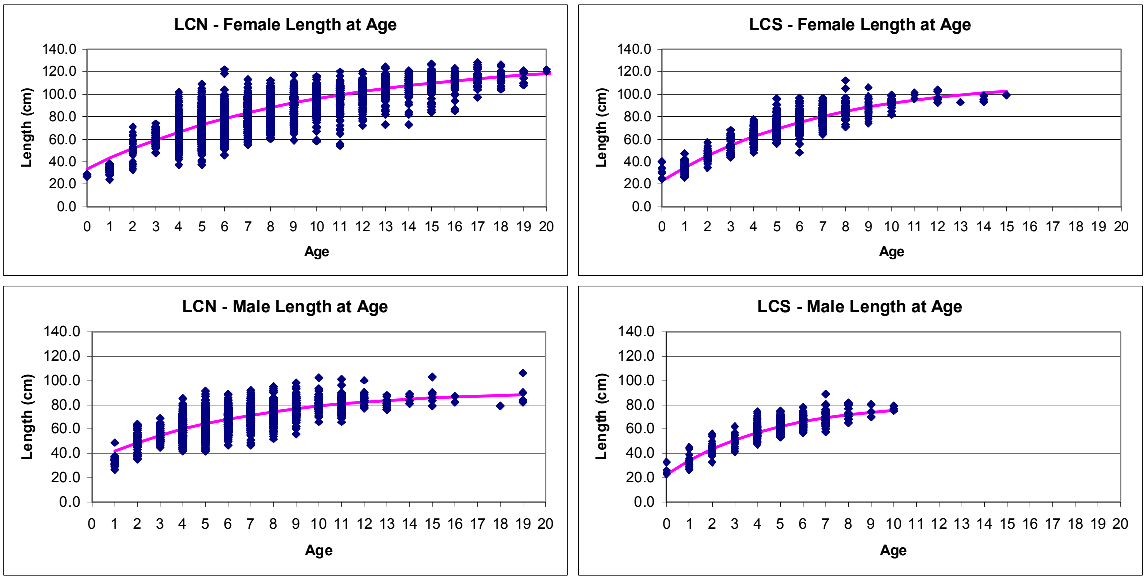


Figure 6. Length-at-age data fit to the von Bertalanffy growth model for the northern (LCN) and southern (LCS) areas. Survey data only were used for ages 1-3. Both survey and fishery data were used for ages 4+.

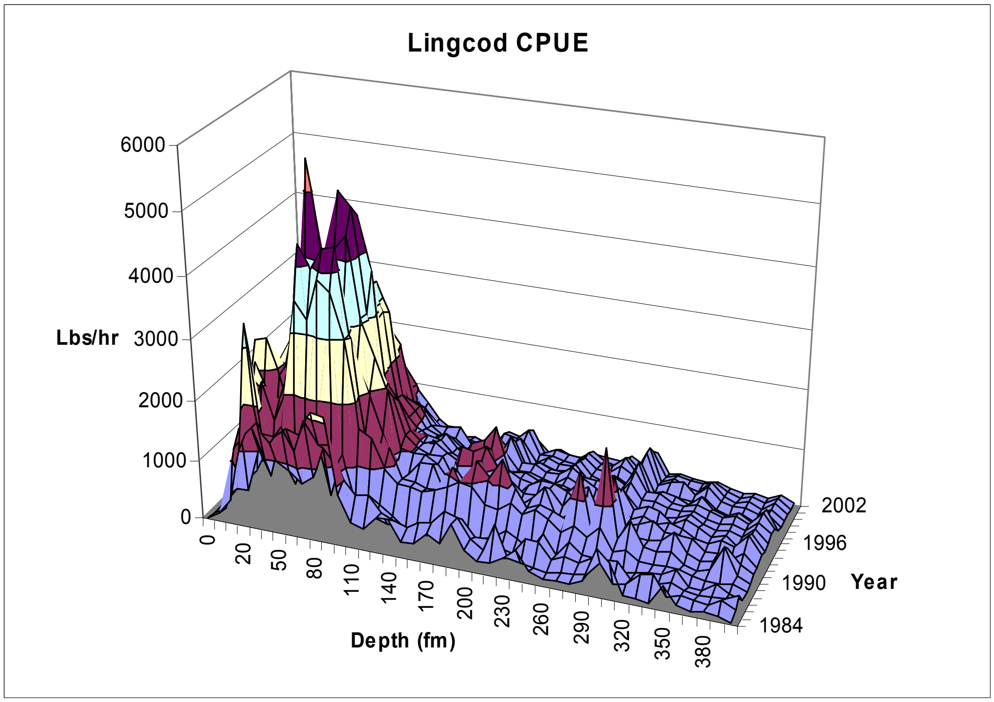


Figure 7. Mean lingcod CPUE calculated from raw data for all tows with a recorded depth.

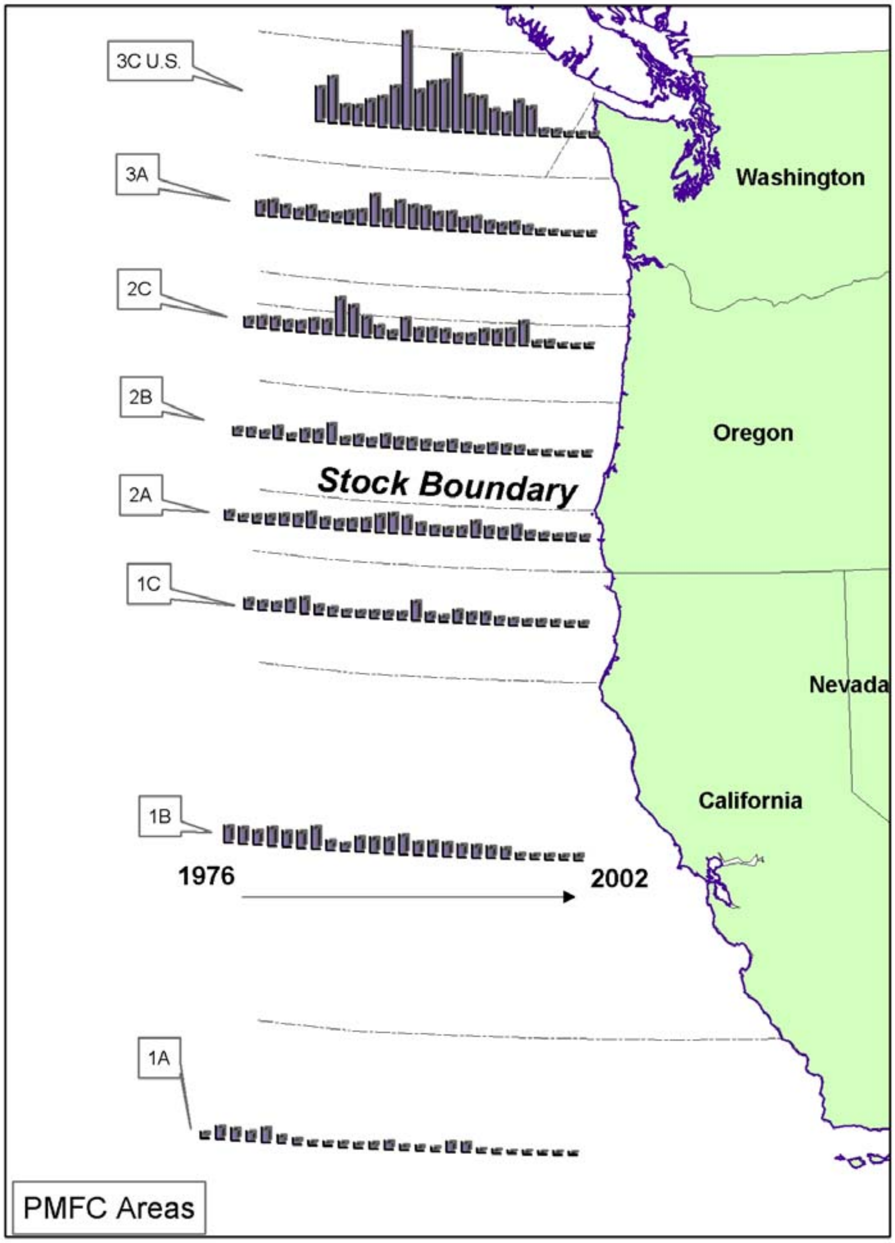


Figure 8. Time series (1976-2002) of observed lingcod trawl logbook CPUE (lbs/hr) by PMFC Area.

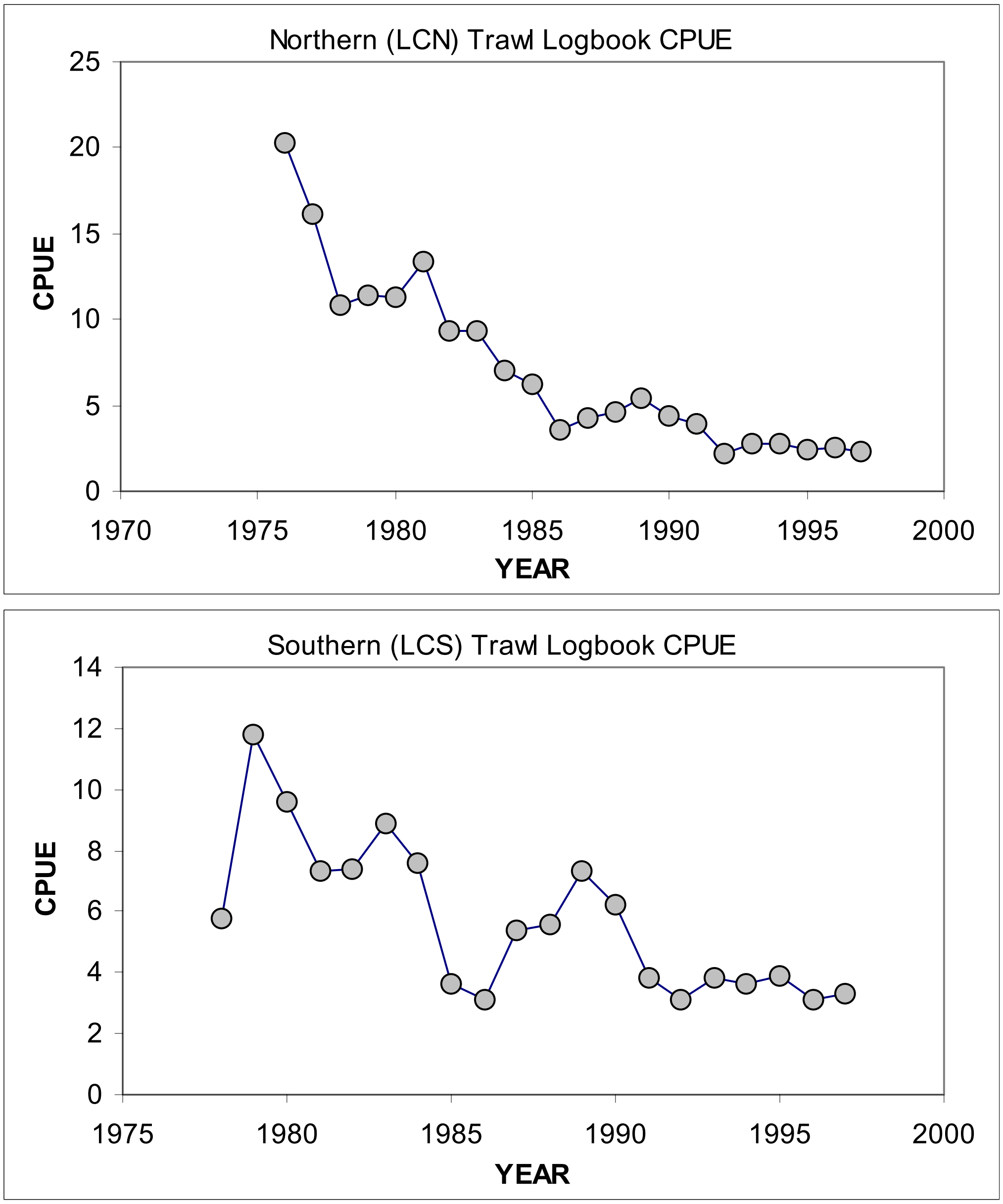


Figure 9. Trawl logbook CPUE indices for the northern (LCN) and southern (LCS) areas.

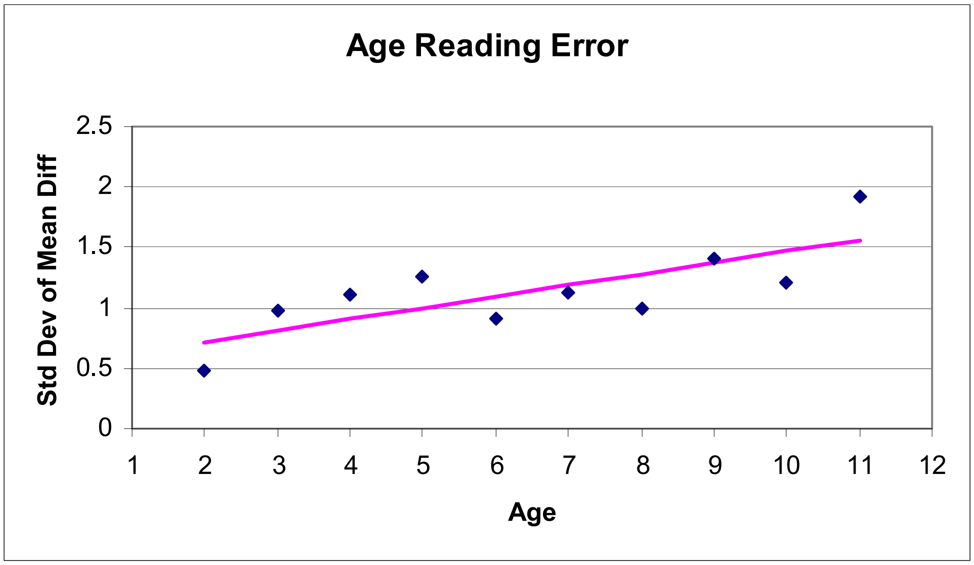


Figure 10. Between-reader (within-lab) estimates of WDFW age reading error variability.

Appendix I. Northern Area (LCN) Base Model Output.

Assessment of Lingcod for the Pacific Fishery Management Council in 2005

Table 1. Negative log likelihood and lambda (likelihood weighting factor) values for the northern area (LCN) base model.

Component	-Log(L)	Lambda
Total Likelihood	**648.58**	
Indices	**22.26**	
Trawl Logbook	14.89	1
NMFS Trawl Survey	7.37	1
WDFW Tagging Survey	0.00	0
Length_comps	**252.14**	
Commercial Fishery	40.57	1
Recreational	22.91	1
NMFS Trawl Survey	96.54	1
WDFW Tagging Survey	92.13	1
Age_comps	**365.35**	
Commercial Fishery	175.10	1
Recreational	112.36	1
NMFS Trawl Survey	20.88	1
WDFW Tagging Survey	57.02	1
Equil_catch	**0.00**	1
Recruitment	**8.73**	1
Parm_priors	**0.02**	1
Parm_devs	**0.00**	1
Penalties	**0.00**	0
Forecast_Recruitment	**0.08**	

Table 2. Parameters used in the northern area (LCN) base model; mortality-growth and biology.

Parameter Name	Value	Min	Max	Active_Cnt	Bound
M-G_parms					
Females					
M-Young	0.18				
M-Old	0				
Lmin	43				
Lmax	118				
VBK	0.1041				
CV-Young	0.0633				
CV-Old	0.28857				
Males					
M-Young	0.5754				
M-Old	0				
Lmin	-0.0231				
Lmax	-0.2842				
VBK	0.3603				
CV-Young	-0.2379				
CV-Old	0.5324				
biology_parms					
Females					
Wt-Len a	0.5754				
Wt-Len b	0.0000				
Mat-Len 1	-0.0231				
Mat-Len 2	-0.2842				
Males					
Wt-Len a	3.95E-06				
Wt-Len b	3.2149				

Table 3. Parameters used in the northern area (LCN) base model; spawner-recruit, recruitment deviations, and initial F.

Parameter Name		Value	Min	Max	Active_Cnt	Bound
SR_parms						
LN(R0)		8.22947	1	100	1	0
H		0.9				
SD-r		1				
Init_R_Mult		0				
Recr_Devs						
	1972	0.404478			2	0
	1973	-0.649724			3	0
	1974	0.183462			4	0
	1975	-0.395553			5	0
	1976	-0.527238			6	0
	1977	0.032428			7	0
	1978	0.101296			8	0
	1979	1.08686			9	0
	1980	-0.366912			10	0
	1981	-0.839416			11	0
	1982	-0.423642			12	0
	1983	-0.56783			13	0
	1984	-0.101602			14	0
	1985	-0.510362			15	0
	1986	0.190429			16	0
	1987	-2.01354			17	0
	1988	-0.752335			18	0
	1989	-0.250904			19	0
	1990	-0.401023			20	0
	1991	0.265252			21	0
	1992	0.392935			22	0
	1993	-0.502319			23	0
	1994	0.751929			24	0
	1995	0.685574			25	0
	1996	-0.096639			26	0
	1997	-0.137624			27	0
	1998	0.85178			28	0
	1999	1.7572			29	0
	2000	1.83304			30	0
init_F_parms						
Com		0.003945	0	1	31	0
Rec		0.000697	0	1	32	0

Table 4. Parameters used in the northern area (LCN) base model; selectivity.

Parameter Name	Value	Min	Max	Active_Cnt	Bound
sel_parms					
Com-Fem					
age@peak	5				
sel@minA	0				
asc_infl (logit)	0.737617	-10	10	33	0
asc_slope	4.19387	0.1	20	34	0
sel@maxA (logit)	-10.5291	-20	30	35	0
desc_infl (logit)	-1.06958	-10	10	36	0
desc_slope	1.25993	-10	2	37	0
width_of_top	1.5				
Com-Male					
Age_@transition	5				
MinL Offset	0	0	0	0	0
M1 Offset	-0.499987	-10	30	38	0
MaxL Offset	-6.46127	-10	10	39	0
Rec-Fem					
age@peak	5				
sel@minA	0				
asc_infl (logit)	0.572743	-10	10	40	0
asc_slope	9.4277	0	20	41	0
sel@maxA (logit)	-10.2262	-20	30	42	0
desc_infl (logit)	-2.41048	-10	10	43	0
desc_slope	0.213336	0	2	44	0
width_of_top	1.5				
Rec-Male					
Age_@transition	5				
MinL Offset	0	0	0	0	0
M1 Offset	1.06322	-10	30	45	0
MaxL Offset	0	0	0	0	0
NMFS-Female					
age@peak	3				
sel@minA	0.149				
asc_infl (logit)	4.62712	-10	10	46	0
asc_slope	0.161997	0	30	47	0
sel@maxA (logit)	-3.2613	-15	30	48	0
desc_infl (logit)	-1.32554	-10	10	49	0
desc_slope	9.89498	0	20	50	0
width_of_top	1				
NMFS-Male					
Age_@transition	3				
MinL Offset	0	0	0	0	0
M1 Offset	-0.030891	-10	0	51	0
MaxL Offset	0	0	0	0	0
WDFW-Female					
age@peak	3				
sel@minA	0				
asc_infl (logit)	-2.50203	-10	10	52	0
asc_slope	6.25441	-10	10	53	0
sel@maxA (logit)	-8.28019	-20	30	54	0
desc_infl (logit)	-2.5929	-10	10	55	0
desc_slope	0.680645	0	10	56	0
width_of_top	1				
WDFW-Male					
Age_@transition	3				
MinL Offset	0				
M1 Offset	2.26672				
MaxL Offset	0				

Figure 1. SS2 output for the northern area (LCN) base model; From the top: recruitment, female spawning biomass, total biomass, and spawner-recruit relationship. Triangular symbols are present assessment estimates; square symbols are 2003 assessment estimates.

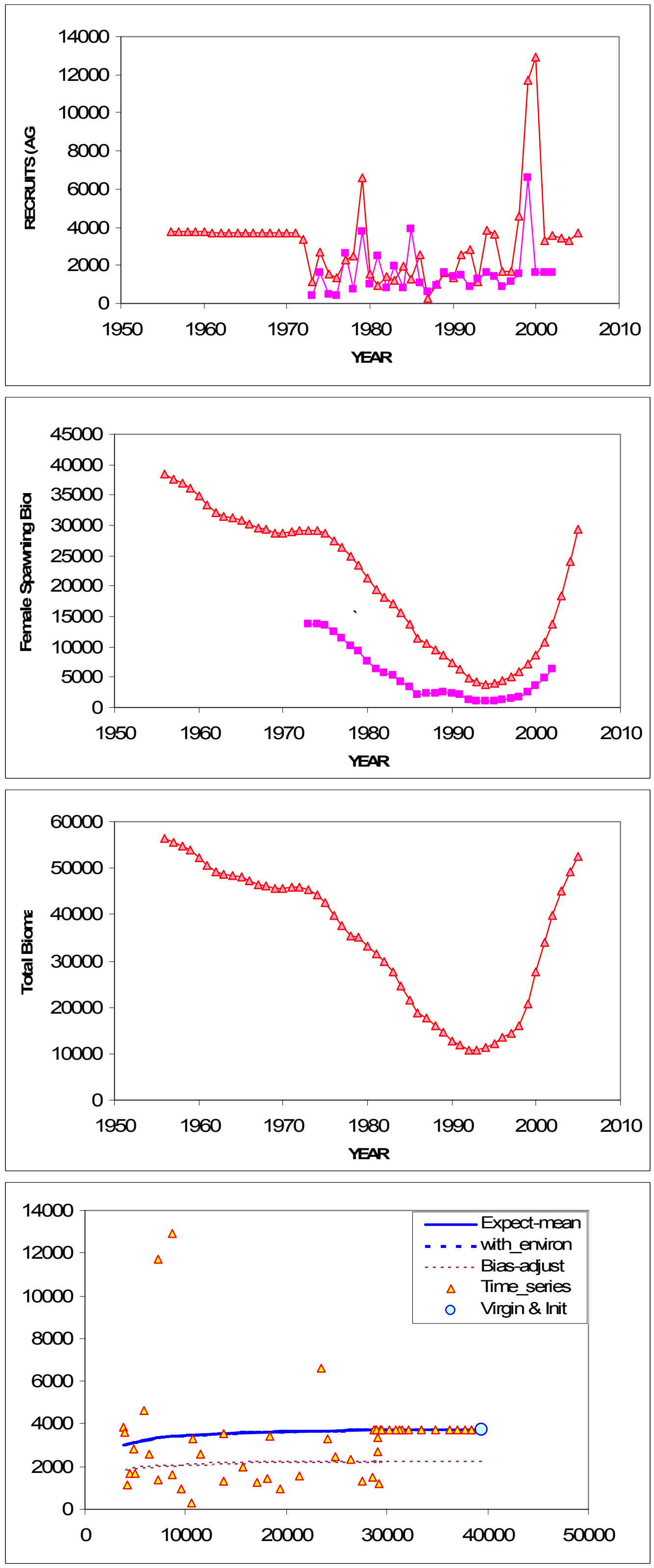
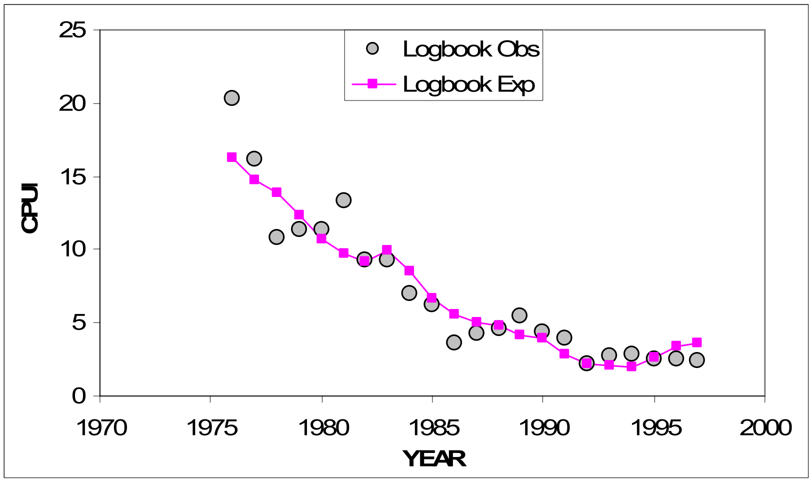


Figure 2. SS2 output for the northern area (LCN) base model: Model fits to indices of abundance; Top: trawl logbook, Bottom: NMFS trawl survey.



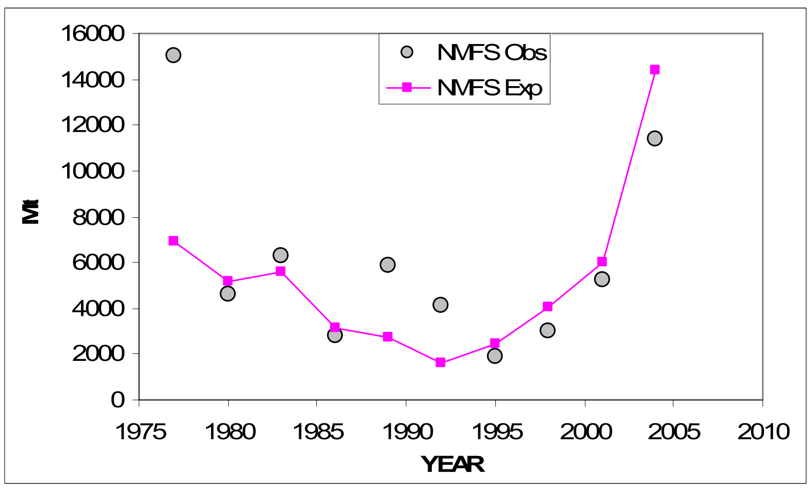


Figure 3. SS2 output for the northern area (LCN) base model: Estimated selectivity for the commercial fishery, recreational fishery, NMFS trawl survey, and WDFW tagging survey.

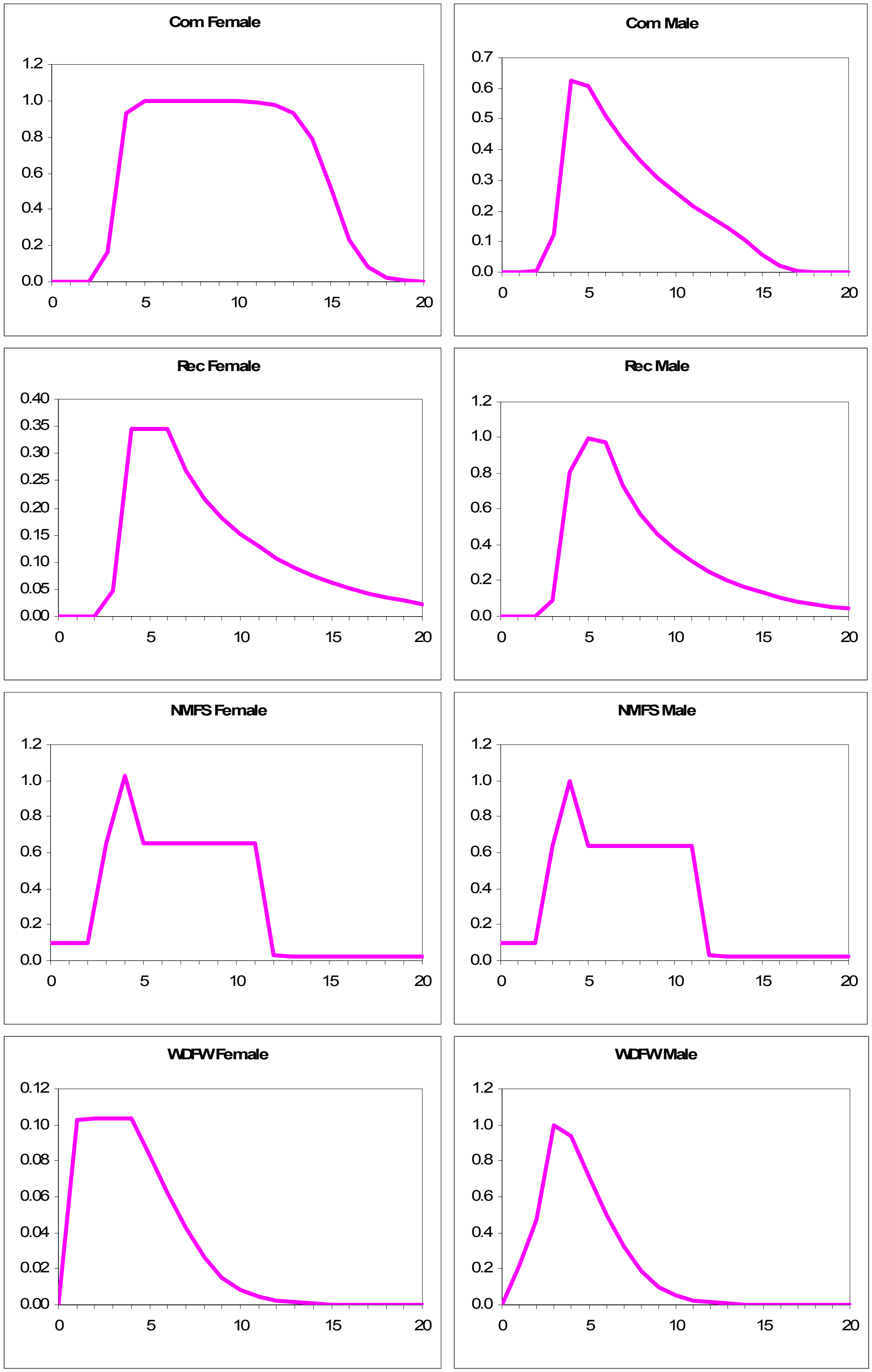
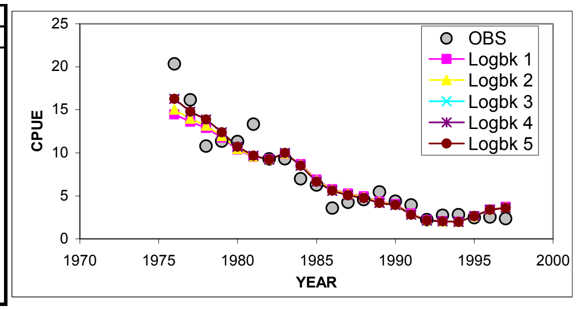
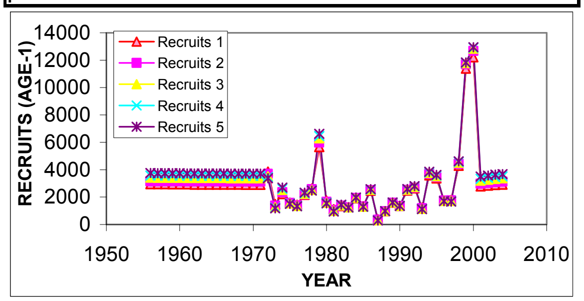
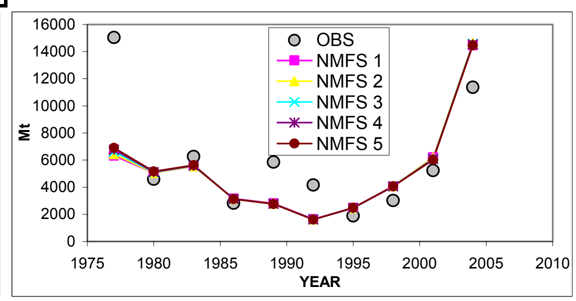


Figure 4. SS2 output for the northern area (LCN) base model: Profile of the base model over the standard deviation of recruitment. Clockwise from top left: negative log likelihood values, trawl logbook index, NMFS trawl survey, female spawning biomass, recruitment.

SD-r	0.7	0.8	0.9	0.95	1.0
Component	Run 1	Run 2	Run 3	Run 4	Run 5
total	668.2	660.6	654.2	651.3	648.7
indices	23.4	23.0	22.6	22.5	22.3
discard	0.000	0.000	0.000	0.000	0.000
mean_body_wt	0.000	0.000	0.000	0.000	0.000
length_comps	259.5	256.7	254.2	253.1	252.1
age_comps	370.5	368.6	367.1	366.3	365.5
size-age	0.000	0.000	0.000	0.000	0.000
Equil_catch	0.000	0.000	0.000	0.000	0.000
Recruitment	14.891	12.238	10.245	9.448	8.752
Parm_priors	0.017	0.017	0.018	0.019	0.019
Parm_devs	0.000	0.000	0.000	0.000	0.000
penalties	0.000	0.000	0.000	0.000	0.000







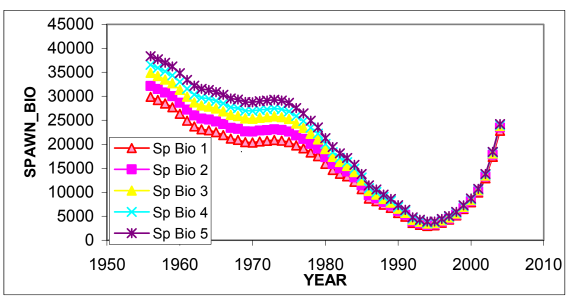
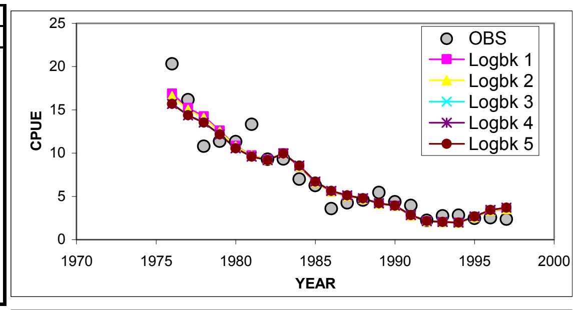
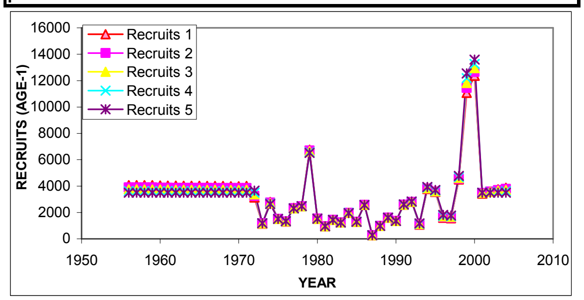
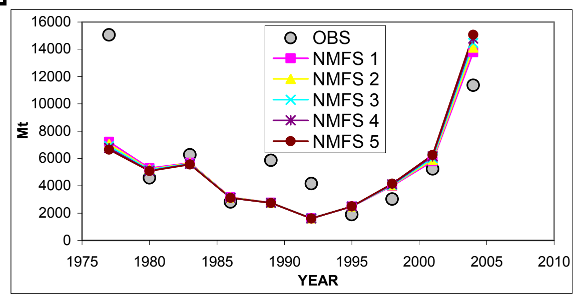


Figure 5. SS2 output for the northern area (LCN) base model: Profile over Beveton-Holt spawner-recruit steepness (*h)*. Clockwise from top left: negative log likelihood values, trawl logbook index, NMFS trawl survey, female spawning biomass, recruitment.

H	0.8	0.85	0.9	0.95	1.0
Component	**Run 1**	**Run 2**	**Run 3**	**Run 4**	**Run 5**
total	646.6	647.6	648.7	649.8	651.0
indices	21.6	21.9	22.3	22.7	23.2
discard	0.000	0.000	0.000	0.000	0.000
mean_body_wt	0.000	0.000	0.000	0.000	0.000
length_comps	251.0	251.6	252.1	252.7	253.2
age_comps	364.8	365.1	365.5	365.8	366.0
size-age	0.000	0.000	0.000	0.000	0.000
Equil_catch	0.000	0.000	0.000	0.000	0.000
Recruitment	9.183	8.937	8.752	8.625	8.554
Parm_priors	0.020	0.019	0.019	0.019	0.018
Parm_devs	0.000	0.000	0.000	0.000	0.000
penalties	0.000	0.000	0.000	0.000	0.000







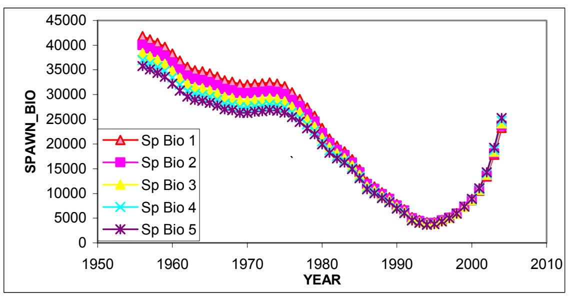
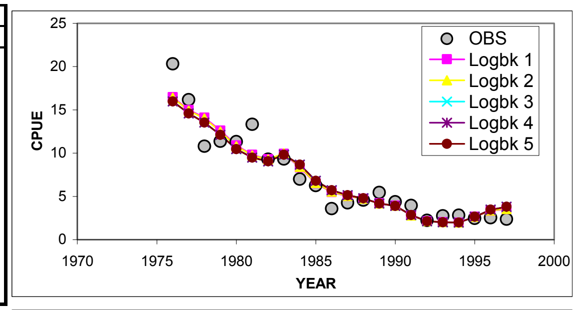
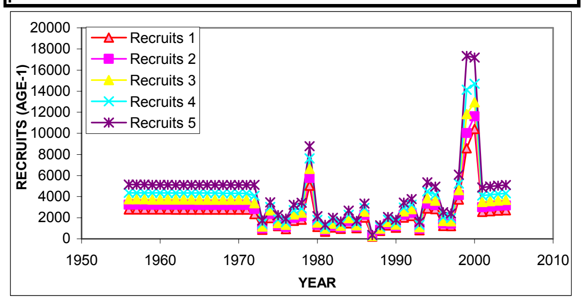
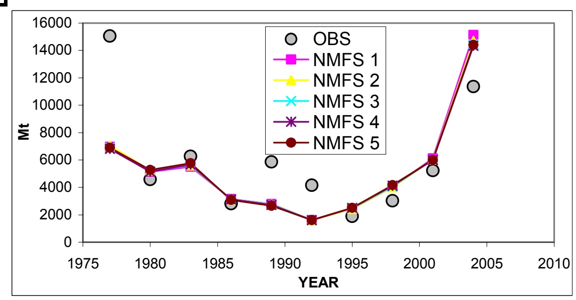


Figure 6. SS2 output for the northern area (LCN) base model: Profile over natural mortality (M). Clockwise from top left: negative log likelihood values, trawl logbook index, NMFS trawl survey, female spawning biomass, recruitment.

M (Fem/Male)	.14/.26	.16/.29	.18/.32	.20/.35	.22/.38
Component	Run 1	Run 2	Run 3	Run 4	Run 5
total	647.4	647.4	648.7	651.1	654.9
indices	21.6	21.8	22.3	23.0	23.9
discard	0.000	0.000	0.000	0.000	0.000
mean_body_wt	0.000	0.000	0.000	0.000	0.000
length_comps	250.5	251.3	252.1	253.7	255.9
age_comps	366.2	365.5	365.5	365.8	366.4
size-age	0.000	0.000	0.000	0.000	0.000
Equil_catch	0.000	0.000	0.000	0.000	0.000
Recruitment	9.006	8.901	8.752	8.638	8.639
Parm_priors	0.026	0.023	0.019	0.014	0.016
Parm_devs	0.000	0.000	0.000	0.000	0.000
penalties	0.000	0.000	0.000	0.000	0.000







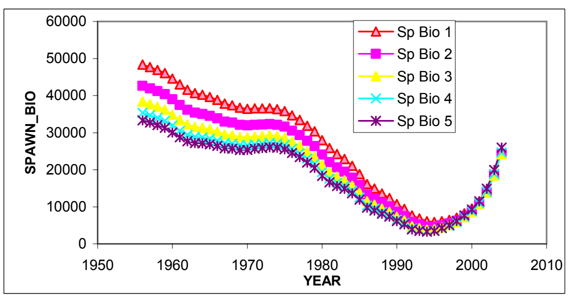
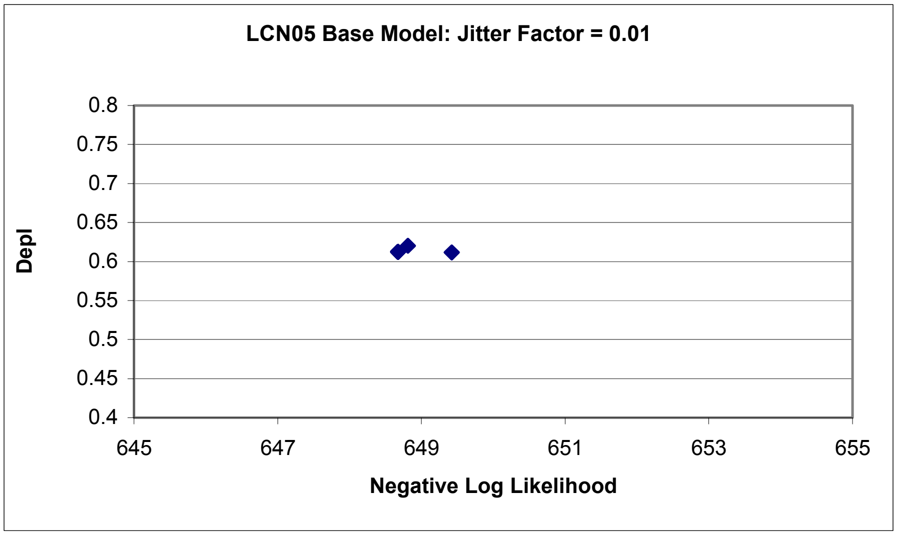
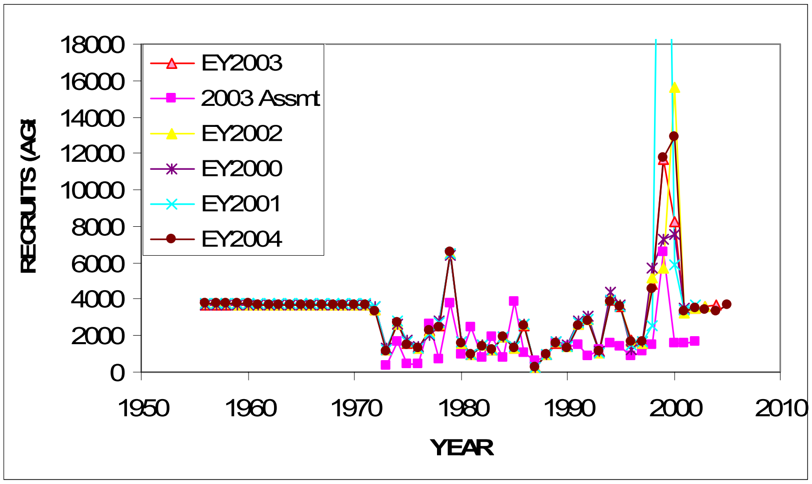


Figure 6a. SS2 output for the northern area (LCN) base model: Model stability test; Results of 30 base-model runs with SS2 jitter factor = 0.01.



Run Number	-Log Likelihood	Depletion
1	648.675	0.612608302
2	648.675	0.612608302
3	648.675	0.612608302
4	648.675	0.612608302
5	648.675	0.612608302
6	648.675	0.612608302
7	648.675	0.612608302
8	648.675	0.612608302
9	648.675	0.612608302
10	648.675	0.612608302
11	648.675	0.612608302
12	648.675	0.612608302
13	648.675	0.612608302
14	648.675	0.612608302
15	648.675	0.612608302
16	648.675	0.612608302
17	648.675	0.612608302
18	648.675	0.612608302
19	648.675	0.612608302
20	648.675	0.612608302
21	648.675	0.612608302
22	648.675	0.612608302
23	648.675	0.612608302
24	648.675	0.612608302
25	648.675	0.612608302
26	648.814	0.620331152
27	648.814	0.620331152
28	649.423	0.611444507
29	649.423	0.611444507
30	649.423	0.611444507

Figure 6b. SS2 output for the northern area (LCN) base model: Retrospective Analysis, obtained by sequentially decrementing end-year from 2004 to 2000; Top: time series of recruitment, Bottom: time series of spawning biomass.



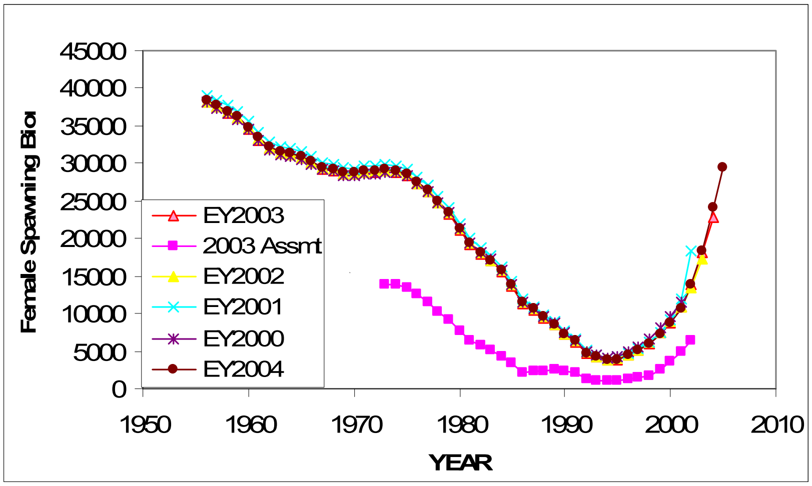


Figure 7. SS2 output for the northern area (LCN) base model: Model fits to commercial fishery catch-at-age.

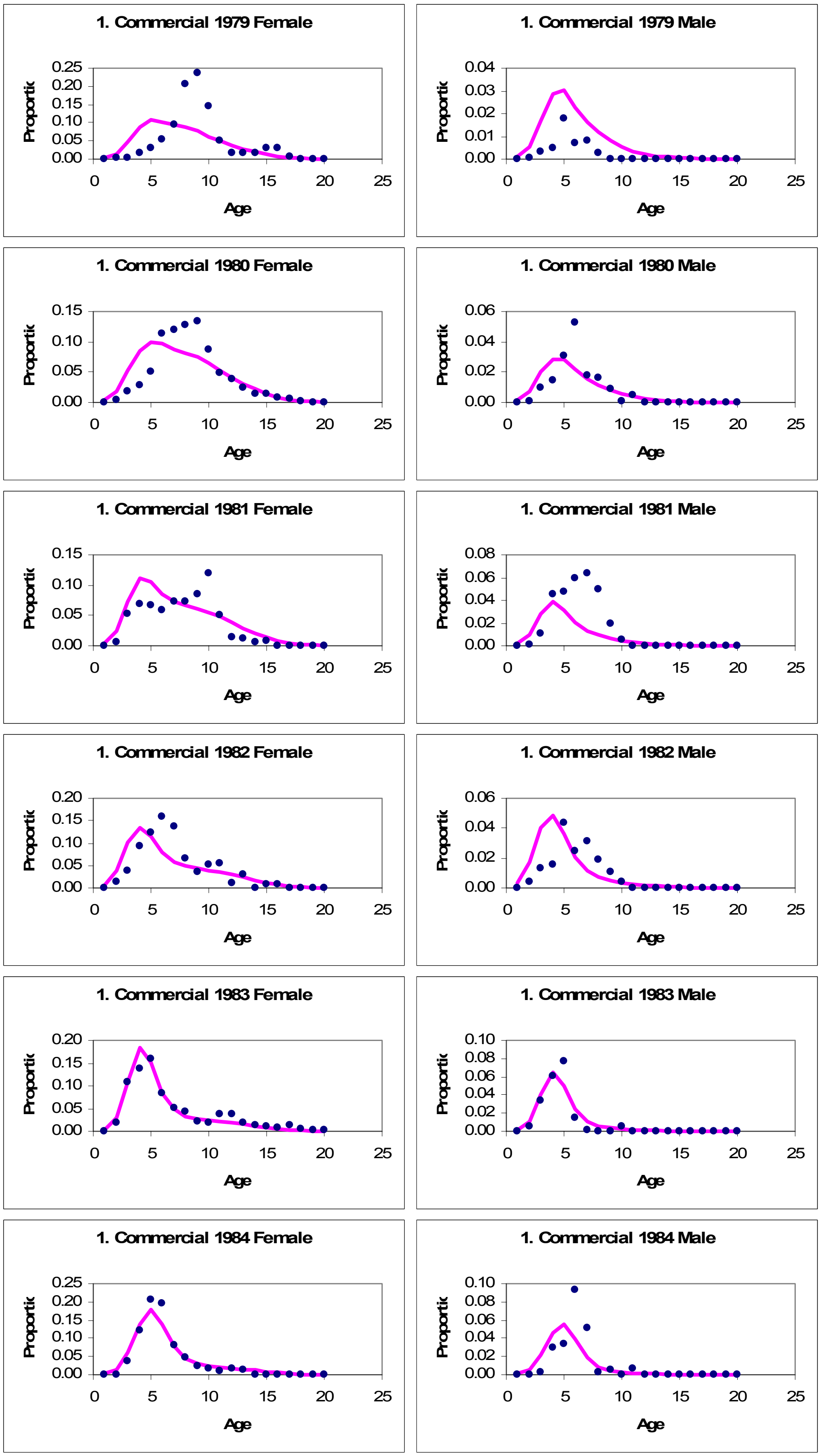


Figure 7, continued. SS2 output for the northern area (LCN) base model: Model fits to commercial fishery catch-at-age.

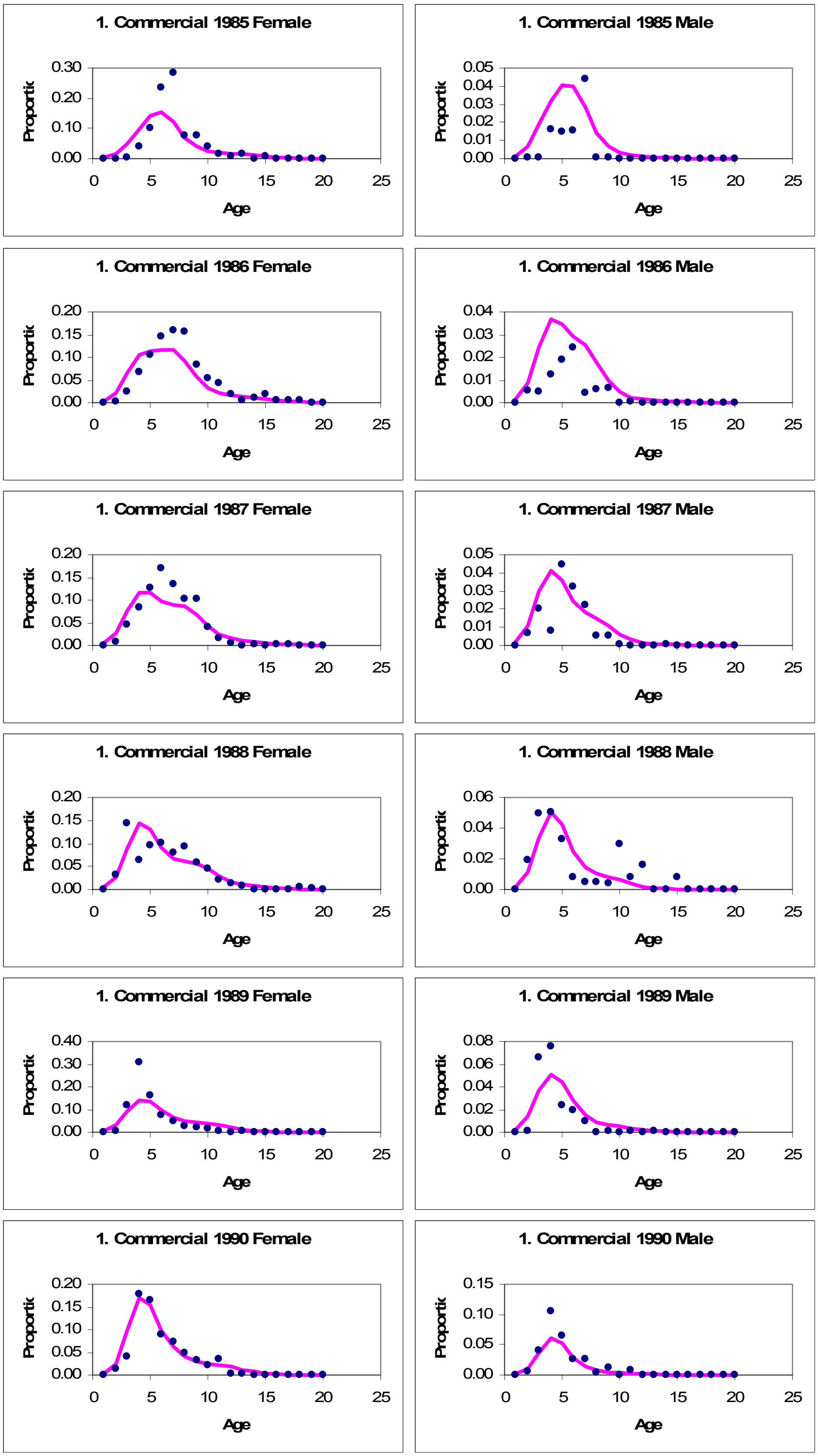


Figure 7, continued. SS2 output for the northern area (LCN) base model: Model fits to commercial fishery catch-at-age.

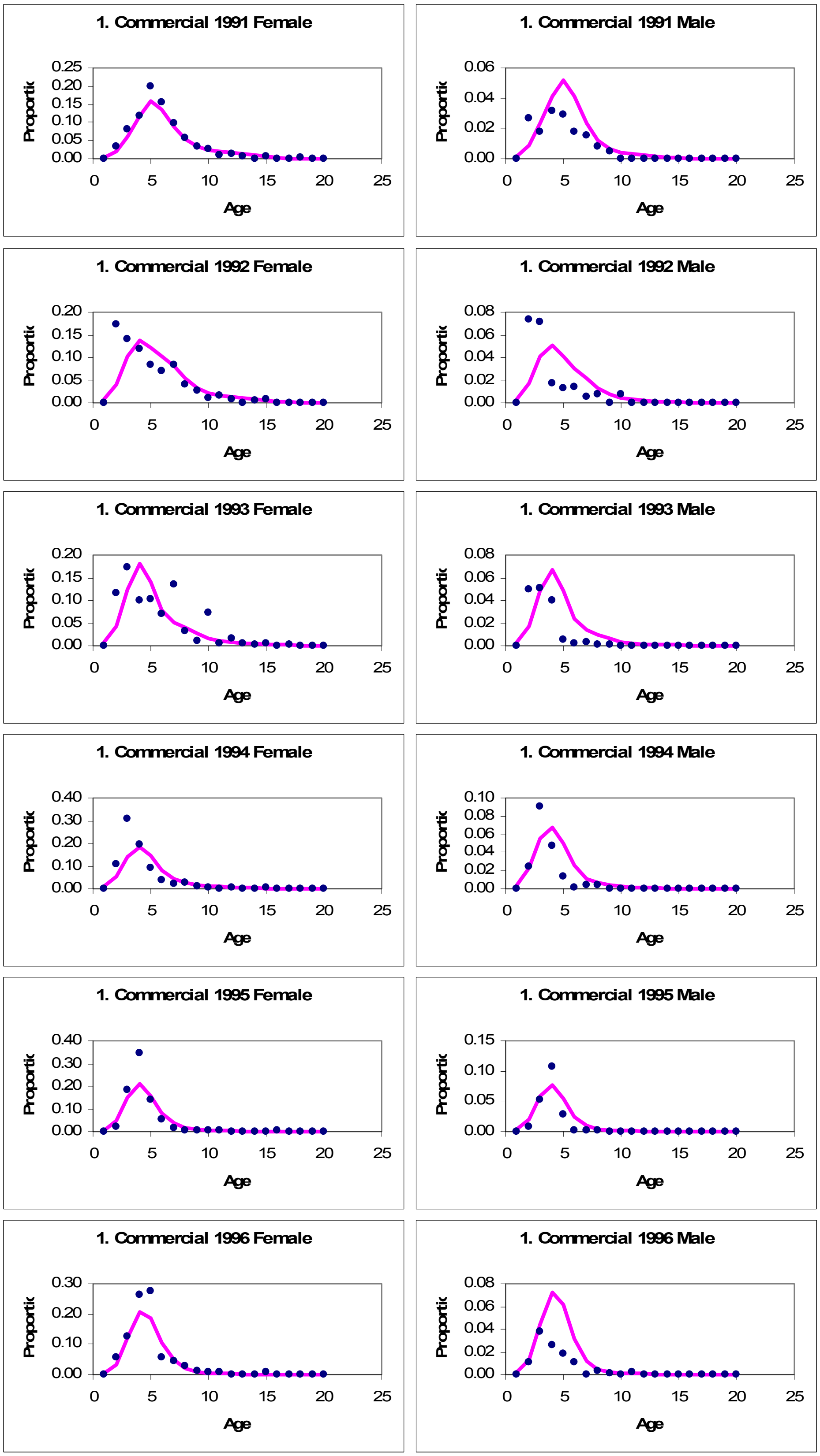


Figure 7, continued. SS2 output for the northern area (LCN) base model: Model fits to commercial fishery catch-at-age.

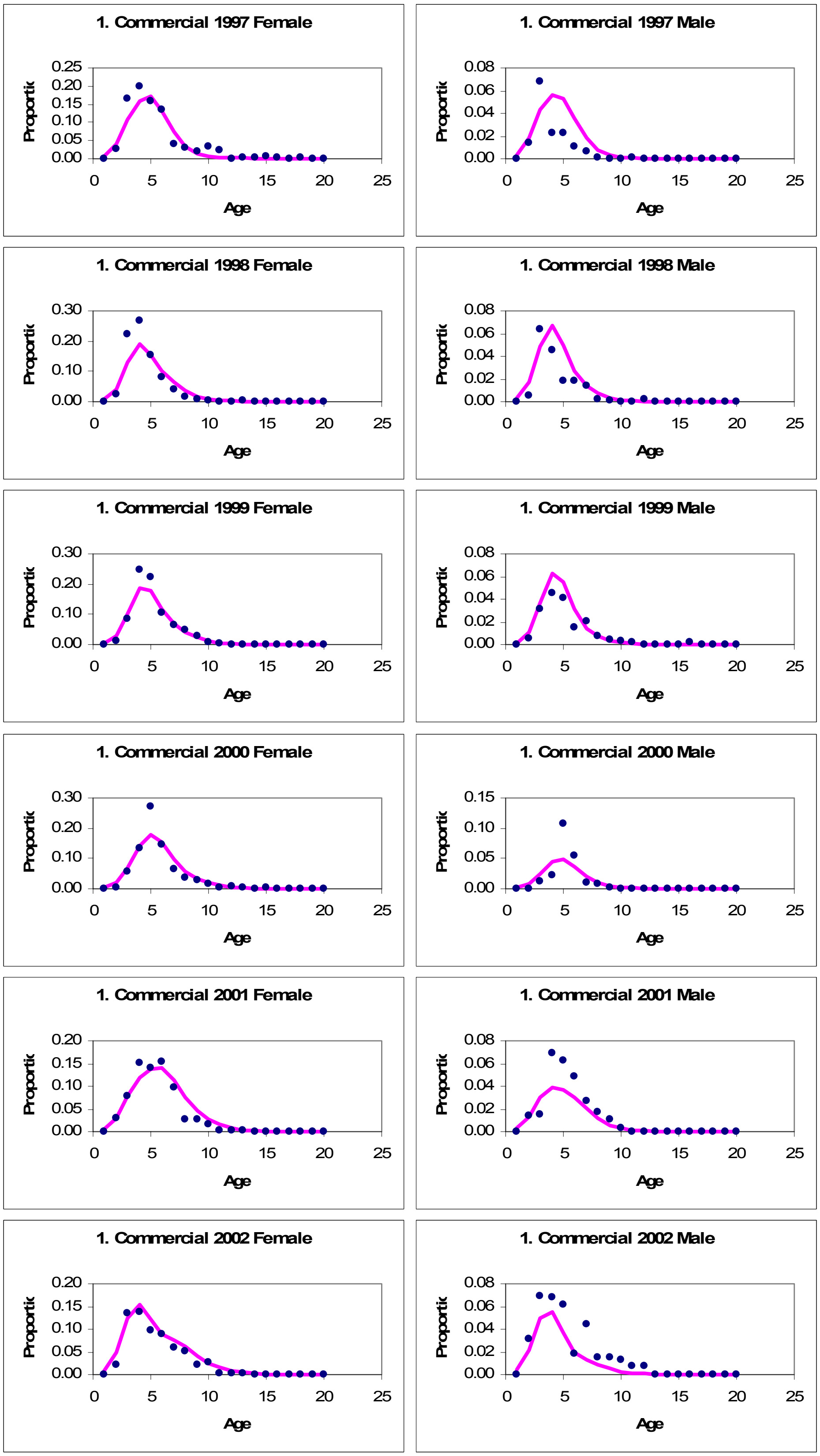


Figure 7, continued. SS2 output for the northern area (LCN) base model: Model fits to commercial fishery catch-at-age.

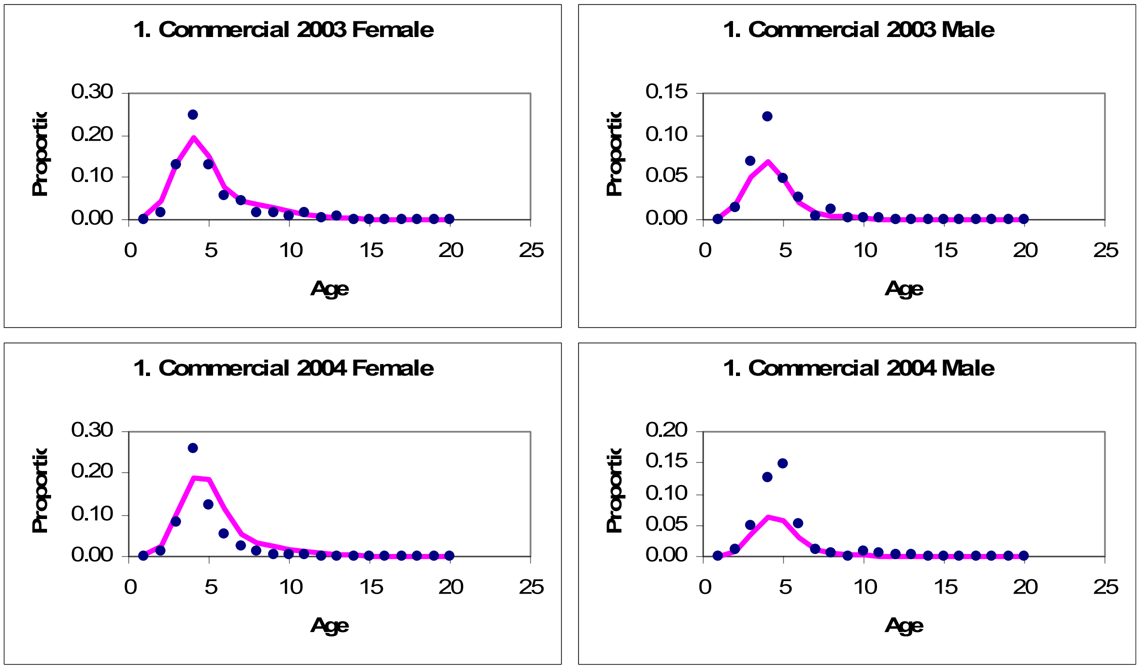


Figure 8. SS2 output for the northern area (LCN) base model: Model fits to recreational fishery catch-at-age.

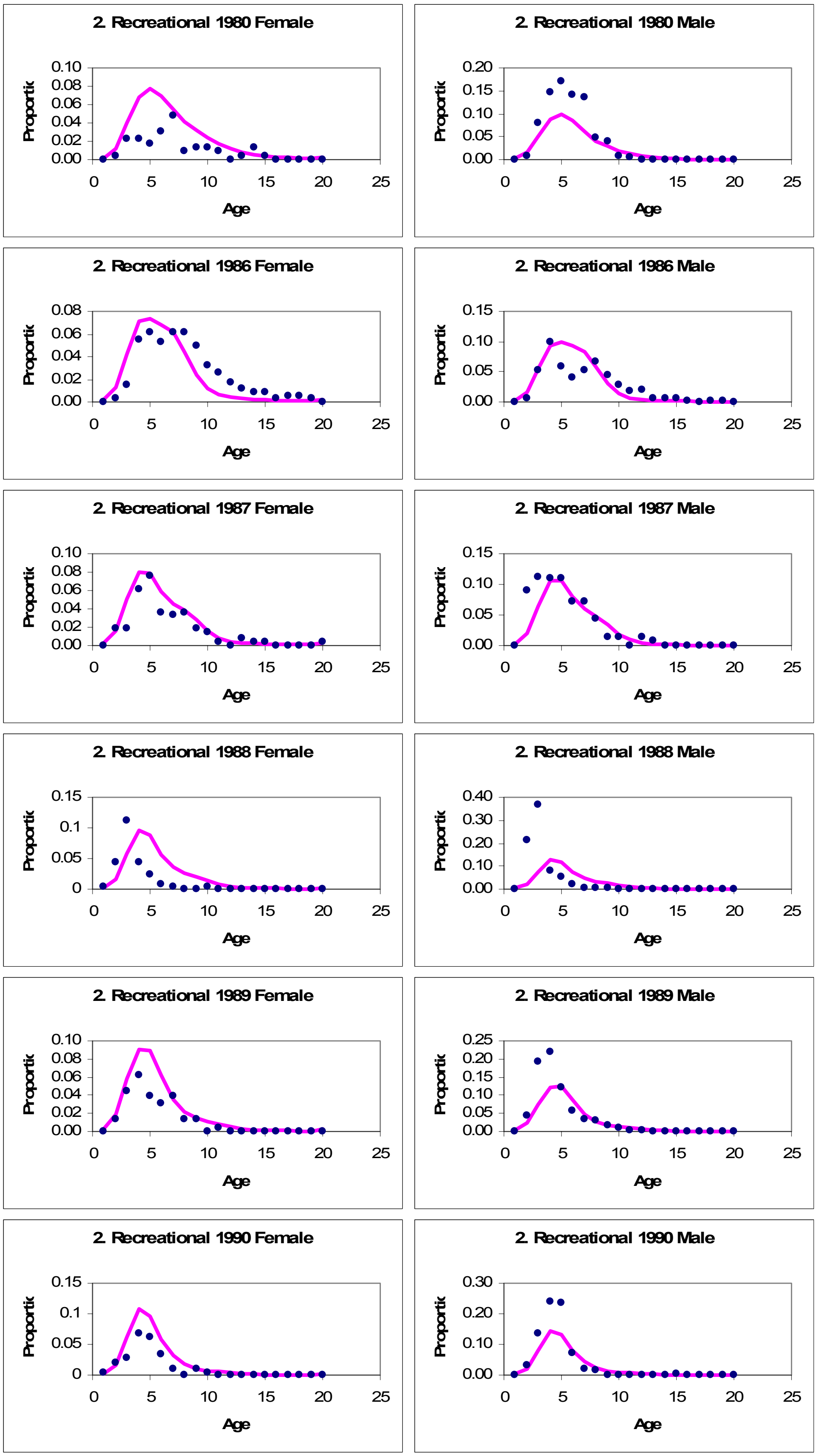


Figure 8, continued. SS2 output for the northern area (LCN) base model: Model fits to recreational fishery catch-at-age.

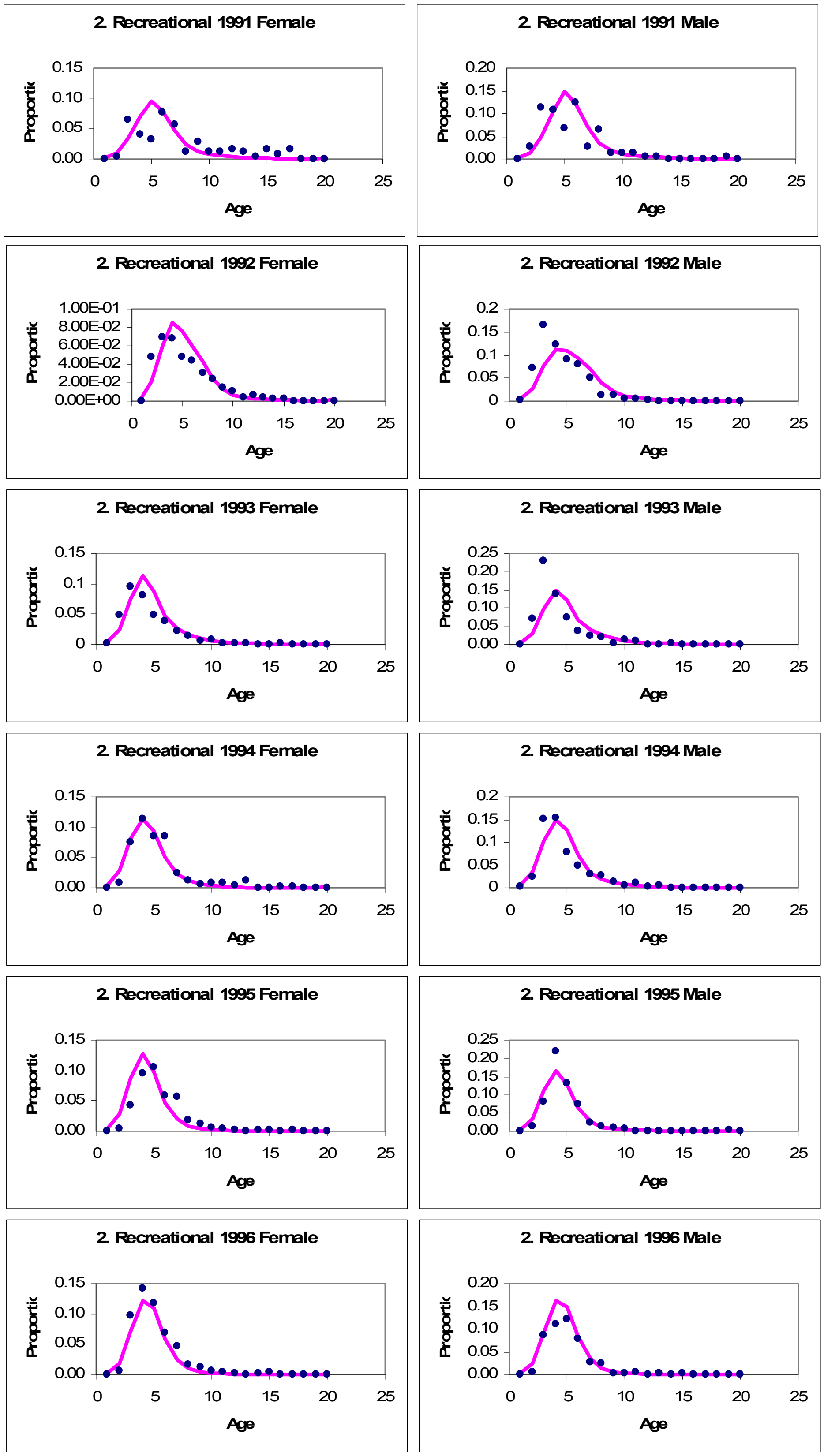


Figure 8, continued. SS2 output for the northern area (LCN) base model: Model fits to recreational fishery catch-at-age.

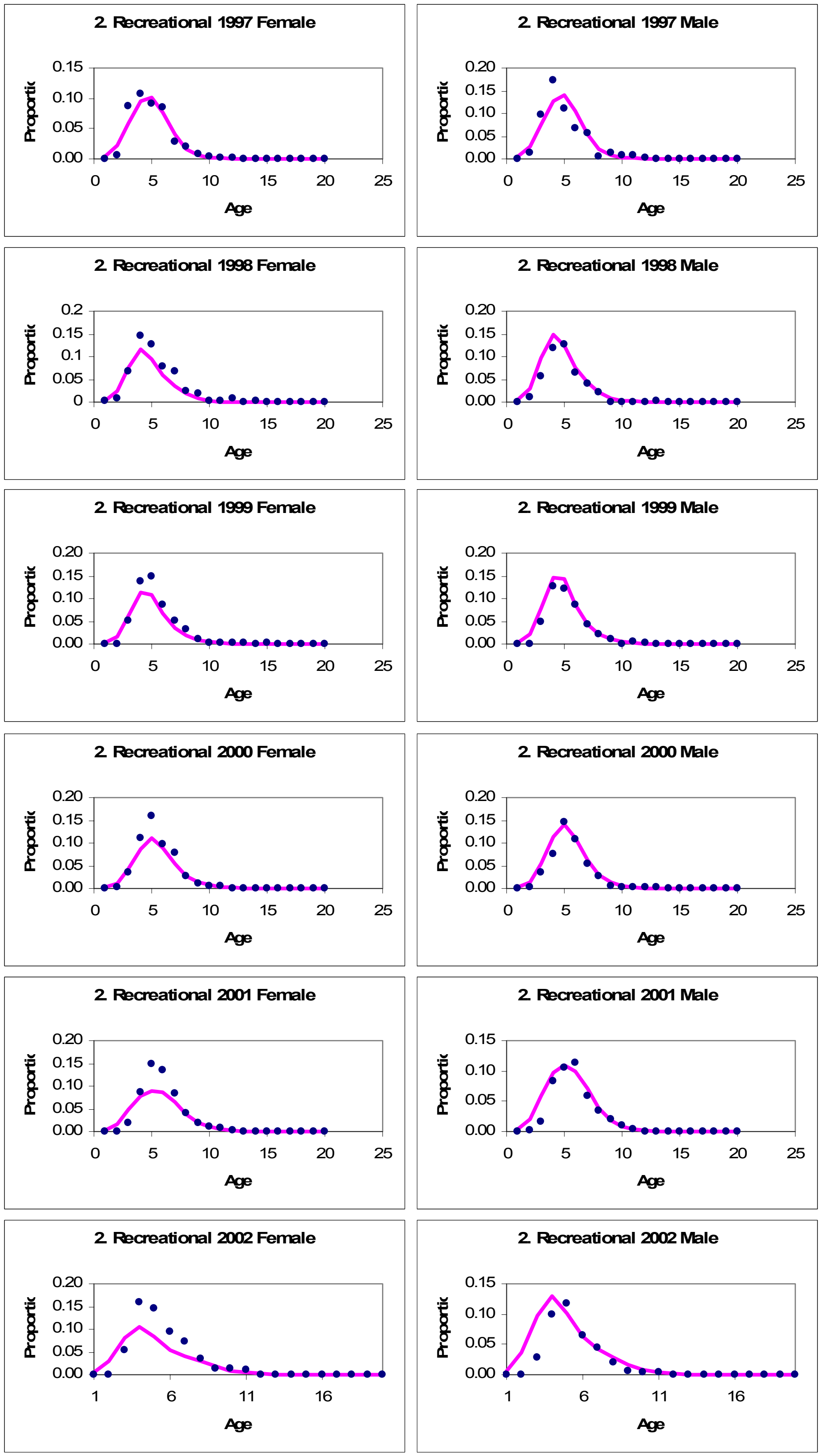


Figure 8, continued. SS2 output for the northern area (LCN) base model: Model fits to recreational fishery catch-at-age.

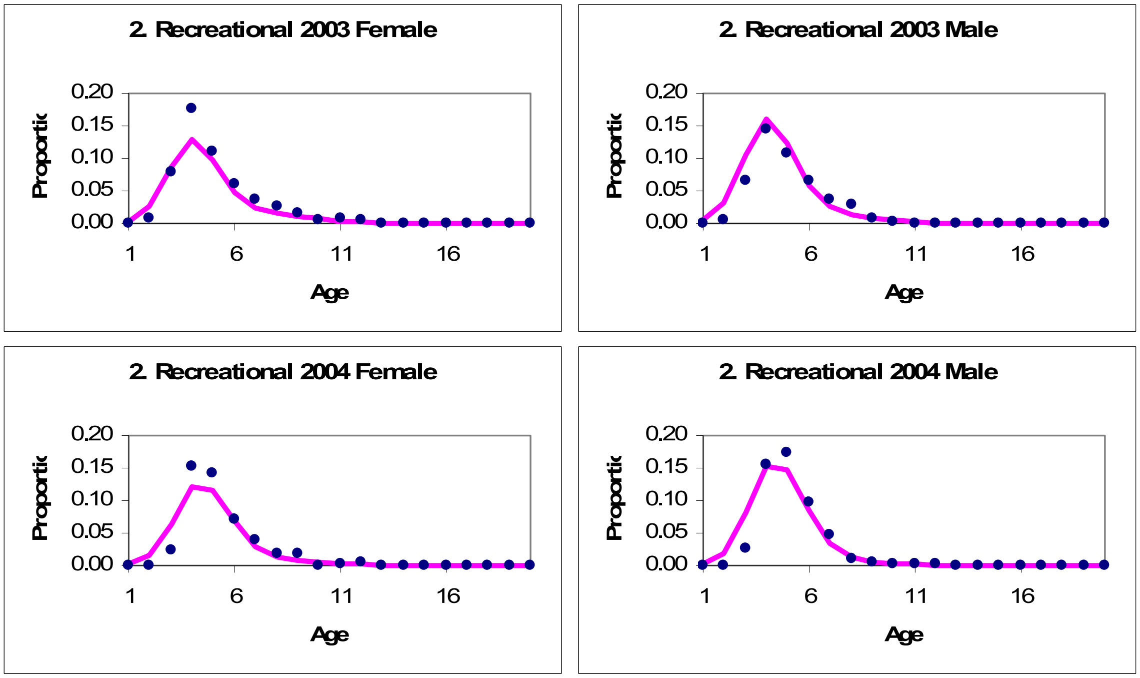


Figure 9. SS2 output for the northern area (LCN) base model: Model fits to commercial fishery catch-at-length.

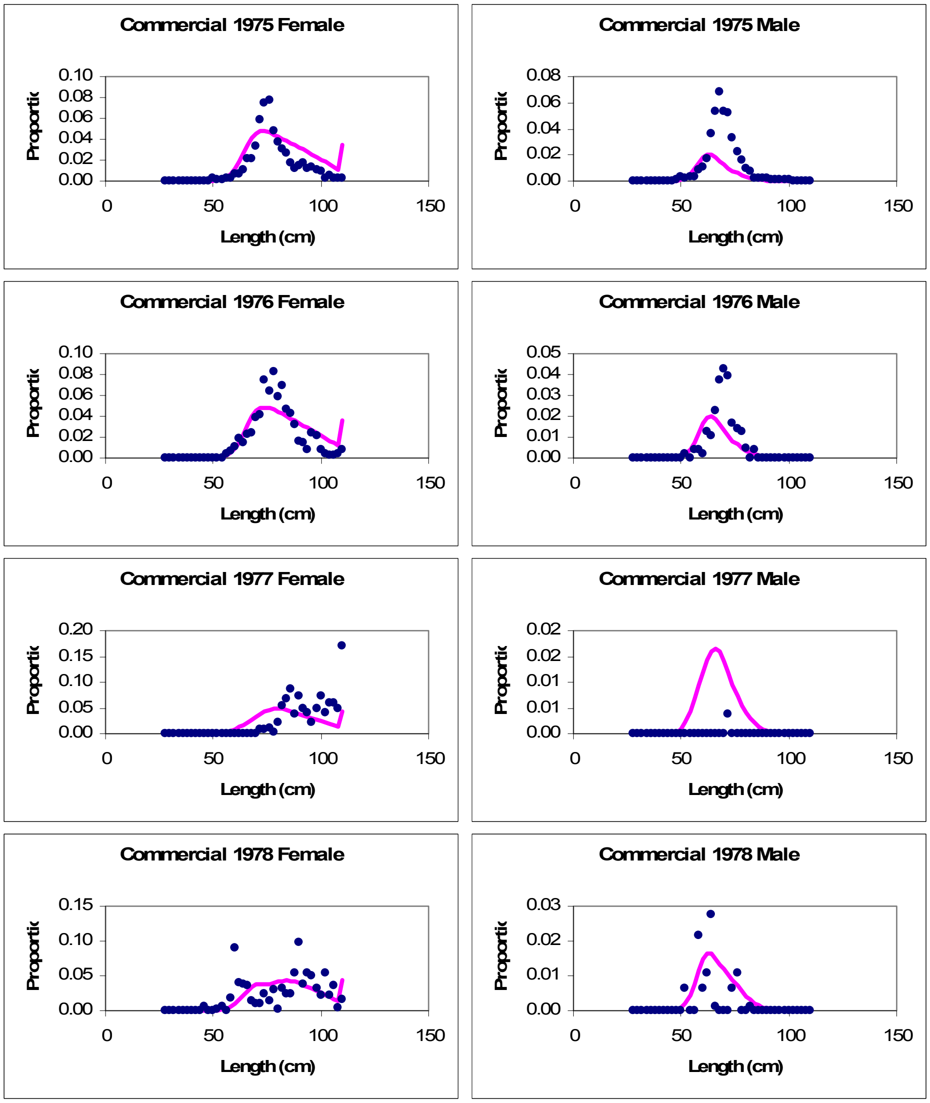


Figure 10. SS2 output for the northern area (LCN) base model: Model fits to recreational fishery catch-at-length.

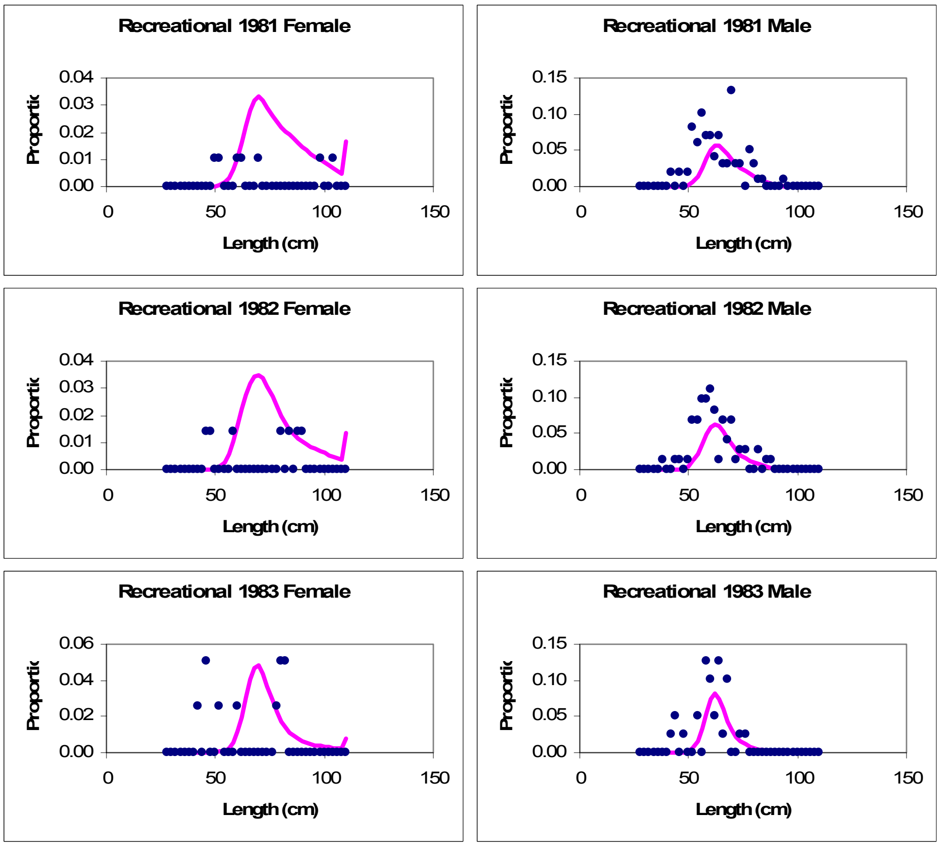


Figure 11. SS2 output for the northern area (LCN) base model: Model fits to NMFS trawl survey catch-at-age.

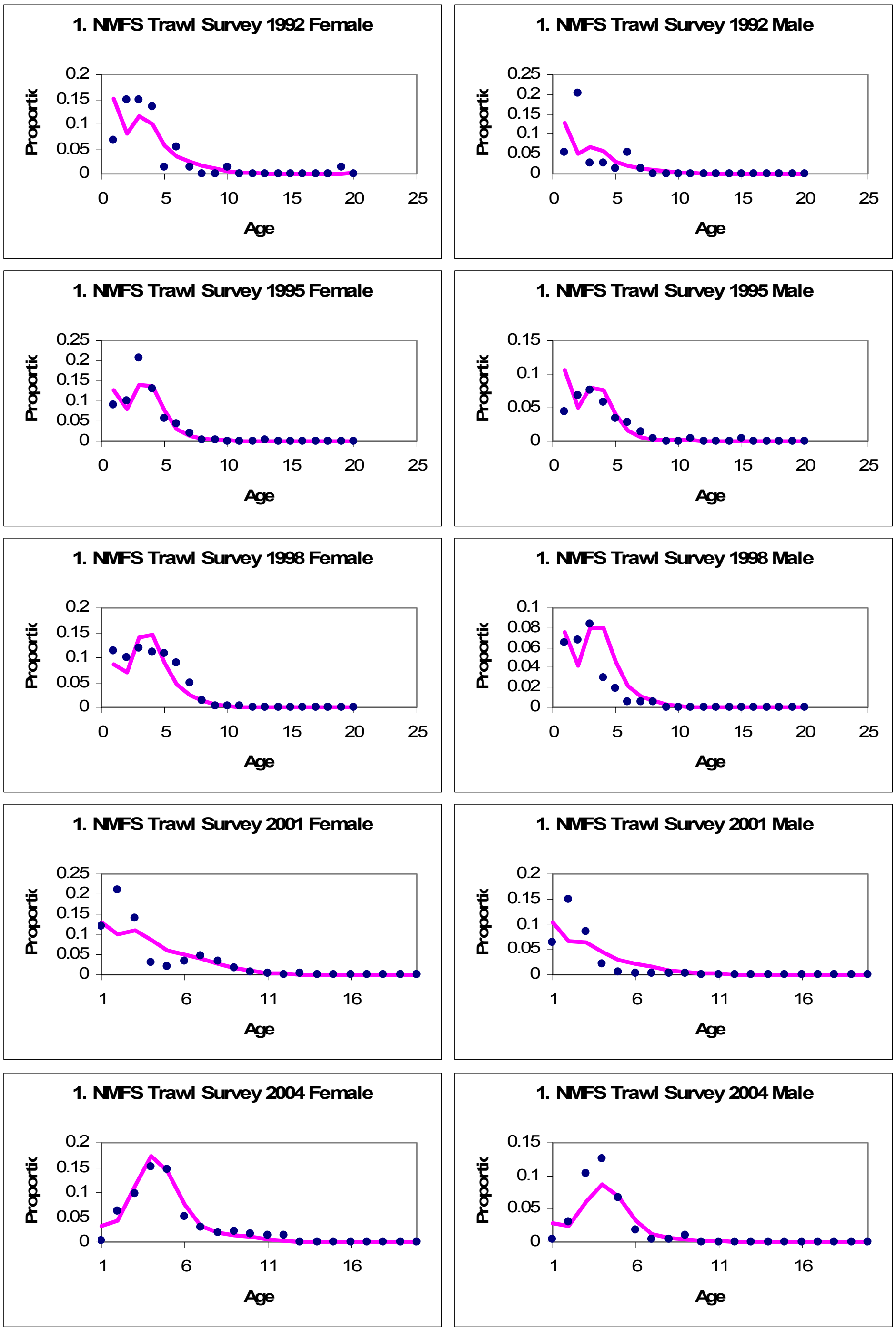


Figure 12. SS2 output for the northern area (LCN) base model: Model fits to WDFW tagging survey catch-at-age.

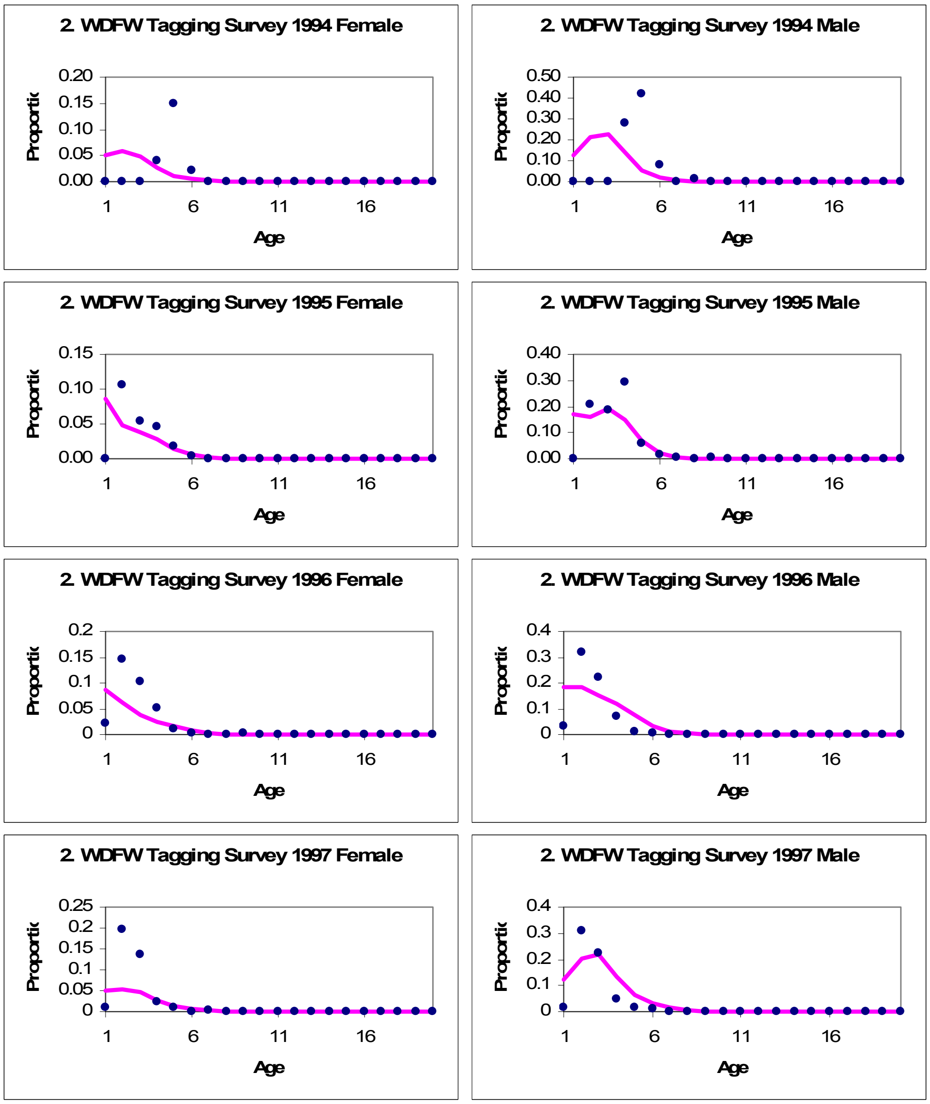


Figure 13. SS2 output for the northern area (LCN) base model: Model fits to NMFS trawl survey catch-at-length.

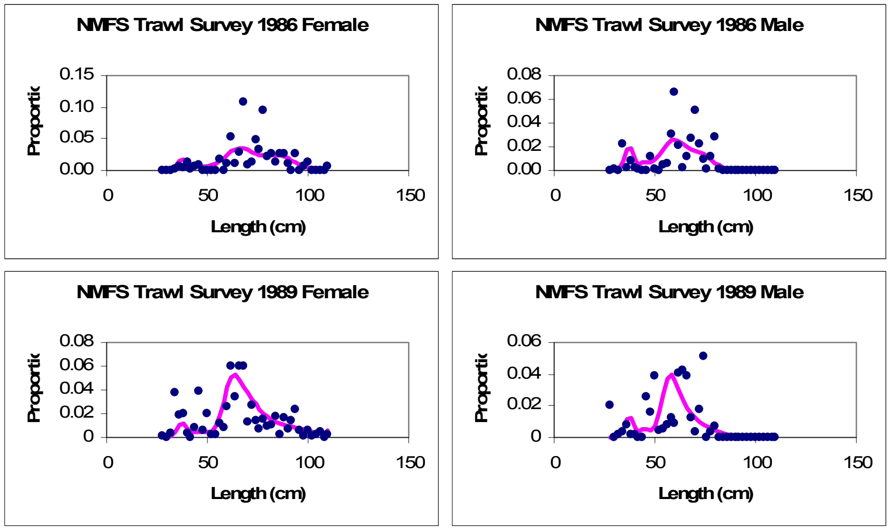


Figure 14. SS2 output for the northern area (LCN) base model: Model fits to WDFW tagging survey catch-at-length.

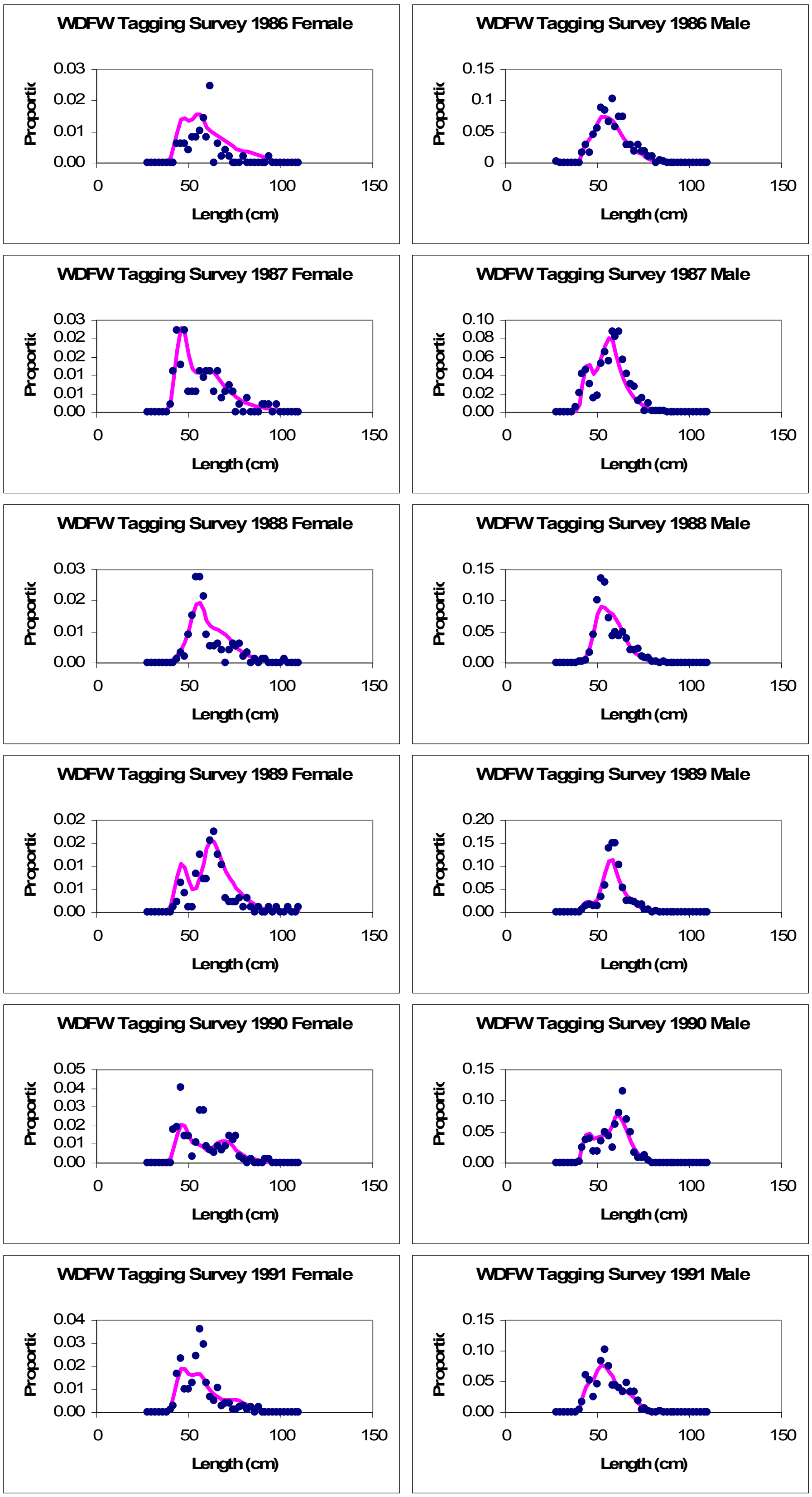
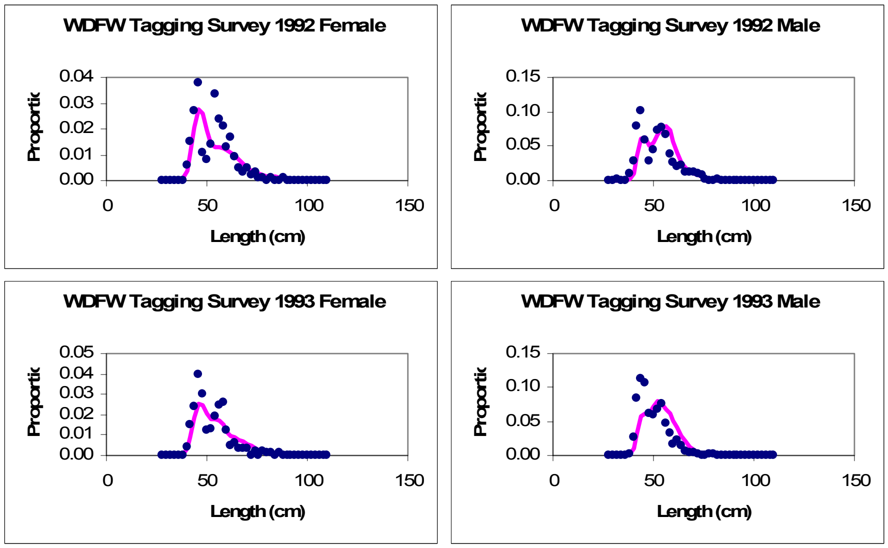


Figure 14, continued. SS2 output for the northern area (LCN) base model: Model fits to WDFW tagging survey catch-at-length.



Filename: LCNCTL05.CTL

```
#  LCNCTL05.ctl: 2005 LCN assessment model ** Tagging Lambda = 0.0 **
#  datafile:LCNData05.dat
2	#_N_growthmorphs

#_assign_sex_to	each_morph_(1=female;_2=male)
1	2

1	#_N_Areas_(populations)

#_each_fleet/survey_operates_in_just_one_area
#_but_different_fleets/surveys_can	be	assigned_to_share_same_selex(FUTURE_coding)

1	1	1	1	1 #area_for_each_fleet and each Survey

0 #do_migration_(0/1)
0 #_N_Block_Designs
#_N_Blocks_per_Design(Block_1_always_starts_in_styr)

#Natural_mortality_and_growth_parameters_for_each_morph
2	#_Last_age_for_natmort_young
3	#_First_age_for_natmort_old
1	#_age_for_growth_Lmin
20	#_age_for_growth_Lmax
-4	#_MGparm_dev_phase

#	LO	HI	INIT	PRIOR	PR_type	SD	PHASE	env-variable	use_dev	dev_minyr dev_maxyr
	dev_stddev
# Female natural mortality and growth
	0.05	0.25	0.18	0.0001	0	99	-3	0	0	0	0	0.5	0
	0	#M1_natM_young
	-3	3	0	1	0	99	-3	0	0	0	0	0.5	0
	0	#M1_natM_old_as_exponential_offset(rel_young)
	10	60	43	43	0	99	-2	0	0	0	0	0.5	0
	0	#M1_Lmin
	40	140	118	118	0	99	-2	0	0	0	0	0.5	0
	0	#M1_Lmax
	0.01	0.5	0.1041	0.1041	0	99	-3	0	0	0	0	0.5	0
	0	#M1_VBK
	0.01	0.5	0.0633	0.0633	0	99	-3	0	0	0	0	0.5	0
	0	#M1_CV-young
	0.01	0.5	0.28857	0.28857	0	99	-3	0	0	0	0	0.5	0
	0	#M1_CV-old_as_exponential_offset(rel_young)
# Male natural mortality and growth
	0.01	0.5	0.5754	0.5754	0	99	-3	0	0	0	0	0.5	0
	0	#M2_natM_young_as_exponential_offset(rel_females)
	-3	3	0	1	0	99	-3	0	0	0	0	0.5	0
	0	#M2_natM_old_as_exponential_offset(rel_young_males)
	-1	1	-0.0231	1.0	0	99	-3	0	0	0	0	0.5	0
	0	#M2_Lmin_as_exponential_offset(rel_females_Lmin)
	-1	1	-0.2842	1.0	0	99	-3	0	0	0	0	0.5	0
	0	#M2_Lmax_as_exponential_offset(rel_females_Lmax)
	0.01	1	0.3603	1.0	0	99	-3	0	0	0	0	0.5	0
	0	#M2_VBK_as_exponential_offset(rel_females)
	-1	1	-0.2379	0	0	99	-3	0	0	0	0	0.5	0
	0	#M2_CV-young_as_exponential_offset(rel_CV-young_females)
	0.01	1.0	0.5324	0	0	99	-3	0	0	0	0	0.5	0
	0	#M2_CV-old_as_exponential_offset(rel_CV-young_males)

# Add 2+2*gender lines to read the wt-Len and mat-Len parameters
# Female length-weight
#	LO	HI	INIT		PRIOR	PR_type	SD	PHASE
	-3	3	0.00000176  0.00000176	0	99	-3	0	0	0	0	0.5
	0	0	#Female wt-len-1 a
	-3	5	3.39780	3.39780 0	99	-3	0	0	0	0	0.5	0
	0	#Female wt-len-2 b
# Female maturity
```

```
	-3	100	68.059	0.1577	0	99	-3	0	0	0	0	0.5	0
	0	#Female mat-len-infl
	-5	5	-0.1577	68.059	0	99	-3	0	0	0	0	0.5	0
	0	#Female mat-len-slope
# Female fecundity - Same as biomass if intercept = 1 and slope = 0
	-3	3	1.	1.	0	99	-3	0	0	0	0	0.5	0
	0	#Female eggs/gm intercept
	-3	3	0.	0.	0	99	-3	0	0	0	0	0.5	0
	0	#Female eggs/gm slope
# Male length-weight
	-3	3	0.000003953		0.000003953	0	99	-3	0	0	0	0
	0.5	0	0	#Male wt-len-1
	-5	5	3.2149	3.2149		0	99	-3	0	0	0	0	0.5
	0	0	#Male wt-len-2

#_allocate_recruits
# pop*gmorph lines For the proportion of each morph in each area
0	1	0.5000	0.2	0	9.8	-3	0	0	0	0	0.5	0	0
	#frac to morph 1 in area 1
0	1	0.5000	0.2	0	9.8	-3	0	0	0	0	0.5	0	0
	#frac to morph 2 in area 1

# pop lines For the proportion assigned to each area
0	1	1	1	0	0.8	-3	0	0	0	0	0.5	0	0
	#frac to area 1

0 #_custom-env_read

#_	0=read_one_setup_and_apply_to_all_env_fxns;	1=read_a_setup_line_for_each_MGparm_with_Env-var>0


0 #_custom-block_read
#_	0=read_one_setup_and_apply_to_all_MG-blocks;	1=read_a_setup_line_for_each_block	x	MGparm_with_block>0

# LO	HI	INIT	PRIOR	Pr_type	SD	PHASE
#-10	10	0.0	0	0	4	4

#_Spawner-Recruitment_parameters

1	# SR_fxn:  1=Beverton-Holt

#LO	HI	INIT	PRIOR	Pr_type	SD	PHASE
1	100	8.22947	7.6187	0	99	1	#Ln(R0)
0.2	5	0.9	0.9	0	99	-4	#steepness
0	20	1.0	0.5	0	99	-3	#SD_recruitments
-5	5	0	0	0	99	-3	#Env_link
-5	5	0	0	0	99	-5	#_ln(init_eq_R_multiplier)

0	#env-var_for_link

#	recruitment_residuals
#start_rec_year		end_rec_year		Lower_limit		Upper_limit		phase
1972		2000		-15		15		3

#init_F_setupforeachfleet
#LO	HI	INIT	PRIOR	PR_type	SD	PHASE
0	1	0.0039	0.09	0	99	1
0	1	0.0006	0.09	0	99	1

#_Qsetup
#_add_parm_row_for_each_positive_entry_below(row_then_column)

#-Float(0/1)		#Do-power(0/1)		#Do-env(0/1)		#Do-dev(0/1)  #env-Var		#Num/Bio(0/1)		for		each
	fleet	and	survey
0	0	0	0	0	1 #Com_1
0	0	0	0	0	1 #Rec_2
0	0	0	0	0	1 #Logbk_3
0	0	0	0	0	1 #NMFS_4
0	0	0	0	0	0 #WDFTag_5
```

```
#	LO	HI	INIT	PRIOR	PR_type	SD	PHASE	env-variable
#_SELEX_&_RETENTION_PARAMETERS

#Selex_type Do_retention(0/1) Do_male Mirrored_selex_number

#Length Selectivity
0	0	0	0	#Com_1
0	0	0	0	#Rec_2
0	0	0	0	#Logbk_3
0	0	0	0	#NMFS_4
0	0	0	0	#WDFTag_5
#_Age	selectivity

18	0	1	0	#Com_1
18	0	1	0	#Rec_2
15	0	0	1	#Logbk_3
18	0	1	0	#NMFS_4
18	0	1	0	#WDFTag_5

#Com_1 1-8 Age Selex for Females: Peak Init Infl1 Slope1 Final Infl2 Slope2 PeakWidth
#LO	HI	INIT	PRIOR	PR_type	SD	PHASE	env-variable	use_dev	dev_minyr dev_maxyrdev_stddev
	Block_Pattern
1	20	5	0.001	0	99	-2	0	0	0	0	0.5	0	0
	# age@peak - fem
0	2	0	1	0	99	-2	0	0	0	0	0.5	0	0
	# sel@minA
-10	10	0.7376	0	0	99	2	0	0	0	0	0.5	0	0
	# asc_infl (logit)
0.1	20	4.193	0.001	0	99	5	0	0	0	0	0.5	0	0
	# asc_slope
-20	30	-10.52	-5	0	99	4	0	0	0	0	0.5	0	0
	# sel@maxA (logit)
-10	10	-1.069	-1.5	0	99	4	0	0	0	0	0.5	0	0
	# desc_infl (logit)
-10	2	1.259	0.5	0	99	4	0	0	0	0	0.5	0	0
	# desc_slope
0	40	1.5	1	0	99	-4	0	0	0	0	0.5	0	0
	# width_of_top <= ( maxA - p1 )
#Com_1 9-12 Age Selex for males relative to females)
# 4 parms: 1=dogleg age, 2=log(rel_sel) at min age, 3= log(rel_sel) at dogleg age, 4+log(relsel) at maxage
1	20	5	3	0	99	-2	0	0	0	0	0	0	0
	# Age_@transition - male
-10	30	0.0	3.21	0	99	-4	0	0	0	0	0	0	0
	# ln(mal_sel/fem_sel) @ minL
-10	30	-0.499	-0.20	0	99	4	0	0	0	0	0	0	0
	# ln(mal_sel/fem_sel) @ m1
-10	10	-6.461	0	0	99	4	0	0	0	0	0	0	0
	# ln(mal_sel/fem_sel) @ maxL

#Rec_2 13-20 Age Selex for Females
1	13	5	0.001	0	99	-2	0	0	0	0	0	0	0
	# age@peak - fem
0	2	0	1	0	99	-2	0	0	0	0	0	0	0
	# sel@minA
-10	10	0.572	0	0	99	2	0	0	0	0	0	0	0
	# asc_infl (logit)
0.0	20	9.427	0.001	0	99	3	0	0	0	0	0	0	0
	# asc_slope
-20	30	-10.22	-5	0	99	4	0	0	0	0	0	0	0
	# sel@maxA (logit)
-10	10	-2.410	-1.5	0	99	4	0	0	0	0	0	0	0
	# desc_infl (logit)
0	2	0.213	0.5	0	99	4	0	0	0	0	0	0	0
	# desc_slope
0	40	1.5	1	0	99	-4	0	0	0	0	0	0	0
	# width_of_top <= ( maxA - p1 )
#Rec_2 21-24 Age Selex for males relative to females
1	10	5	5	0	99	-2	0	0	0	0	0	0	0
	# Age_@transition - male
```

```
-10    30    00.0    20.35    0    99    -4    0    0    0    0    0    0    0
       # ln(mal_sel/fem_sel) @ minL
-10    30    1.06    -0.09    0    99    4     0    0    0    0    0    0    0
       # ln(mal_sel/fem_sel) @ m1
-10    10    00.0    0.33     0    99    -4    0    0    0    0    0    0    0
       # ln(mal_sel/fem_sel) @ maxL

#NMFS_4 25-32 Age Selex for Females: Peak Init Infl1 Slope1 Final Infl2 Slope2 PeakWidth
1      35    3    0.001 0     99    -2    0    0    0    0    0    0    0    #
age@peak - fem
0      2     0.149    1       0    99    -2    0    0    0    0    0    0    0
       # sel@minA
-10    10    4.627    2       0    99    2     0    0    0    0    0    0    0
       # asc_infl (logit)
0      30    0.161    0.001   0    99    3     0    0    0    0    0    0    0
       # asc_slope
-15    30    -3.26    -5      0    99    4     0    0    0    0    0    0    0
       # sel@maxA (logit)
-10    10    -1.32    -1.5    0    99    4     0    0    0    0    0    0    0
       # desc_infl (logit)
0      20    9.894    0.5     0    99    5     0    0    0    0    0    0    0
       # desc_slope
0      40    1.0      1       0    99    -5    0    0    0    0    0    0    0
       # width_of_top <= ( maxA - p1 )
#NMFS_4 33-36 Age Selex for males relative to females
# 4 parms: 1=dogleg age, 2=log(rel_sel) at min age, 3= log(rel_sel) at dogleg age, 4+log(relsel) at maxage
1      10    3        3       0    99    -2    0    0    0    0    0    0    0
       # Age_@transition - male
-10    30    0.0      1       0    99    -4    0    0    0    0    0    0    0
       # ln(mal_sel/fem_sel) @ minL
-10    0     -0.030   1       0    99    4     0    0    0    0    0    0    0
       # ln(mal_sel/fem_sel) @ m1
-30    0     0.00     1       0    99    -4    0    0    0    0    0    0    0
       # ln(mal_sel/fem_sel) @ maxL

#WDFWTag_5 37-44 Age Selex for Females
0      20    3        0.001   0    99    -3    0    0    0    0    0    0    0
       # age@peak - fem
0      2     0        1       0    99    -3    0    0    0    0    0    0    0
       # sel@minA
-10    10    -2.50    -.249   0    99    3     0    0    0    0    0    0    0
       # asc_infl (logit)
-10    10    6.25     .134    0    99    4     0    0    0    0    0    0    0
       # asc_slope
-20    30    -8.28    -5      0    99    4     0    0    0    0    0    0    0
       # sel@maxA (logit)
-10    10    -2.59    -1.5    0    99    4     0    0    0    0    0    0    0
       # desc_infl (logit)
0      10    0.680    0.5     0    99    5     0    0    0    0    0    0    0
       # desc_slope
0      40    1        1       0    99    -5    0    0    0    0    0    0    0
       # width_of_top <= ( maxA - p1 )
#WDFWTag_5 45-48 Age Selex for males relative to females
0      20    3        3       0    99    -2    0    0    0    0    0    0    0
       # Age_@transition - male
-15    10    0.0      6.61    0    99    -4    0    0    0    0    0    0    0
       # ln(mal_sel/fem_sel) @ minL
-20    20    2.26     5.62    0    99    4     0    0    0    0    0    0    0
       # ln(mal_sel/fem_sel) @ m1
-20    20    0.00     0       0    99    -4    0    0    0    0    0    0    0
       # ln(mal_sel/fem_sel) @ maxL

#_custom-env_read
0      #_ 0=read_one_setup_and_apply_to_all_env_fxns;  1=read_a_setup_line_for_each_SELparm_with_Env-var>0
#    except read NO setup lines If no SELparms have Env-var>0
# LO   HI    INIT    PRIOR    PR_type    SD    PHASE
# -10  10    0       0        0          4     4       #Env-parm_setup

#_custom-block_read
```

```
0	#_	0=read_one_setup_and_apply_to_all;_1=Custom_so_see_detailed_instructions_for_N_rows_in_Custom_setup

#LO	HI	INIT	PRIOR	PR_type	SD	PHASE
# -10	10	0	0	0	4	4
-4	#_phase_for_selex_parm_devs

1	#_max_lambda_phases:_read_this_Number_of_values_for_each_componentxtype_below
0	#_sd_offset - 0 = omit +log(s) term; 1 = include Log(s) term in Like
#_CPUE_lambdas for each fleet and survey
1	1	1	1	0
#_discard_lambdas
0	0	0	0	0
#_meanwtlambda(one_for_all_sources)
0
#_lenfreq_lambdas
1	1	0	1	1
#_age_freq_lambdas
1	1	0	1	1
#_size@age_lambdas
1	1	0	1	1
#_initial_equil_catch
1
#_recruitment_lambda
1.0
#_parm_prior_lambda
1
#_parm_dev_timeseries_lambda
1
# crashpen lambda
100
#max F
0.9
999	#_end-of-file
```

Filename: LCNData05d.DAT

#_Number_of_datafiles: 1
#_start_nudata: 1
#_MODEL_DIMENSIONS
1956 #_styr
2004 #_endyr
1 #_nseas

#_vector_with_N_months_in_each_season
12 #_months/season
1 #_spawn_seas
2 #_Nfleet
3 #_Nsurv

Labels
Comm1%Sport2%logbk3%NMFS4%WDFTAG5

Timing within each season, for each fishery and survey
0.5 0.5 0.5 0.5 0.5

2 #_Ngenders
40 #_accumulator_age;_model_always_starts_with_age_0
132 7.6 #_init_equil_catch_for_each_fishery

#_catch_biomass(mtons):_columns_are_fisheries _rows_are_year*season

920	0
1000	5
1133	9
1863	14
2028	18
1875	23
1323	27
938	32
1257	36
1538	40
1813	45
1244	49
1626	54
1148	58
851	63
1009	67
952	72
1326	76
1549	81
2019	85
1662	69
1671	76
1346	70
2211	82
2004	93

1905	128
2241	128
3051	114
3005	156
3127	90
1305	95
1620	111
1646	115
2231	146
1746	125
2320	121
1207	210
1429	252
1214	255
1018	117
1186	129
1106	120
718	73
665	101
223	75
206	86
226	140
147	144
208	168

39 #_N_cpue_and_surveyabundance_observations
#_year seas index obs se(log)
#Logbook GLM
1976 1 3 20.33 0.2
1977 1 3 16.16 0.2
1978 1 3 10.79 0.2
1979 1 3 11.37 0.2
1980 1 3 11.32 0.2
1981 1 3 13.33 0.2
1982 1 3 9.29 0.2
1983 1 3 9.32 0.2
1984 1 3 6.99 0.2
1985 1 3 6.26 0.2
1986 1 3 3.58 0.2
1987 1 3 4.24 0.2
1988 1 3 4.56 0.2
1989 1 3 5.45 0.2
1990 1 3 4.36 0.2
1991 1 3 3.94 0.2
1992 1 3 2.23 0.2
1993 1 3 2.74 0.2
1994 1 3 2.82 0.2
1995 1 3 2.47 0.2
1996 1 3 2.54 0.2
1997 1 3 2.36 0.2
#NMFS Trawl Survey no water hauls
1977 1 4 15043.15776 0.77
1980 1 4 4579.96215 0.31

1983 1 4 6267.97273 0.16
1986 1 4 2811.65104 0.12
1989 1 4 5855.76262 0.3
1992 1 4 4154.87076 0.49
1995 1 4 1884.36548 0.56
1998 1 4 3019.97203 0.26
2001 1 4 5226.82217 0.27
2004 1 4 11365.7 0.35
#WDFW Tag Survey in numbers of fish
1986 1 5 119700 0.16
1987 1 5 208500 0.15
1988 1 5 165400 0.11
1989 1 5 149000 0.09
1990 1 5 123800 0.08
1991 1 5 114400 0.08
1992 1 5 127300 0.09

2 #_discard_type
0 #_N_discard_obs

0 #_N_meanbodywt_obs

-1 #_comp_tail_compression
0.0001 #_add_to_comp

42 #_N_LengthBins
28 30 32 34 36 38 40 42 44 46 48 50 52 54 56 58 60 62 64 66 68 70 72 74 76 78 80 82 84 86 88 90 92 94 96 98 100 102 104 106 108 110

17 #_N_Length_obs
#Yr Seas Flt/Svy Gender Part Nsamp(Fem-Male)
#Com_1 Length Comps
1975 1 1 3 0 14.6 0.0000000000 0.0000000000 0.0000000000 0.0000000000 0.0000000000 0.0000000000 0.0000000000 0.0000000000
0.0000000000 0.0000000000 0.0001489417 0.0031108317 0.0017565662 0.0011852852 0.0025418072 0.0029410116
0.0065371858 0.0067358572 0.0107029144 0.0214315447 0.0213849300 0.0334709147 0.0584148774 0.0752367302
0.0779870928 0.0487304609 0.0375367740 0.0303834109 0.0274517735 0.0170846334 0.0116896115 0.0143208604
0.0168067903 0.0117262534 0.0128513433 0.0105013505 0.0094854849 0.0027994129 0.0049533924 0.0023328711
0.0019703447 0.0028396070 0.0000000000 0.0000000000 0.0000000000 0.0000000000 0.0000000000 0.0000000000
0.0000000000 0.0000000000 0.0000000000 0.0000744708 0.0010472954 0.0034707080 0.0015286394 0.0031044549
0.0032655141 0.0084576705 0.0110242922 0.0168913290 0.0368298376 0.0533668091 0.0686534366 0.0532135656
0.0522671670 0.0328809278 0.0221313752 0.0163318470 0.0091745992 0.0077709247 0.0022468499 0.0022993468
0.0018747793 0.0015849008 0.0004976894 0.0008954757 0.0004976894 0.0009953787 0.0004976894 0.0000000000
0.0000744708 0.0000000000 0.0000000000 0.0000000000
1976 1 1 3 0 40.0 0.0000000000 0.0000000000 0.0000000000 0.0000000000 0.0000000000 0.0000000000 0.0000000000 0.0000000000
0.0000000000 0.0000000000 0.0000000000 0.0000000000 0.0000000000 0.0000000000 0.0042932706 0.0063050163
0.0104633974 0.0186452699 0.0148915575 0.0230734300 0.0234780986 0.0393022855 0.0415838104 0.0755253064
0.0645223509 0.0826280626 0.0595546326 0.0694784718 0.0468097104 0.0427862189 0.0327274901 0.0163637451
0.0144868889 0.0081818725 0.0246805071 0.0207919052 0.0081818725 0.0040234915 0.0021466353 0.0021466353
0.0042932706 0.0084516516 0.0000000000 0.0000000000 0.0000000000 0.0000000000 0.0000000000 0.0000000000
0.0000000000 0.0000000000 0.0000000000 0.0000000000 0.0000000000 0.0000000000 0.0021466353 0.0000000000
0.0040234915 0.0041583810 0.0021466353 0.0126100327 0.0103285078 0.0230734300 0.0374254293 0.0431908875
0.0393022855 0.0166335242 0.0143519993 0.0124751431 0.0042932706 0.0000000000 0.0040234915 0.0000000000

0.0000000000 0.0000000000 0.0000000000 0.0000000000 0.0000000000 0.0000000000 0.0000000000 0.0000000000
0.0000000000 0.0000000000 0.0000000000 0.0000000000
1977 1 1 3 0 26.2 0.0000000000 0.0000000000 0.0000000000 0.0000000000 0.0000000000 0.0000000000 0.0000000000 0.0000000000
0.0000000000 0.0000000000 0.0000000000 0.0000000000 0.0000000000 0.0000000000 0.0000000000 0.0000000000
0.0000000000 0.0000000000 0.0000000000 0.0000000000 0.0000000000 0.0000000000 0.0076335878 0.0076335878
0.0114503817 0.0038167939 0.0229007634 0.0534351145 0.0687022901 0.0877862595 0.0381679389 0.0725190840
0.0496183206 0.0419847328 0.0229007634 0.0496183206 0.0725190840 0.0419847328 0.0610687023 0.0610687023
0.0496183206 0.1717557252 0.0000000000 0.0000000000 0.0000000000 0.0000000000 0.0000000000 0.0000000000
0.0000000000 0.0000000000 0.0000000000 0.0000000000 0.0000000000 0.0000000000 0.0000000000 0.0000000000
0.0000000000 0.0000000000 0.0000000000 0.0000000000 0.0000000000 0.0000000000 0.0000000000 0.0000000000
0.0038167939 0.0000000000 0.0000000000 0.0000000000 0.0000000000 0.0000000000 0.0000000000 0.0000000000
0.0000000000 0.0000000000 0.0000000000 0.0000000000 0.0000000000 0.0000000000 0.0000000000 0.0000000000
0.0000000000 0.0000000000 0.0000000000 0.0000000000
1978 1 1 3 0 22.3 0.0000000000 0.0000000000 0.0000000000 0.0000000000 0.0000000000 0.0000000000 0.0000000000 0.0000000000
0.0000000000 0.0064070830 0.0000000000 0.0000000000 0.0009766171 0.0064070830 0.0000000000 0.0181416502
0.0909142142 0.0407371492 0.0373628991 0.0353066833 0.0137907830 0.0107579501 0.0107579501 0.0245487331
0.0137907830 0.0299791990 0.0019532341 0.0319324331 0.0234691344 0.0249779695 0.0549571686 0.0986241689
0.0372447548 0.0550601503 0.0510507004 0.0324646513 0.0221511001 0.0536391343 0.0230247354 0.0368155184
0.0039064682 0.0167206342 0.0000000000 0.0000000000 0.0000000000 0.0000000000 0.0000000000 0.0000000000
0.0000000000 0.0000000000 0.0000000000 0.0000000000 0.0000000000 0.0000000000 0.0064070830 0.0000000000
0.0000000000 0.0215159003 0.0064070830 0.0107579501 0.0279229832 0.0009766171 0.0000000000 0.0000000000
0.0000000000 0.0064070830 0.0107579501 0.0000000000 0.0000000000 0.0009766171 0.0000000000 0.0000000000
0.0000000000 0.0000000000 0.0000000000 0.0000000000 0.0000000000 0.0000000000 0.0000000000 0.0000000000
0.0000000000 0.0000000000 0.0000000000 0.0000000000
#Rec Length Comps
1981 1 2 3 0 9.8 0.0000000000 0.0000000000 0.0000000000 0.0000000000 0.0000000000 0.0000000000 0.0000000000 0.0000000000
0.0000000000 0.0000000000 0.0000000000 0.0102040816 0.0102040816 0.0000000000 0.0000000000 0.0000000000
0.0102040816 0.0102040816 0.0000000000 0.0000000000 0.0000000000 0.0102040816 0.0000000000 0.0000000000
0.0000000000 0.0000000000 0.0000000000 0.0000000000 0.0000000000 0.0000000000 0.0000000000 0.0000000000
0.0000000000 0.0000000000 0.0000000000 0.0102040816 0.0000000000 0.0000000000 0.0102040816 0.0000000000
0.0000000000 0.0000000000 0.0000000000 0.0000000000 0.0000000000 0.0000000000 0.0000000000 0.0000000000
0.0000000000 0.0204081633 0.0000000000 0.0204081633 0.0000000000 0.0204081633 0.0816326531 0.0612244898
0.1020408163 0.0714285714 0.0714285714 0.0408163265 0.0714285714 0.0306122449 0.0306122449 0.1326530612
0.0306122449 0.0306122449 0.0000000000 0.0510204082 0.0306122449 0.0102040816 0.0102040816 0.0000000000
0.0000000000 0.0000000000 0.0000000000 0.0102040816 0.0000000000 0.0000000000 0.0000000000 0.0000000000
0.0000000000 0.0000000000 0.0000000000 0.0000000000
1982 1 2 3 0 7.2 0.0000000000 0.0000000000 0.0000000000 0.0000000000 0.0000000000 0.0000000000 0.0000000000 0.0000000000
0.0000000000 0.0138888889 0.0138888889 0.0000000000 0.0000000000 0.0000000000 0.0000000000 0.0138888889
0.0000000000 0.0000000000 0.0000000000 0.0000000000 0.0000000000 0.0000000000 0.0000000000 0.0000000000
0.0000000000 0.0000000000 0.0138888889 0.0000000000 0.0138888889 0.0000000000 0.0138888889 0.0138888889
0.0000000000 0.0000000000 0.0000000000 0.0000000000 0.0000000000 0.0000000000 0.0000000000 0.0000000000
0.0000000000 0.0000000000 0.0000000000 0.0000000000 0.0000000000 0.0000000000 0.0000000000 0.0138888889
0.0000000000 0.0000000000 0.0138888889 0.0138888889 0.0000000000 0.0138888889 0.0694444444 0.0694444444
0.0972222222 0.0972222222 0.1111111111 0.0833333333 0.0138888889 0.0694444444 0.0416666667 0.0694444444
0.0138888889 0.0277777778 0.0277777778 0.0000000000 0.0000000000 0.0277777778 0.0000000000 0.0138888889
0.0138888889 0.0000000000 0.0000000000 0.0000000000 0.0000000000 0.0000000000 0.0000000000 0.0000000000
0.0000000000 0.0000000000 0.0000000000 0.0000000000
1983 1 2 3 0 3.9 0.0000000000 0.0000000000 0.0000000000 0.0000000000 0.0000000000 0.0000000000 0.0000000000 0.0256410256
0.0000000000 0.0512820513 0.0000000000 0.0000000000 0.0256410256 0.0000000000 0.0000000000 0.0000000000
0.0256410256 0.0000000000 0.0000000000 0.0000000000 0.0000000000 0.0000000000 0.0000000000 0.0000000000
0.0000000000 0.0256410256 0.0512820513 0.0512820513 0.0000000000 0.0000000000 0.0000000000 0.0000000000
0.0000000000 0.0000000000 0.0000000000 0.0000000000 0.0000000000 0.0000000000 0.0000000000 0.0000000000

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0.0000000000 0.0000000000 0.0000000000 0.0000000000 0.0000000000 0.0000000000 0.0000000000 0.0000000000
0.0000000000 0.0256410256 0.0512820513 0.0000000000 0.0256410256 0.0000000000 0.0000000000 0.0512820513
0.0000000000 0.1282051282 0.1025641026 0.0512820513 0.1282051282 0.0256410256 0.1025641026 0.0000000000
0.0000000000 0.0256410256 0.0256410256 0.0000000000 0.0000000000 0.0000000000 0.0000000000 0.0000000000
0.0000000000 0.0000000000 0.0000000000 0.0000000000 0.0000000000 0.0000000000 0.0000000000 0.0000000000
0.0000000000 0.0000000000 0.0000000000 0.0000000000
#NMFS Survey Length Comps
1986 1 4 3 0 99 0.0000000000 0.0000000000 0.0000000000 0.0010924626 0.0066860944 0.0049146845 0.0140637093 0.0022254385
0.0059680308 0.0097036381 0.0000000000 0.0000000000 0.0000000000 0.0008829109 0.0169583160 0.0000000000
0.0101646517 0.0526240057 0.0107625724 0.0290676069 0.1079526246 0.0097148142 0.0122336249 0.0498816732
0.0327640979 0.0961101627 0.0230548718 0.0262470418 0.0125954508 0.0256742673 0.0261436630 0.0118103306
0.0008829109 0.0257315448 0.0000000000 0.0073007793 0.0126904475 0.0000000000 0.0000000000 0.0000000000
0.0000000000 0.0063955162 0.0000000000 0.0008144574 0.0000000000 0.0224681272 0.0026948341 0.0085776473
0.0019362572 0.0011217998 0.0000000000 0.0000000000 0.0120589986 0.0009667316 0.0000000000 0.0050152693
0.0056592914 0.0312427530 0.0657433356 0.0216997712 0.0028582844 0.0123188426 0.0277725778 0.0513639018
0.0223507783 0.0095108506 0.0011036387 0.0116692325 0.0278717656 0.0008829109 0.0000000000 0.0000000000
0.0000000000 0.0000000000 0.0000000000 0.0000000000 0.0000000000 0.0000000000 0.0000000000 0.0000000000
0.0000000000 0.0000000000 0.0000000000 0.0000000000
1989 1 4 3 0 99 0.0013070357 0.0000000000 0.0030014599 0.0375334563 0.0193774252 0.0201898203 0.0029934560 0.0000000000
0.0083248492 0.0394535902 0.0063638954 0.0199168876 0.0020537990 0.0017056296 0.0122867763 0.0085113399
0.0264800799 0.0609296362 0.0338108456 0.0608856148 0.0602901251 0.0125637110 0.0267754236 0.0137058665
0.0074796381 0.0150137027 0.0096639005 0.0109621320 0.0171435386 0.0028261747 0.0169034218 0.0064935585
0.0141516834 0.0230576152 0.0052841702 0.0014975284 0.0063606938 0.0016079821 0.0025740520 0.0048783728
0.0000000000 0.0025740520 0.0200681612 0.0000000000 0.0017368448 0.0032303713 0.0076052992 0.0017368448
0.0013998809 0.0000000000 0.0000000000 0.0254683878 0.0157756733 0.0390774073 0.0042020439 0.0053802169
0.0081607694 0.0120522622 0.0090211879 0.0404388695 0.0425006723 0.0393127217 0.0121611152 0.0034128600
0.0180431762 0.0517587755 0.0000000000 0.0031999565 0.0073235622 0.0000000000 0.0000000000 0.0000000000
0.0000000000 0.0000000000 0.0000000000 0.0000000000 0.0000000000 0.0000000000 0.0000000000 0.0000000000
0.0000000000 0.0000000000 0.0000000000 0.0000000000
#WDFW Tagging Length Comps
1986 1 5 3 0 99 0.0000000000 0.0000000000 0.0000000000 0.0000000000 0.0000000000 0.0000000000 0.0000000000 0.0000000000
0.0061983471 0.0061983471 0.0061983471 0.0041322314 0.0082644628 0.0082644628 0.0103305785 0.0144628099
0.0082644628 0.0247933884 0.0000000000 0.0061983471 0.0020661157 0.0041322314 0.0020661157 0.0000000000
0.0000000000 0.0000000000 0.0020661157 0.0000000000 0.0000000000 0.0000000000 0.0000000000 0.0000000000
0.0000000000 0.0020661157 0.0000000000 0.0000000000 0.0000000000 0.0000000000 0.0000000000 0.0000000000
0.0000000000 0.0000000000 0.0020661157 0.0000000000 0.0000000000 0.0000000000 0.0000000000 0.0000000000
0.0000000000 0.0165289256 0.0289256198 0.0165289256 0.0454545455 0.0557851240 0.0888429752 0.0847107438
0.0661157025 0.1033057851 0.0578512397 0.0743801653 0.0743801653 0.0289256198 0.0289256198 0.0185950413
0.0289256198 0.0185950413 0.0185950413 0.0103305785 0.0103305785 0.0000000000 0.0041322314 0.0020661157
0.0000000000 0.0000000000 0.0000000000 0.0000000000 0.0000000000 0.0000000000 0.0000000000 0.0000000000
0.0000000000 0.0000000000 0.0000000000 0.0000000000
1987 1 5 3 0 99 0.0000000000 0.0000000000 0.0000000000 0.0000000000 0.0000000000 0.0000000000 0.0018450185 0.0110701107
0.0221402214 0.0129151292 0.0221402214 0.0055350554 0.0055350554 0.0055350554 0.0110701107 0.0092250923
0.0110701107 0.0110701107 0.0055350554 0.0110701107 0.0036900369 0.0055350554 0.0073800738 0.0055350554
0.0000000000 0.0018450185 0.0000000000 0.0036900369 0.0000000000 0.0000000000 0.0000000000 0.0018450185
0.0018450185 0.0018450185 0.0000000000 0.0018450185 0.0000000000 0.0000000000 0.0000000000 0.0000000000
0.0000000000 0.0000000000 0.0000000000 0.0000000000 0.0000000000 0.0000000000 0.0000000000 0.0055350554
0.0202952030 0.0424354244 0.0461254613 0.0313653137 0.0147601476 0.0184501845 0.0535055351 0.0664206642
0.0553505535 0.0885608856 0.0830258303 0.0885608856 0.0571955720 0.0424354244 0.0313653137 0.0276752768
0.0129151292 0.0147601476 0.0018450185 0.0092250923 0.0018450185 0.0018450185 0.0018450185 0.0018450185
0.0000000000 0.0000000000 0.0000000000 0.0000000000 0.0000000000 0.0000000000 0.0000000000 0.0000000000
0.0000000000 0.0000000000 0.0000000000 0.0000000000
```

1988 1 5 3 0 99	0.0000000000	0.0000000000	0.0000000000	0.0000000000	0.0000000000	0.0000000000	0.0000000000	0.0000000000
	0.0010224949	0.0030674847	0.0020449898	0.0092024540	0.0153374233	0.0276073620	0.0276073620	0.0214723926
	0.0092024540	0.0051124744	0.0051124744	0.0061349693	0.0040899796	0.0000000000	0.0040899796	0.0061349693
	0.0051124744	0.0061349693	0.0020449898	0.0030674847	0.0000000000	0.0010224949	0.0000000000	0.0010224949
	0.0010224949	0.0000000000	0.0000000000	0.0000000000	0.0000000000	0.0010224949	0.0000000000	0.0000000000
	0.0000000000	0.0000000000	0.0000000000	0.0000000000	0.0000000000	0.0000000000	0.0000000000	0.0000000000
	0.0010224949	0.0020449898	0.0040899796	0.0173824131	0.0449897751	0.1022494888	0.1370143149	0.1308793456
	0.0715746421	0.0429447853	0.0490797546	0.0439672802	0.0490797546	0.0398773006	0.0214723926	0.0214723926
	0.0235173824	0.0112474438	0.0071574642	0.0071574642	0.0010224949	0.0020449898	0.0000000000	0.0010224949
	0.0000000000	0.0000000000	0.0000000000	0.0000000000	0.0000000000	0.0000000000	0.0000000000	0.0000000000
	0.0000000000	0.0000000000	0.0000000000	0.0000000000				
1989 1 5 3 0 99	0.0000000000	0.0000000000	0.0000000000	0.0000000000	0.0000000000	0.0000000000	0.0000000000	0.0010373444
	0.0020746888	0.0062240664	0.0041493776	0.0010373444	0.0010373444	0.0082987552	0.0124481328	0.0072614108
	0.0072614108	0.0155601660	0.0176348548	0.0124481328	0.0103734440	0.0031120332	0.0020746888	0.0020746888
	0.0020746888	0.0031120332	0.0010373444	0.0031120332	0.0010373444	0.0000000000	0.0010373444	0.0000000000
	0.0000000000	0.0010373444	0.0000000000	0.0010373444	0.0000000000	0.0000000000	0.0010373444	0.0000000000
	0.0000000000	0.0010373444	0.0000000000	0.0000000000	0.0000000000	0.0010373444	0.0000000000	0.0000000000
	0.0010373444	0.0041493776	0.0145228216	0.0165975104	0.0145228216	0.0145228216	0.0321576763	0.0580912863
	0.1410788382	0.1504149378	0.1504149378	0.1026970954	0.0539419087	0.0248962656	0.0248962656	0.0217842324
	0.0155601660	0.0165975104	0.0041493776	0.0041493776	0.0010373444	0.0020746888	0.0000000000	0.0000000000
	0.0000000000	0.0000000000	0.0000000000	0.0000000000	0.0000000000	0.0000000000	0.0000000000	0.0000000000
	0.0000000000	0.0000000000	0.0000000000	0.0000000000				
1990 1 5 3 0 99	0.0000000000	0.0000000000	0.0000000000	0.0000000000	0.0000000000	0.0000000000	0.0000000000	0.0177619893
	0.0195381883	0.0408525755	0.0142095915	0.0142095915	0.0035523979	0.0106571936	0.0284191829	0.0284191829
	0.0088809947	0.0071047957	0.0053285968	0.0088809947	0.0071047957	0.0088809947	0.0142095915	0.0124333925
	0.0142095915	0.0035523979	0.0017761989	0.0000000000	0.0017761989	0.0000000000	0.0000000000	0.0000000000
	0.0017761989	0.0017761989	0.0000000000	0.0000000000	0.0000000000	0.0000000000	0.0000000000	0.0000000000
	0.0000000000	0.0000000000	0.0000000000	0.0000000000	0.0000000000	0.0000000000	0.0000000000	0.0000000000
	0.0017761989	0.0239786856	0.0373001776	0.0390763766	0.0195381883	0.0186500888	0.0355239787	0.0497335702
	0.0444049734	0.0248667851	0.0621669627	0.0799289520	0.1154529307	0.0710479574	0.0506216696	0.0159857904
	0.0088809947	0.0088809947	0.0115452931	0.0035523979	0.0000000000	0.0008880995	0.0008880995	0.0000000000
	0.0000000000	0.0000000000	0.0000000000	0.0000000000	0.0000000000	0.0000000000	0.0000000000	0.0000000000
	0.0000000000	0.0000000000	0.0000000000	0.0000000000				
1991 1 5 3 0 99	0.0000000000	0.0000000000	0.0000000000	0.0000000000	0.0000000000	0.0000000000	0.0009832842	0.0029498525
	0.0167158309	0.0235988201	0.0098328417	0.0098328417	0.0127826942	0.0245821042	0.0363815143	0.0294985251
	0.0127826942	0.0068829892	0.0049164208	0.0108161259	0.0029498525	0.0039331367	0.0039331367	0.0009832842
	0.0009832842	0.0019665683	0.0029498525	0.0009832842	0.0019665683	0.0000000000	0.0019665683	0.0000000000
	0.0000000000	0.0000000000	0.0000000000	0.0000000000	0.0000000000	0.0000000000	0.0000000000	0.0000000000
	0.0000000000	0.0000000000	0.0000000000	0.0000000000	0.0000000000	0.0000000000	0.0000000000	0.0000000000
	0.0039331367	0.0167158309	0.0599803343	0.0521140610	0.0255653884	0.0452310718	0.0845624385	0.1022615536
	0.0757128810	0.0432645034	0.0432645034	0.0403146509	0.0334316618	0.0481809243	0.0344149459	0.0334316618
	0.0196656834	0.0049164208	0.0058997050	0.0009832842	0.0000000000	0.0000000000	0.0009832842	0.0000000000
	0.0000000000	0.0000000000	0.0000000000	0.0000000000	0.0000000000	0.0000000000	0.0000000000	0.0000000000
	0.0000000000	0.0000000000	0.0000000000	0.0000000000				
1992 1 5 3 0 99	0.0000000000	0.0000000000	0.0000000000	0.0000000000	0.0000000000	0.0000000000	0.0059820538	0.0149551346
	0.0269192423	0.0378863410	0.0109670987	0.0079760718	0.0139581256	0.0338983051	0.0239282154	0.0209371884
	0.0129611167	0.0169491525	0.0089730808	0.0049850449	0.0029910269	0.0049850449	0.0019940179	0.0029910269
	0.0009970090	0.0009970090	0.0000000000	0.0009970090	0.0000000000	0.0000000000	0.0009970090	0.0000000000
	0.0000000000	0.0000000000	0.0000000000	0.0000000000	0.0000000000	0.0000000000	0.0000000000	0.0000000000
	0.0000000000	0.0000000000	0.0000000000	0.0000000000	0.0009970090	0.0000000000	0.0000000000	0.0109670987
	0.0279162512	0.0797607178	0.1026919242	0.0598205384	0.0289132602	0.0438683948	0.0737786640	0.0767696909
	0.0667996012	0.0388833500	0.0269192423	0.0209371884	0.0219341974	0.0129611167	0.0129611167	0.0119641077

0.0109670987 0.0089730808 0.0019940179 0.0000000000 0.0000000000 0.0009970090 0.0000000000 0.0000000000
0.0000000000 0.0000000000 0.0000000000 0.0000000000 0.0000000000 0.0000000000 0.0000000000 0.0000000000
0.0000000000 0.0000000000 0.0000000000 0.0000000000
1993 1 5 3 0 99 0.0000000000 0.0000000000 0.0000000000 0.0000000000 0.0000000000 0.0000000000 0.0040160643 0.0150602410
0.0240963855 0.0401606426 0.0301204819 0.0120481928 0.0130522088 0.0190763052 0.0251004016 0.0261044177
0.0120481928 0.0050200803 0.0060240964 0.0030120482 0.0030120482 0.0030120482 0.0000000000 0.0020080321
0.0000000000 0.0020080321 0.0010040161 0.0010040161 0.0000000000 0.0010040161 0.0000000000 0.0000000000
0.0000000000 0.0000000000 0.0000000000 0.0000000000 0.0000000000 0.0000000000 0.0000000000 0.0000000000
0.0000000000 0.0000000000 0.0000000000 0.0000000000 0.0000000000 0.0000000000 0.0000000000 0.0020080321
0.0271084337 0.0843373494 0.1144578313 0.1074297189 0.0622489960 0.0592369478 0.0692771084 0.0763052209
0.0471887550 0.0321285141 0.0170682731 0.0220883534 0.0140562249 0.0070281124 0.0030120482 0.0030120482
0.0020080321 0.0000000000 0.0000000000 0.0010040161 0.0010040161 0.0000000000 0.0000000000 0.0000000000
0.0000000000 0.0000000000 0.0000000000 0.0000000000 0.0000000000 0.0000000000 0.0000000000 0.0000000000
0.0000000000 0.0000000000 0.0000000000 0.0000000000

20 #_N_age_bins
1 2 3 4 5 6 7 8 9 10 11 12 13 14 15 16 17 18 19 20

2 #_N_ageerror_definitions

0.5 1.5 2.5 3.5 4.5 5.5 6.5 7.5 8.5 9.5 10.5 11.5 12.5 13.5 14.5 15.5 16.5 17.5
18.5 19.5 20.5 21.5 22.5 23.5 24.5 25.5 26.5 27.5 28.5 29.5 30.5 31.5 32.5 33.5 34.5
35.5 36.5 37.5 38.5 39.5 40.5
0.001 0.001 0.001 0.001 0.001 0.001 0.001 0.001 0.001 0.001 0.001 0.001 0.001 0.001 0.001 0.001 0.001 0.001
0.001 0.001 0.001 0.001 0.001 0.001 0.001 0.001 0.001 0.001 0.001 0.001 0.001 0.001 0.001 0.001 0.001
0.001 0.001 0.001 0.001 0.001 0.001
0.5 1.5 2.5 3.5 4.5 5.5 6.5 7.5 8.5 9.5 10.5 11.5 12.5 13.5 14.5 15.5 16.5 17.5
18.5 19.5 20.5 21.5 22.5 23.5 24.5 25.5 26.5 27.5 28.5 29.5 30.5 31.5 32.5 33.5 34.5
35.5 36.5 37.5 38.5 39.5 40.5
0.5 0.715501191 0.809263396 0.903025602 0.996787807 1.090550012 1.184312217 1.278074422 1.371836627
1.465598832 1.559361037 1.653123242 1.746885447 1.840647652 1.934409857 2.028172062 2.121934267
2.215696472 2.309458677 2.403220882 2.5 2.6 2.7 2.8 2.9 3 3 3 3 3 3
3 3 3 3 3 3 3 3 3 3

55 #_N_Agecomp_obs
#Yr Seas Flt/Svy Gender Part Ageerr Lbin_lo Lbin_hi Nsamp datavector(female-male)
#Com_1 Age Comps
1979 1 1 3 0 2 -1 -1 40.0 0 0.002553316 0.004046359 0.015273198 0.031165609 0.052476117 0.093628843 0.206630678 0.236086714 0.14492568 0.04957326 0.018095932 0.017173086
0.017335274 0.029611456 0.031145955 0.006287515 0.00038875 0 0 0 0.000549647 0.003424967 0.004659841 0.017581272 0.006998617 0.007906343 0.002481571 0 0 0 0 0 0 0 0 0 0 0 0
1980 1 1 3 0 2 -1 -1 40.0 0 0.003701201 0.018961966 0.029276376 0.051113189 0.112958127 0.12042954 0.127980038 0.134158111 0.086853476 0.048782599 0.038168099 0.025266011
0.01484596 0.014500354 0.007677481 0.006003076 0.001962052 0 0.000806368 0 0.000421964 0.009378278 0.014302048 0.030909132 0.053038019 0.018066328 0.016067437 0.00858445
0.000792878 0.004995442 0 0 0 0 0 0 0 0 0
1981 1 1 3 0 2 -1 -1 40.0 0 0.006869185 0.052506503 0.069993811 0.067419153 0.059190293 0.072991602 0.07334632 0.084607436 0.119046534 0.049943728 0.01337834 0.011897026
0.005864662 0.008774407 0.00023413 0.00023413 0.00023413 0 0 0 0.000557103 0.010329262 0.045310559 0.047693511 0.059863587 0.063999261 0.050057075 0.019800218 0.005858033 0 0 0 0
0 0 0 0 0 0
1982 1 1 3 0 2 -1 -1 40.0 0 0.012509712 0.038969607 0.093193043 0.124398574 0.160189722 0.136380008 0.066956608 0.036793993 0.051707373 0.053790001 0.009619453 0.030483778 0
0.009141072 0.009141072 0 0.000699384 0 0 0 0.003750265 0.012882527 0.015666803 0.043747685 0.02500972 0.031607407 0.018931115 0.01044001 0.003991068 0 0 0 0 0 0 0 0 0 0
1983 1 1 3 0 2 -1 -1 40.0 0 0.01926718 0.109635254 0.136972446 0.161227685 0.085226544 0.052443709 0.044306675 0.021325408 0.017824325 0.036620831 0.038943158 0.019579944
0.014001155 0.010940847 0.008422366 0.013676059 0.005470424 0.002735212 0.002843577 0 0.004908855 0.034006453 0.060702445 0.077084684 0.014604098 0.001643053 0 0 0.005587612 0 0
0 0 0 0 0 0 0 0

1984 1 1 3 0 2 -1 -1 33.9 0 0 0.036025544 0.120691126 0.205723659 0.195994048 0.080291529 0.048373013 0.022136789 0.015551624 0.009605419 0.018134869 0.01333085 0.001251173
0.001251173 0.001251173 0.001251173 0 0.00E+00 0 0 0 0.003277179 0.030123953 0.034160295 0.094055209 0.052029531 0.003157329 0.005700359 0 0.006632983 0 0 0 0 0 0 0 0 0
1985 1 1 3 0 2 -1 -1 31.2 0 0.000298442 0.001987681 0.040266078 0.101435357 0.235397499 0.28549755 0.078193054 0.076501121 0.040042177 0.015636681 0.008692065 0.015636681 0
0.007910621 0.00018456 0 0 0 0 0 0.000298442 0.000298442 0.015860582 0.015149817 0.015263699 0.044298886 0.000596884 0.00055368 0 0 0 0 0 0 0 0 0 0
1986 1 1 3 0 2 -1 -1 40.0 0 0.003131076 0.025630353 0.068767155 0.106038917 0.146744688 0.15963359 0.156209909 0.083834838 0.053998121 0.043001166 0.018085335 0.006186117
0.011920448 0.018312428 0.00430184 0.004539594 0.006395238 0 0 0 0.005372104 0.004577363 0.01264405 0.018918589 0.024507474 0.004485753 0.006036146 0.006427093 0 0.00026961
3.10042E-05 0 0 0 0 0 0 0 0
1987 1 1 3 0 2 -1 -1 40.0 0 0.008008495 0.046026893 0.084541681 0.126700838 0.171608157 0.136863551 0.103892467 0.102368503 0.040526178 0.014946603 0.005422533 0.000826192
0.002510307 0.000778998 0.003096766 0.003567064 0 0.000778998 0 0 0.006975622 0.020496225 0.008001659 0.044379211 0.032795377 0.022623806 0.005563232 0.005472926 0.000843368 0 0
0 0.000384348 0 0 0 0 0 0
1988 1 1 3 0 2 -1 -1 40.0 0 0.031461304 0.143703543 0.063950551 0.097407275 0.101245268 0.07905152 0.094056031 0.058183815 0.044969992 0.022374834 0.012568141 0.007242449
0.000171169 0 0 0 0.005165158 0.002760466 0 0 0.019556469 0.049873815 0.05041191 0.032731189 0.008245977 0.004712567 0.004432702 0.004154582 0.029627873 0.00798535 0.015970701 0 0
0.00798535 0 0 0 0 0
1989 1 1 3 0 2 -1 -1 40.0 0 0.00438203 0.119850817 0.308531241 0.160874677 0.074930028 0.047520555 0.024461295 0.021788907 0.017132945 0.007788129 0.000398926 0.007637376 0
0.001433006 0.000379793 0.000345031 0 0.001433006 0 0 0.001444961 0.06636062 0.076382447 0.024314279 0.019148552 0.01004375 0.000268011 0.00101337 0 0.00134598 0 0.000790268 0 0 0
0 0 0 0
1990 1 1 3 0 2 -1 -1 40.0 0 0.012735386 0.041192816 0.17936064 0.1666164 0.08829784 0.072300378 0.049076648 0.032136199 0.020732015 0.036305249 0.003702667 0.002966772 0.000104005 0
0 0 0 0 0 0.005861697 0.040707867 0.105617182 0.065616985 0.026057341 0.025919138 0.004247243 0.012543125 0 0.007902405 0 0 0 0 0 0 0 0 0
1991 1 1 3 0 2 -1 -1 40.0 0 0.033978925 0.081646227 0.119145743 0.198796205 0.157053846 0.099018027 0.056862363 0.032448742 0.028190025 0.010605135 0.013072406 0.00600988 0
0.007223898 0 0.001177783 0.002355567 0 0 0 0.026909853 0.018198879 0.031780812 0.028880766 0.01803825 0.015154818 0.008202836 0.005042711 0 0.000206305 0 0 0 0 0 0 0 0
1992 1 1 3 0 2 -1 -1 40.0 0 0.174545732 0.141631532 0.118847697 0.08471211 0.071157023 0.083169424 0.041690113 0.026168794 0.010159997 0.01511247 0.009142544 0.00045196 0.003998033
0.008222562 0.000692762 0.000117528 0.000117528 0 0 0 0.073907669 0.071856319 0.017431569 0.012555422 0.013709238 0.005386803 0.007817122 8.52498E-05 0.007312801 0 0 0 0 0 0 0 0 0
1993 1 1 3 0 2 -1 -1 40.0 0 0.115904949 0.173321339 0.099808484 0.102417754 0.070684752 0.134930006 0.032190892 0.009603728 0.073164131 0.004309527 0.015265726 0.006342657
0.001722002 0.004568442 0.000487329 0.001264005 0 0 0 0 0.050118204 0.050526469 0.040459262 0.005636169 0.001660381 0.003626994 0.001337019 0.000649777 0 0 0 0 0 0 0 0 0 0
1994 1 1 3 0 2 -1 -1 40.0 0 0.107436681 0.307512726 0.194312593 0.094545405 0.038646301 0.019124911 0.024868623 0.011072403 0.006379807 0.001531115 0.002731525 0.000551815
0.001267983 0.00394701 0.000275908 0 0.000154992 0 0 0 0.024139059 0.091469083 0.047061823 0.012829561 0.001856329 0.003545312 0.004144914 0 0 0.000297061 0 0 0 0.000297061 0 0 0 0
0
1995 1 1 3 0 2 -1 -1 40.0 0 0.020855938 0.186631402 0.346820219 0.143670099 0.055176057 0.017753033 0.003888755 0.007216244 0.002702272 0.003355004 0.002427255 0 0.000212006
0.000764918 0.005834658 0.000143364 0 0.00E+00 0 0 0.008916665 0.051895815 0.106864094 0.027857337 0.002375977 0.002324269 0.001459598 0 0 0 0.000855021 0 0 0 0 0 0 0
1996 1 1 3 0 2 -1 -1 40.0 0 0.057656682 0.124272217 0.266098901 0.276199336 0.05842101 0.043081862 0.026935931 0.011673259 0.00765892 0.008377882 0 0 0.000146652 0.009967668 0 0 0 0
0 0.011215279 0.038182338 0.02544157 0.017995599 0.011076331 0 0.002756044 0.001159518 0 0.001683 0 0 0 0 0 0 0 0
1997 1 1 3 0 2 -1 -1 40.0 0 0.027943356 0.164570217 0.200047866 0.15880798 0.134765534 0.040889581 0.031650072 0.019976674 0.033161279 0.024193226 0.00134466 0.001993163
0.003397766 0.007539747 0.001993163 0 0.001993163 0 0 0 0.013625481 0.067975335 0.022301909 0.022612928 0.010704626 0.006015221 0.001346798 0.000381302 0 0.000768953 0 0 0 0 0 0 0
0
1998 1 1 3 0 2 -1 -1 40.0 0 0.022571578 0.224078633 0.269319671 0.154833462 0.080761094 0.040775873 0.017793558 0.006973829 0.00449362 0.000770763 0.001291276 0.003484523 0
0.000770763 0 0.001478371 0 0 0 0 0.00520524 0.063695051 0.045437909 0.018198033 0.018884286 0.013479797 0.002572789 0.001245003 0 0 0.00188488 0 0 0 0 0 0 0
1999 1 1 3 0 2 -1 -1 40.0 0 0.010735673 0.087086226 0.246760247 0.223243455 0.104572668 0.064114745 0.048535482 0.026961615 0.006548026 0.002267982 0 0.000850155 0.001284383 0 0 0 0
0 0 0 0.004877356 0.031622519 0.045780185 0.040668634 0.015301976 0.020681676 0.00743565 0.003741394 0.002867282 0.002031174 0 0 0 0 0.002031497 0 0 0 0
2000 1 1 3 0 2 -1 -1 31.0 0 0.003312198 0.057174317 0.136052656 0.272972728 0.146809557 0.063522878 0.034794558 0.030235539 0.015478467 0.003989225 0.008744508 0.0048401 0
0.002845487 0 0 0 0 0 0 0.013087343 0.023209794 0.106994324 0.053986903 0.01045394 0.008649991 0.002845487 0 0 0 0 0 0 0 0 0 0
2001 1 1 3 0 2 -1 -1 40.0 0 0.030990492 0.078880433 0.151138149 0.141684561 0.15465605 0.098778973 0.027077623 0.025856518 0.015439547 0.003379184 0.002575701 0.003379184 0 0 0 0 0
0 0 0.013815632 0.014871391 0.068850873 0.06235235 0.048272112 0.027560033 0.016944226 0.010813348 0.00268362 0 0 0 0 0 0 0 0 0
2002 1 1 3 0 2 -1 -1 40.0 0 0.020643537 0.135452478 0.138246818 0.098044234 0.090768969 0.059515129 0.050170547 0.021561314 0.02609329 0.003934479 0.00196724 0.00196724 0 0 0 0 0 0
0 0.031179337 0.069312086 0.068583265 0.061816348 0.018065704 0.044048329 0.014953709 0.015397012 0.013429772 0.007424582 0.007424582 0 0 0 0 0 0 0
2003 1 1 3 0 2 -1 -1 40.0 0.0000000000 0.0166880616 0.1309370988 0.2464698331 0.1283697047 0.0577663671 0.0436456996 0.0166880616
0.0179717587 0.0077021823 0.0154043646 0.0051347882 0.0064184852 0.0012836970 0.0000000000 0.0000000000
0.0012836970 0.0000000000 0.0000000000 0.0000000000 0.0000000000 0.0141206675 0.0693196406 0.1219512195
0.0487804878 0.0256739409 0.0038510911 0.0128369705 0.0025673941 0.0025673941 0.0025673941 0.0000000000
0.0000000000 0.0000000000 0.0000000000 0.0000000000 0.0000000000 0.0000000000 0.0000000000 0.0000000000
2004 1 1 3 0 2 -1 -1 40.0 0.0000000000 0.0132450331 0.0838852097 0.2582781457 0.1236203091 0.0529801325 0.0242825607 0.0110375276
0.0022075055 0.0044150110 0.0022075055 0.0000000000 0.0000000000 0.0000000000 0.0000000000 0.0000000000
0.0000000000 0.0000000000 0.0000000000 0.0000000000 0.0000000000 0.0110375276 0.0485651214 0.1258278146

0.1479028698 0.0529801325 0.0110375276 0.0066225166 0.0000000000 0.0088300221 0.0066225166 0.0022075055
0.0022075055 0.0000000000 0.0000000000 0.0000000000 0.0000000000 0.0000000000 0.0000000000 0.0000000000
#Rec_Age Comps
1980 1 2 3 0 2 -1 -1 22.6 0 0.004424779 0.022123894 0.022123894 0.017699115 0.030973451 0.048672566 0.008849558 0.013274336 0.013274336 0.008849558 0 0.004424779 0.013274336
0.004424779 0 0 0 0 0 0 0.008849558 0.079646018 0.146017699 0.172566372 0.14159292 0.137168142 0.048672566 0.039823009 0.008849558 0.004424779 0 0 0 0 0 0 0 0 0
1986 1 2 3 0 2 -1 -1 34.1 0 0.002932551 0.014662757 0.055718475 0.061583578 0.052785924 0.061583578 0.061583578 0.049853372 0.032258065 0.026392962 0.017595308 0.011730205
0.008797654 0.008797654 0.002932551 0.005865103 0.005865103 0.002932551 0 0 0.005865103 0.052785924 0.099706745 0.058651026 0.041055718 0.052785924 0.06744868 0.04398827
0.029325513 0.017595308 0.020527859 0.005865103 0.005865103 0.005865103 0.002932551 0 0.002932551 0.002932551 0
1987 1 2 3 0 2 -1 -1 27.4 0 0.018248175 0.018248175 0.062043796 0.076642336 0.03649635 0.032846715 0.03649635 0.018248175 0.01459854 0.003649635 0 0.00729927 0.003649635 0.003649635
0 0 0 0 0.003649635 0 0.091240876 0.113138686 0.109489051 0.109489051 0.072992701 0.072992701 0.04379562 0.01459854 0.01459854 0 0.01459854 0.00729927 0 0 0 0 0 0 0
1988 1 2 3 0 2 -1 -1 25.0 0.004 0.044 0.112 0.044 0.024 0.008 0.004 0 0 0.004 0 0 0 0 0 0 0 0 0 0 0 0.216 0.372 0.08 0.056 0.02 0.004 0.004 0.004 0 0 0 0 0 0 0 0 0 0 0
1989 1 2 3 0 2 -1 -1 22.7 0 0.013215859 0.044052863 0.061674009 0.039647577 0.030837004 0.039647577 0.013215859 0.013215859 0 0.004405286 0 0 0 0 0 0 0 0 0 0.044052863 0.193832599
0.220264317 0.123348018 0.057268722 0.035242291 0.030837004 0.017621145 0.008810573 0.004405286 0.004405286 0 0 0 0 0 0 0 0
1990 1 2 3 0 2 -1 -1 20.7 0.004830918 0.019323671 0.028985507 0.06763285 0.062801932 0.033816425 0.009661836 0 0.009661836 0.004830918 0 0 0 0 0 0 0 0 0 0 0.033816425 0.1352657
0.241545894 0.236714976 0.072463768 0.019323671 0.014492754 0 0 0 0 0 0 0.004830918 0 0 0 0 0
1991 1 2 3 0 2 -1 -1 24.7 0 0.004048583 0.064777328 0.04048583 0.032388664 0.076923077 0.056680162 0.012145749 0.028340081 0.012145749 0.012145749 0.016194332 0.012145749
0.004048583 0.016194332 0.008097166 0.016194332 0 0 0 0 0.028340081 0.113360324 0.109311741 0.068825911 0.125506073 0.028340081 0.064777328 0.012145749 0.012145749 0.012145749
0.004048583 0.004048583 0 0 0 0 0 0.004048583 0
1992 1 2 3 0 2 -1 -1 40.0 0 0.048096192 0.070140281 0.068136273 0.048096192 0.044088176 0.03006012 0.024048096 0.014028056 0.01002004 0.004008016 0.006012024 0.004008016
0.002004008 0.002004008 0 0 0 0 0 0.002004008 0.072144289 0.166332665 0.124248497 0.092184369 0.080160321 0.052104208 0.014028056 0.012024048 0.004008016 0.004008016 0.002004008
0 0 0 0 0 0 0 0
1993 1 2 3 0 2 -1 -1 40.0 0.001886792 0.049056604 0.096226415 0.081132075 0.049056604 0.037735849 0.022641509 0.01509434 0.005660377 0.00754717 0.001886792 0.001886792 0.001886792
0 0 0.001886792 0 0 0 0 0 0.069811321 0.230188679 0.137735849 0.075471698 0.037735849 0.024528302 0.020754717 0.003773585 0.013207547 0.011320755 0 0 0.001886792 0 0 0 0 0 0
1994 1 2 3 0 2 -1 -1 40.0 0 0.008908686 0.075723831 0.113585746 0.084632517 0.084632517 0.024498886 0.011135857 0.006681514 0.008908686 0.008908686 0.004454343 0.011135857 0 0
0.002227171 0.002227171 0 0 0 0.002227171 0.024498886 0.151447661 0.155902004 0.077951002 0.048997773 0.028953229 0.026726058 0.013363029 0.004454343 0.011135857 0.002227171
0.004454343 0 0 0 0 0 0 0
1995 1 2 3 0 2 -1 -1 40.0 0 0.00466563 0.041990669 0.096423017 0.105754277 0.059097978 0.057542768 0.018662519 0.01244168 0.00622084 0.00466563 0.00155521 0 0.00155521 0.00155521 0
0.00155521 0 0 0 0 0.01399689 0.082426128 0.220839813 0.133748056 0.074650078 0.023328149 0.01244168 0.01088647 0.00622084 0.00155521 0.00155521 0.00155521 0 0 0 0 0 0.00311042 0
1996 1 2 3 0 2 -1 -1 40.0 0 0.006507592 0.097613883 0.143167028 0.117136659 0.069414317 0.047722343 0.015184382 0.013015184 0.006507592 0.004338395 0.002169197 0 0.002169197
0.004338395 0 0 0 0 0 0.006507592 0.086767896 0.110629067 0.121475054 0.078091106 0.028199566 0.023861171 0.002169197 0.002169197 0.006507592 0 0.002169197 0 0.002169197 0 0 0 0 0
1997 1 2 3 0 2 -1 -1 40.0 0 0.006726457 0.087443946 0.107623318 0.091928251 0.085201794 0.029147982 0.020179372 0.00896861 0.004484305 0.002242152 0.002242152 0 0 0 0 0 0 0 0 0
0.013452915 0.098654709 0.17264574 0.109865471 0.067264574 0.056053812 0.004484305 0.013452915 0.006726457 0.00896861 0.002242152 0 0 0 0 0 0 0 0
1998 1 2 3 0 2 -1 -1 40.0 0.002403846 0.007211538 0.067307692 0.146634615 0.127403846 0.079326923 0.067307692 0.024038462 0.019230769 0.002403846 0.002403846 0.007211538 0
0.002403846 0 0 0 0 0 0 0 0.009615385 0.057692308 0.120192308 0.127403846 0.064903846 0.040865385 0.021634615 0 0 0 0 0.002403846 0 0 0 0 0 0 0
1999 1 2 3 0 2 -1 -1 40.0 0 0 0.052545156 0.137931034 0.149425287 0.085385878 0.052545156 0.032840722 0.011494253 0.003284072 0.003284072 0.001642036 0.001642036 0 0.001642036 0 0 0
0 0 0 0 0.047619048 0.128078818 0.123152709 0.087027915 0.042692939 0.02134647 0.009852217 0 0.004926108 0.001642036 0 0 0 0 0 0 0 0
2000 1 2 3 0 2 -1 -1 40.0 0 0.001639344 0.036065574 0.109836066 0.159016393 0.098360656 0.078688525 0.027868852 0.01147541 0.004918033 0.006557377 0 0 0 0 0 0 0 0 0 0.001639344
0.03442623 0.07704918 0.147540984 0.108196721 0.054098361 0.026229508 0.006557377 0.003278689 0.003278689 0.001639344 0.001639344 0 0 0 0 0 0
2001 1 2 3 0 2 -1 -1 40.0 0 0 0.018730489 0.087408949 0.14880333 0.134235172 0.083246618 0.039542144 0.019771072 0.01144641 0.007284079 0.002081165 0.001040583 0 0 0 0 0 0 0 0
0.002081165 0.015608741 0.083246618 0.106139438 0.1144641 0.058272633 0.03433923 0.019771072 0.009365245 0.003121748 0 0 0 0 0 0 0 0 0
2002 1 2 3 0 2 -1 -1 40.0 0 0.000910747 0.053734062 0.160291439 0.146630237 0.094717668 0.073770492 0.035519126 0.014571949 0.014571949 0.010928962 0.000910747 0.000910747
0.000910747 0.000910747 0 0 0 0 0 0 0.028233151 0.100182149 0.118397086 0.06557377 0.044626594 0.02003643 0.006375228 0.003642987 0.003642987 0 0 0 0 0 0 0 0 0
2003 1 2 3 0 2 -1 -1 40.0 0.0000000000 0.0067632850 0.0801932367 0.1777777778 0.1120772947 0.0599033816 0.0357487923 0.0270531401
0.0154589372 0.0057971014 0.0067632850 0.0038647343 0.0000000000 0.0009661836 0.0009661836 0.0000000000
0.0000000000 0.0000000000 0.0000000000 0.0000000000 0.0000000000 0.0048309179 0.0657004831 0.1439613527
0.1091787440 0.0647342995 0.0376811594 0.0299516908 0.0077294686 0.0019323671 0.0000000000 0.0009661836
0.0000000000 0.0000000000 0.0000000000 0.0000000000 0.0000000000 0.0000000000 0.0000000000 0.0000000000
2004 1 2 3 0 2 -1 -1 40.0 0.0000000000 0.0000000000 0.0247349823 0.1537102473 0.1431095406 0.0706713781 0.0388692580 0.0176678445
0.0194346290 0.0000000000 0.0017667845 0.0053003534 0.0000000000 0.0000000000 0.0000000000 0.0000000000
0.0000000000 0.0000000000 0.0000000000 0.0000000000 0.0000000000 0.0000000000 0.0265017668 0.1554770318
0.1749116608 0.0971731449 0.0477031802 0.0106007067 0.0053003534 0.0017667845 0.0035335689 0.0017667845
0.0000000000 0.0000000000 0.0000000000 0.0000000000 0.0000000000 0.0000000000 0.0000000000 0.0000000000

#NMFS Survey Age Comps
1992 1 4 3 0 2 -1 -1 7.4 0.067567568 0.148648649 0.148648649 0.135135135 0.013513514 0.054054054 0.013513514 0 0 0.013513514 0 0 0 0 0 0 0 0.013513514 0 0.054054054 0.202702703 0.027027027 0.027027027 0.013513514 0.054054054 0.013513514 0 0 0 0 0 0 0 0 0 0 0 0
1995 1 4 3 0 2 -1 -1 20.8 0.091346154 0.100961538 0.206730769 0.129807692 0.057692308 0.043269231 0.019230769 0.004807692 0.004807692 0 0 0 0.004807692 0 0 0 0 0 0 0.043269231 0.067307692 0.076923077 0.057692308 0.033653846 0.028846154 0.014423077 0.004807692 0 0 0.004807692 0 0 0 0.004807692 0 0 0 0 0
1998 1 4 3 0 2 -1 -1 36.7 0.114441417 0.100817439 0.119891008 0.111716621 0.108991826 0.089918256 0.049046322 0.013623978 0.002724796 0.002724796 0.002724796 0 0 0 0 0 0 0 0 0.065395095 0.068119891 0.084468665 0.029972752 0.019073569 0.005449591 0.005449591 0.005449591 0 0 0 0 0 0 0 0 0 0 0
2001 1 4 3 0 2 -1 -1 40.0 0.1195511955 0.2107096602 0.1402315543 0.0309798553 0.0209665630 0.0337843188 0.0454866809 0.0322222722
0.0162576739 0.0073745878 0.0039712182 0.0000000000 0.0020728571 0.0000000000 0.0014768564 0.0000000000
0.0000000000 0.0000000000 0.0000000000 0.0000000000 0.0649520542 0.1497722942 0.0849266799 0.0214044940
0.0042836979 0.0025585764 0.0023129119 0.0025889516 0.0012448931 0.0008701533 0.0000000000 0.0000000000
0.0000000000 0.0000000000 0.0000000000 0.0000000000 0.0000000000 0.0000000000 0.0000000000 0.0000000000
2004 1 4 3 0 2 -1 -1 40.0 0.0035952614 0.0628980471 0.0971440942 0.1524476852 0.1472861247 0.0513114833 0.0291076123 0.0193219005
0.0218298424 0.0168063783 0.0140589282 0.0141983541 0.0000000000 0.0011644763 0.0000000000 0.0000000000
0.0000000000 0.0000000000 0.0000000000 0.0000000000 0.0041222304 0.0314111635 0.1033534247 0.1263304322
0.0676519629 0.0187346499 0.0029694938 0.0038425081 0.0095699167 0.0008440299 0.0000000000 0.0000000000
0.0000000000 0.0000000000 0.0000000000 0.0000000000 0.0000000000 0.0000000000 0.0000000000 0.0000000000
#WDFW Tagging Survey Age Comps
1994 1 5 3 0 2 -1 -1 10.0 0 0 0 0.04 0.15 0.02 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0.28 0.42 0.08 0 0.01 0 0 0 0 0 0 0 0 0 0 0 0
1995 1 5 3 0 2 -1 -1 28.1 0 0.106761566 0.053380783 0.046263345 0.017793594 0.003558719 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0.206405694 0.185053381 0.295373665 0.060498221 0.014234875 0.007117438 0 0 0.003558719 0 0 0 0 0 0 0 0 0 0 0
1996 1 5 3 0 2 -1 -1 40.0 0.021526419 0.146771037 0.1037182 0.050880626 0.011741683 0.001956947 0 0 0.001956947 0 0 0 0 0 0 0 0 0 0 0.031311155 0.318982387 0.225048924 0.070450098 0.011741683 0.003913894 0 0 0 0 0 0 0 0 0 0 0 0 0 0
1997 1 5 3 0 2 -1 -1 40.0 0.010040161 0.196787149 0.138554217 0.024096386 0.010040161 0 0.002008032 0 0 0 0 0 0 0 0 0 0 0 0 0.014056225 0.309236948 0.226907631 0.046184739 0.014056225 0.008032129 0 0 0 0 0 0 0 0 0 0 0 0 0 0

0 #_N_MeanSize-at-Age_obs
#Yr Seas Flt/Svy Gender Part Ageerr Ignore datavector(female-male)
samplesize(female-male)

0 #_N_environ_variables
0 #_N_environ_obs

999

ENDDATA

Filename: SS2NAMES.NAM

```
LCNDATA05d.dat
LCNCTL05.CTL
1     #run number
0      # 0=no Parameter read; use the init values in the CTL file; 1=use SS2.PAR
1     #Show_run_progress_on_console_(0/1/2)

1     #Produce_detailed_.rep_file_(0/1)

0     #_N_nudata
5      #_last_phase
Code_version_:_
10      # burn in for mcmc chain
2       # thinning interval for mcmc chain
.000  # jitter initial parm values
0.01  # push initial parm values away from bounds
-1    # min year for spbio sd_report (negative value sets to styr-2; the virgin
level)
-1    # max year for spbio sd_report (negative value sets to endyr+1)
```

Filename: FORECAST.SS2

```
2     # summary age for biomass reporting
1     # 0=skip forecast; 1=normal; 2=force without sdreport required
2     # Do_MSY:  0=skip; 1=calculate; 2=set to Fspr; 3=set to endyear(only
useful if set relative F from endyr)
0.45    # target SPR
12    # number of forecast years
12    # number of forecast years with stddev
10    # emphasis for the forecast recruitment devs that occur prior to endyyr+1
0     # fraction of bias adjustment to use with forecast_recruitment_devs before
endyr+1
0     # fraction of bias adjustment to use with forecast_recruitment_devs after
endyr
0.0   # topend of 40:10 option; set to 0.0 for no 40:10
0.0   # bottomend of 40:10 option
1.0   # OY scalar relative to ABC
1     # for forecast:  1=set relative F from endyr; 2=use relative F read below
# relative Fs used for forecast; rows are seasons; columns are fleets
 # Fleet 1  Fleet 2
0.5   0.5

 # verify end of input harvest rates
 999

 # specified actual catches into the future
 # (negative values are not used, but there must be a sufficient number of
values)
 # fleet1 fleet2
      -1    -1    #year 1     season      1
      -1    -1    #year 2     season      1
      -1    -1    #year 3     season      1
      -1    -1    #year 4     season      1
      -1    -1    #year 5     season      1
      -1    -1    #year 6     season      1
      -1    -1    #year 7     season      1
      -1    -1    #year 8     season      1
      -1    -1    #year 9     season      1
      -1    -1    #year 10    season      1
      -1    -1    #year 11    season      1
      -1    -1    #year 12    season      1
```

Filename: SS2.STD

index	name	value	std dev
1	SR_parm[1]	8.2295e+000	6.0926e-002
2	rec_dev1	4.0448e-001	3.4968e-001
3	rec_dev1	-6.4972e-001	5.5649e-001
4	rec_dev1	1.8346e-001	3.6967e-001
5	rec_dev1	-3.9555e-001	5.1451e-001
6	rec_dev1	-5.2724e-001	4.6657e-001
7	rec_dev1	3.2428e-002	3.9414e-001
8	rec_dev1	1.0130e-001	4.7424e-001
9	rec_dev1	1.0869e+000	2.1447e-001
10	rec_dev1	-3.6691e-001	5.0167e-001
11	rec_dev1	-8.3942e-001	4.8202e-001
12	rec_dev1	-4.2364e-001	2.6594e-001
13	rec_dev1	-5.6783e-001	2.5719e-001
14	rec_dev1	-1.0160e-001	1.7944e-001
15	rec_dev1	-5.1036e-001	2.0569e-001
16	rec_dev1	1.9043e-001	1.1324e-001
17	rec_dev1	-2.0135e+000	3.8910e-001
18	rec_dev1	-7.5233e-001	1.6636e-001
19	rec_dev1	-2.5090e-001	1.3077e-001
20	rec_dev1	-4.0102e-001	1.7001e-001
21	rec_dev1	2.6525e-001	1.2684e-001
22	rec_dev1	3.9293e-001	1.4381e-001
23	rec_dev1	-5.0232e-001	4.1306e-001
24	rec_dev1	7.5193e-001	2.3349e-001
25	rec_dev1	6.8557e-001	2.7234e-001
26	rec_dev1	-9.6639e-002	4.6511e-001
27	rec_dev1	-1.3762e-001	4.6978e-001
28	rec_dev1	8.5178e-001	3.0361e-001
29	rec_dev1	1.7572e+000	3.1580e-001
30	rec_dev1	1.8330e+000	3.0397e-001
31	init_F[1]	3.9449e-003	2.2767e-004
32	init_F[2]	6.9670e-004	7.7643e-005
33	selparm[3]	7.3762e-001	1.6314e-001
34	selparm[4]	4.1939e+000	1.6927e+000
35	selparm[5]	-1.0529e+001	3.8664e+001
36	selparm[6]	-1.0696e+000	1.3400e-001
37	selparm[7]	1.2599e+000	9.6629e-001
38	selparm[11]	-4.9999e-001	1.1698e-001
39	selparm[12]	-6.4613e+000	2.3977e+000
40	selparm[15]	5.7274e-001	5.5487e-001
41	selparm[16]	9.4277e+000	3.0578e+001
42	selparm[17]	-1.0226e+001	3.9672e+001
43	selparm[18]	-2.4105e+000	4.5483e-001
44	selparm[19]	2.1334e-001	9.3221e-002
45	selparm[23]	1.0632e+000	9.5736e-002
46	selparm[27]	4.6271e+000	3.5876e-002
47	selparm[28]	1.6200e-001	2.6107e-001
48	selparm[29]	-3.2613e+000	2.0208e+000
49	selparm[30]	-1.3255e+000	3.8484e-001
50	selparm[31]	9.8950e+000	4.1573e+001
51	selparm[35]	-3.0891e-002	1.3149e-001
52	selparm[39]	-2.5020e+000	1.0955e+001
53	selparm[40]	6.2544e+000	2.5305e+001
54	selparm[41]	-8.2802e+000	4.3552e+001

55	selparm[42]	-2.5929e+000	2.1912e-001
56	selparm[43]	6.8064e-001	3.3308e-001
57	selparm[47]	2.2667e+000	1.0225e-001
58	fore_recruitments	-4.9803e-002	2.9962e-001
59	fore_recruitments	-3.7198e-003	3.1477e-001
60	fore_recruitments	-5.6715e-002	3.0745e-001
61	fore_recruitments	-1.0465e-001	3.0097e-001
62	fore_recruitments	0.0000e+000	1.0000e+000
63	fore_recruitments	0.0000e+000	1.0000e+000
64	fore_recruitments	0.0000e+000	1.0000e+000
65	fore_recruitments	0.0000e+000	1.0000e+000
66	fore_recruitments	0.0000e+000	1.0000e+000
67	fore_recruitments	0.0000e+000	1.0000e+000
68	fore_recruitments	0.0000e+000	1.0000e+000
69	fore_recruitments	0.0000e+000	1.0000e+000
70	fore_recruitments	0.0000e+000	1.0000e+000
71	fore_recruitments	0.0000e+000	1.0000e+000
72	fore_recruitments	0.0000e+000	1.0000e+000
73	fore_recruitments	0.0000e+000	1.0000e+000
74	R0	3.7498e+003	3.7561e+000
75	S0	3.9466e+004	3.7561e+000
76	spbio_std	3.9466e+004	3.7561e+000
77	spbio_std	3.8357e+004	3.7561e+000
78	spbio_std	3.8357e+004	3.7561e+000
79	spbio_std	3.7696e+004	3.7561e+000
80	spbio_std	3.6979e+004	3.7561e+000
81	spbio_std	3.6181e+004	3.7561e+000
82	spbio_std	3.4816e+004	3.7561e+000
83	spbio_std	3.3381e+004	3.7561e+000
84	spbio_std	3.2166e+004	3.7561e+000
85	spbio_std	3.1513e+004	3.7561e+000
86	spbio_std	3.1280e+004	3.7561e+000
87	spbio_std	3.0866e+004	3.7561e+000
88	spbio_std	3.0281e+004	3.7561e+000
89	spbio_std	2.9521e+004	3.7561e+000
90	spbio_std	2.9283e+004	3.7561e+000
91	spbio_std	2.8785e+004	3.7561e+000
92	spbio_std	2.8723e+004	3.7561e+000
93	spbio_std	2.8946e+004	3.7561e+000
94	spbio_std	2.9065e+004	3.7561e+000
95	spbio_std	2.9236e+004	3.7561e+000
96	spbio_std	2.9073e+004	3.7561e+000
97	spbio_std	2.8628e+004	3.7561e+000
98	spbio_std	2.7545e+004	3.7561e+000
99	spbio_std	2.6402e+004	3.7561e+000
100	spbio_std	2.4918e+004	3.7561e+000
101	spbio_std	2.3504e+004	3.7561e+000
102	spbio_std	2.1260e+004	3.7561e+000
103	spbio_std	1.9384e+004	3.7561e+000
104	spbio_std	1.8112e+004	3.7561e+000
105	spbio_std	1.7140e+004	3.7561e+000
106	spbio_std	1.5700e+004	3.7561e+000
107	spbio_std	1.3790e+004	3.7561e+000
108	spbio_std	1.1454e+004	3.7561e+000
109	spbio_std	1.0562e+004	3.7561e+000
110	spbio_std	9.5239e+003	3.7561e+000
111	spbio_std	8.6149e+003	3.7561e+000

112	spbio_std	7.2956e+003	3.7561e+000
113	spbio_std	6.3284e+003	3.7561e+000
114	spbio_std	4.7957e+003	3.7561e+000
115	spbio_std	4.2661e+003	3.7561e+000
116	spbio_std	3.8638e+003	3.7561e+000
117	spbio_std	3.9241e+003	3.7561e+000
118	spbio_std	4.4488e+003	3.7561e+000
119	spbio_std	5.0338e+003	3.7561e+000
120	spbio_std	5.8857e+003	3.7561e+000
121	spbio_std	7.2455e+003	3.7561e+000
122	spbio_std	8.6752e+003	3.7561e+000
123	spbio_std	1.0702e+004	3.7561e+000
124	spbio_std	1.3758e+004	3.7561e+000
125	spbio_std	1.8370e+004	3.7561e+000
126	spbio_std	2.4077e+004	3.7561e+000
127	spbio_std	2.9416e+004	3.7561e+000
128	recr_std	3.7498e+003	3.7561e+000
129	recr_std	3.7498e+003	3.7561e+000
130	recr_std	3.7468e+003	3.7561e+000
131	recr_std	3.7449e+003	3.7561e+000
132	recr_std	3.7428e+003	3.7561e+000
133	recr_std	3.7404e+003	3.7561e+000
134	recr_std	3.7360e+003	3.7561e+000
135	recr_std	3.7309e+003	3.7561e+000
136	recr_std	3.7263e+003	3.7561e+000
137	recr_std	3.7237e+003	3.7561e+000
138	recr_std	3.7228e+003	3.7561e+000
139	recr_std	3.7210e+003	3.7561e+000
140	recr_std	3.7185e+003	3.7561e+000
141	recr_std	3.7151e+003	3.7561e+000
142	recr_std	3.7140e+003	3.7561e+000
143	recr_std	3.7116e+003	3.7561e+000
144	recr_std	3.7113e+003	3.7561e+000
145	recr_std	3.7124e+003	3.7561e+000
146	recr_std	3.3747e+003	3.7561e+000
147	recr_std	1.1762e+003	3.7561e+000
148	recr_std	2.7055e+003	3.7561e+000
149	recr_std	1.5154e+003	3.7561e+000
150	recr_std	1.3265e+003	3.7561e+000
151	recr_std	2.3175e+003	3.7561e+000
152	recr_std	2.4767e+003	3.7561e+000
153	recr_std	6.6186e+003	3.7561e+000
154	recr_std	1.5392e+003	3.7561e+000
155	recr_std	9.5497e+002	3.7561e+000
156	recr_std	1.4417e+003	3.7561e+000
157	recr_std	1.2440e+003	3.7561e+000
158	recr_std	1.9717e+003	3.7561e+000
159	recr_std	1.2981e+003	3.7561e+000
160	recr_std	2.5765e+003	3.7561e+000
161	recr_std	2.8221e+002	3.7561e+000
162	recr_std	9.8575e+002	3.7561e+000
163	recr_std	1.6096e+003	3.7561e+000
164	recr_std	1.3568e+003	3.7561e+000
165	recr_std	2.5887e+003	3.7561e+000
166	recr_std	2.8057e+003	3.7561e+000
167	recr_std	1.1197e+003	3.7561e+000
168	recr_std	3.8411e+003	3.7561e+000

169	recr_std	3.6070e+003	3.7561e+000
170	recr_std	1.6944e+003	3.7561e+000
171	recr_std	1.6655e+003	3.7561e+000
172	recr_std	4.6015e+003	3.7561e+000
173	recr_std	1.1733e+004	3.7561e+000
174	recr_std	1.2945e+004	3.7561e+000
175	recr_std	3.3198e+003	3.7561e+000
176	recr_std	3.5516e+003	3.7561e+000
177	recr_std	3.4335e+003	3.7561e+000
178	recr_std	3.3183e+003	3.7561e+000
179	recr_std	3.7146e+003	3.7561e+000
180	depletion	6.1008e-001	3.7561e+000
181	depletion	7.4534e-001	3.7561e+000
182	depletion	2.6631e+003	3.7561e+000
183	depletion	1.7140e+004	3.7561e+000
184	depletion	4.5000e-001	3.7561e+000
185	depletion	2.9416e+004	3.7561e+000
186	depletion	3.7146e+003	3.7561e+000
187	depletion	7.4534e-001	3.7561e+000
188	depletion	-1.#INDe+000	3.7561e+000
189	depletion	-1.#INDe+000	3.7561e+000
190	depletion	-1.#INDe+000	3.7561e+000
191	depletion	-1.#INDe+000	3.7561e+000
192	depletion	-1.#INDe+000	3.7561e+000
193	depletion	-1.#INDe+000	3.7561e+000
194	depletion	-1.#INDe+000	3.7561e+000
195	depletion	-1.#INDe+000	3.7561e+000
196	depletion	-1.#INDe+000	3.7561e+000
197	depletion	-1.#INDe+000	3.7561e+000
198	depletion	-1.#INDe+000	3.7561e+000
199	depletion	-1.#INDe+000	3.7561e+000
200	depletion	-1.#INDe+000	3.7561e+000
201	depletion	-1.#INDe+000	3.7561e+000
202	depletion	-1.#INDe+000	3.7561e+000
203	depletion	-1.#INDe+000	3.7561e+000
204	depletion	-1.#INDe+000	3.7561e+000
205	depletion	-1.#INDe+000	3.7561e+000
206	depletion	-1.#INDe+000	3.7561e+000
207	depletion	-1.#INDe+000	3.7561e+000
208	depletion	-1.#INDe+000	3.7561e+000
209	depletion	-1.#INDe+000	3.7561e+000
210	depletion	-1.#INDe+000	3.7561e+000
211	depletion	-1.#INDe+000	3.7561e+000
212	depletion	-1.#INDe+000	3.7561e+000
213	depletion	-1.#INDe+000	3.7561e+000
214	depletion	-1.#INDe+000	3.7561e+000
215	depletion	-1.#INDe+000	3.7561e+000
216	depletion	-1.#INDe+000	3.7561e+000
217	depletion	-1.#INDe+000	3.7561e+000
218	depletion	-1.#INDe+000	3.7561e+000
219	depletion	-1.#INDe+000	3.7561e+000
220	depletion	-1.#INDe+000	3.7561e+000
221	depletion	-1.#INDe+000	3.7561e+000
222	depletion	-1.#INDe+000	3.7561e+000
223	depletion	-1.#INDe+000	3.7561e+000
224	depletion	-1.#INDe+000	3.7561e+000
225	depletion	-1.#INDe+000	3.7561e+000

226	depletion	-1.#INDe+000	3.7561e+000
227	depletion	-1.#INDe+000	3.7561e+000
228	depletion	-1.#INDe+000	3.7561e+000
229	depletion	-1.#INDe+000	3.7561e+000
230	depletion	-1.#INDe+000	3.7561e+000
231	depletion	-1.#INDe+000	3.7561e+000
232	depletion	-1.#INDe+000	3.7561e+000
233	depletion	-1.#INDe+000	3.7561e+000
234	depletion	-1.#INDe+000	3.7561e+000
235	depletion	-1.#INDe+000	3.7561e+000
236	depletion	-1.#INDe+000	3.7561e+000
237	depletion	-1.#INDe+000	3.7561e+000
238	depletion	-1.#INDe+000	3.7561e+000
239	depletion	-1.#INDe+000	3.7561e+000
240	depletion	-1.#INDe+000	3.7561e+000
241	depletion	-1.#INDe+000	3.7561e+000
242	depletion	-1.#INDe+000	3.7561e+000
243	depletion	-1.#INDe+000	3.7561e+000
244	depletion	-1.#INDe+000	3.7561e+000

Appendix II. Southern Area (LCS) Base Model Output.

Assessment of Lingcod for the Pacific Fishery Management Council in 2005

Table 1. Negative log likelihood and lambda (likelihood weighting factor) values for the southern area (LCS) base model.

Component	-Log(L)	Lambda
Total Likelihood	**168.74**	
Indices	**21.72**	
Trawl Logbook	7.50	1
NMFS Trawl Survey	14.22	1
Discard	**0.00**	
Age_comps	**140.07**	
Commercial Fishery	78.74	1
Recreational	47.09	1
NMFS Trawl Survey	14.23	1
Size-at-age	**0.00**	
Equil_catch	**0.00**	1
Recruitment	**6.71**	1
Parm_priors	**0.02**	1
Parm_devs	**0.00**	1
Penalties	**0.00**	0.000
Forecast_Recruitment	**0.22**	0

Table 2. Parameters used in the southern area (LCS) base model; mortality-growth and biology.

Parameter Name	Value	Min	Max	Active_Cnt	Bound
M-G_parms					
Females					
M-Young	0.18				
M-Old	0				
Lmin	35.1				
Lmax	107.9				
VBK	0.1449				
CV-Young	0.0699				
CV-Old	-0.13116				
Males					
M-Young	0.5754				
M-Old	0				
Lmin	-0.02482				
Lmax	-0.28624				
VBK	0.43216				
CV-Young	-0.17699				
CV-Old	0.98074				
biology_parms					
Females					
Wt-Len a	1.76E-06				
Wt-Len b	3.3978				
Mat-Len 1	60.6010				
Mat-Len 2	-0.1550				
Males					
Wt-Len a	3.95E-06				
Wt-Len b	3.2149				

Table 3. Parameters used in the southern area (LCS) base model; spawner-recruit, recruitment deviations, and initial F.

Parameter Name		Value	Min	Max	Active_Cnt	Bound
SR_parms						
LN(R0)		7.82528	1	100	1	0
H		0.9				
SD-r		1				
Init_R_Mult		0				
Recr_Devs						
	1976	0.981304			2	0
	1977	-0.298281			3	0
	1978	-0.187007			4	0
	1979	1.31782			5	0
	1980	-0.050209			6	0
	1981	-0.912532			7	0
	1982	-1.09592			8	0
	1983	-0.435261			9	0
	1984	1.34793			10	0
	1985	-0.226117			11	0
	1986	1.20906			12	0
	1987	-0.97255			13	0
	1988	-0.851553			14	0
	1989	0.15918			15	0
	1990	0.221584			16	0
	1991	0.436269			17	0
	1992	-0.447594			18	0
	1993	0.221315			19	0
	1994	-0.107363			20	0
	1995	-0.19598			21	0
	1996	0.777998			22	0
	1997	-1.3312			23	0
	1998	-0.3149			24	0
	1999	0.509758			25	0
	2000	0.244251			26	0
init_F_parms						
Com		0.0141265	0	1	27	0
Rec		0.0027733	0	1	28	0

Table 4. Parameters used in the southern area (LCS) base model; selectivity.

Parameter Name	Value	Min	Max	Active_Cnt	Bound
sel_parms					
Com-Fem					
age@peak	5				
sel@minA	0				
asc_infl (logit)	0.309357	-20	20	29	0
asc_slope	12.3414	0.1	20	30	0
sel@maxA (logit)	-9.49234	-20	20	31	0
desc_infl (logit)	-2.8446	-20	20	32	0
desc_slope	1.69115	0	2	33	0
width_of_top	1.5				
Com-Male					
Age_@transition	5				
MinL Offset	0	0	0	0	0
M1 Offset	-0.415637	-10	10	34	0
MaxL Offset	4.13413	-10	10	35	0
Rec-Fem					
age@peak	4				
sel@minA	0				
asc_infl (logit)	4.1625	-10	10	36	0
asc_slope	0.1	0	0	0	0
sel@maxA (logit)	-8.14862	-10	30	37	0
desc_infl (logit)	-1.72958	-10	10	38	0
desc_slope	8.90171	0	20	39	0
width_of_top	1.5				
Rec-Male					
Age_@transition	4				
MinL Offset	0	0	0	0	0
M1 Offset	0	0	0	0	0
MaxL Offset	0	0	0	0	0
NMFS-Female					
age@peak	3				
sel@minA	0				
asc_infl (logit)	-4.92714	-20	20	40	0
asc_slope	0.101	0	0	0	0
sel@maxA (logit)	-8.04143	-20	30	41	0
desc_infl (logit)	-1.33629	-20	30	42	0
desc_slope	9.65261	0	20	43	0
width_of_top	1				
NMFS-Male					
Age_@transition	3				
MinL Offset	0	0	0	0	0
M1 Offset	-0.060557	-10	20	44	0
MaxL Offset	0	0	0	0	0

Figure 1. SS2 output for the southern area (LCS) base model; From the top: recruitment, female spawning biomass, total biomass, and spawner-recruit relationship. Triangular symbols are present assessment estimates; square symbols are 2003 assessment estimates.

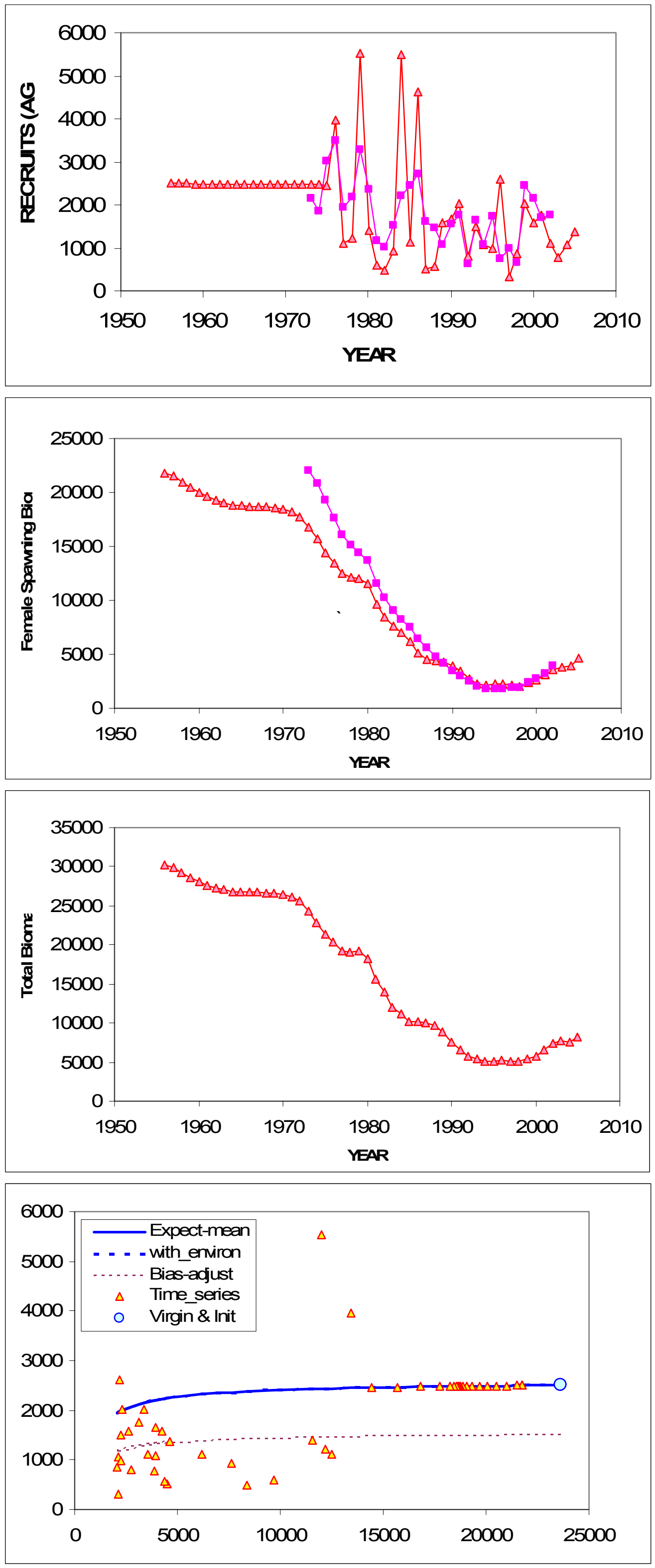
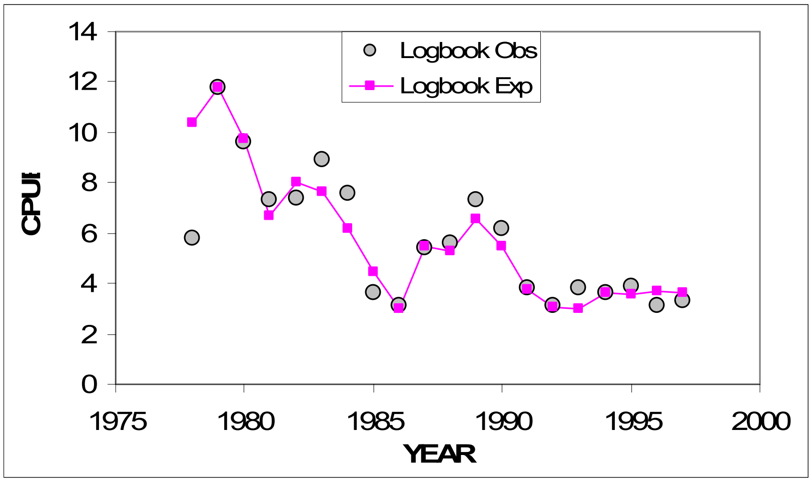


Figure 2. SS2 output for the southern area (LCS) base model: Model fits to indices of abundance; Top; trawl logbook, bottom; NMFS trawl survey.



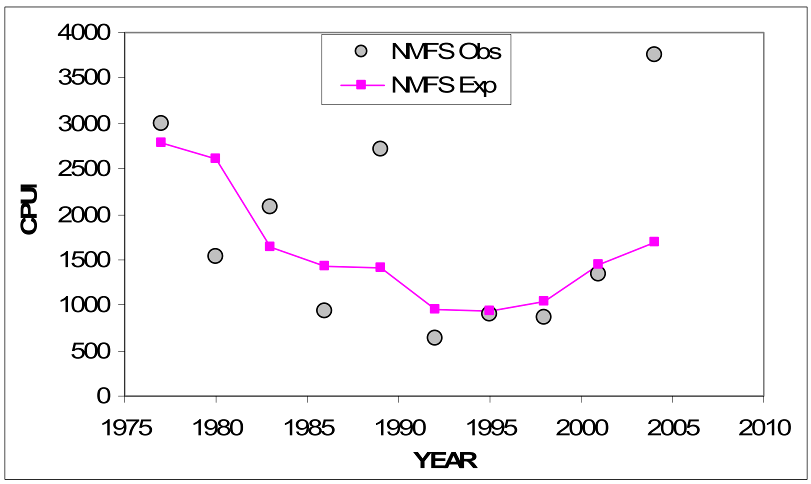


Figure 3. SS2 output for the southern area (LCS) base model: Estimated selectivity for the commercial fishery, recreational fishery, NMFS trawl survey, and WDFW tagging survey.

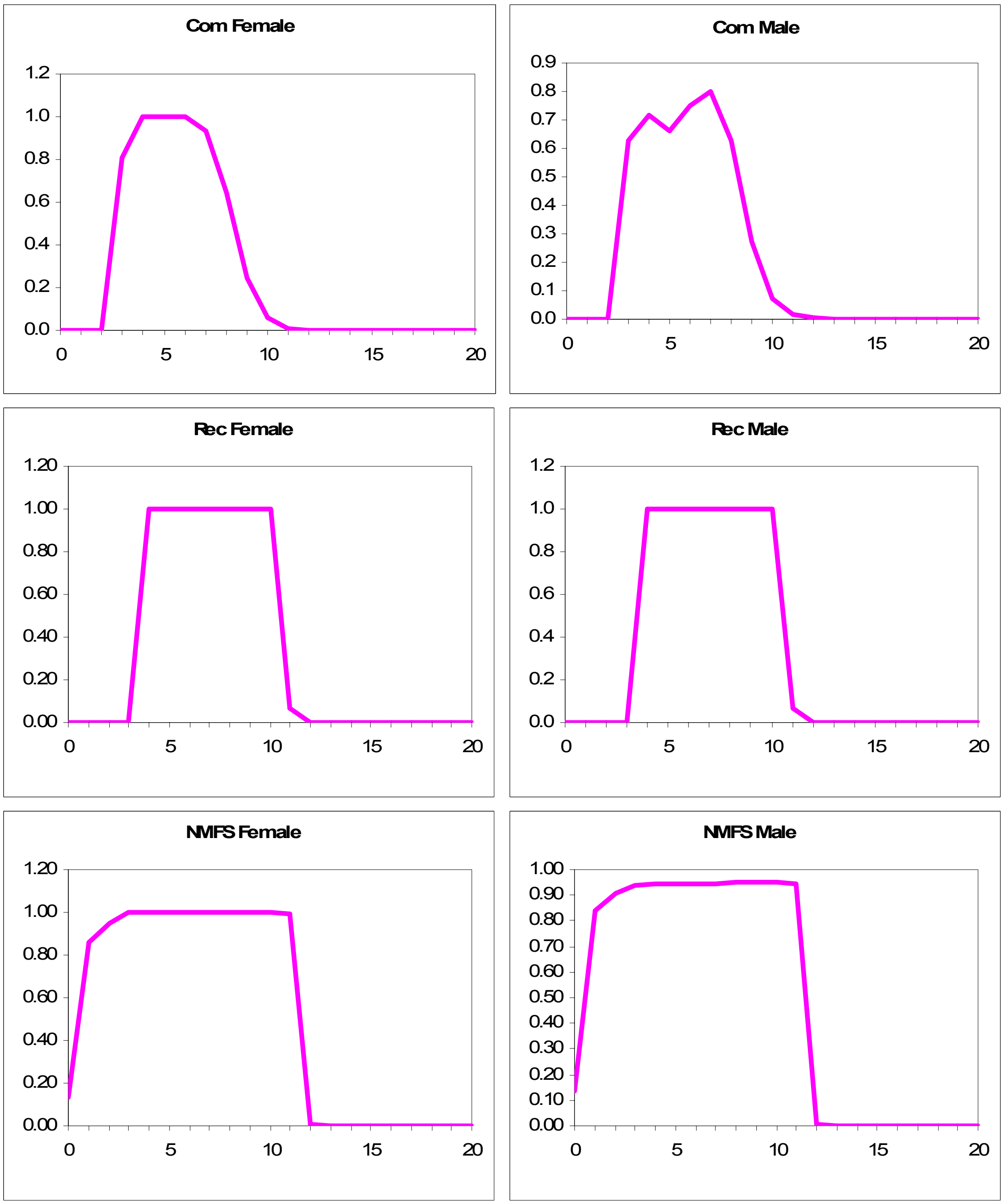
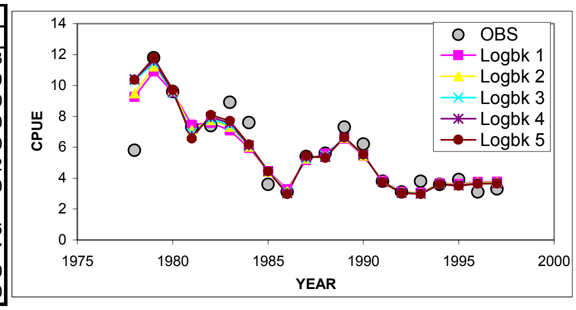
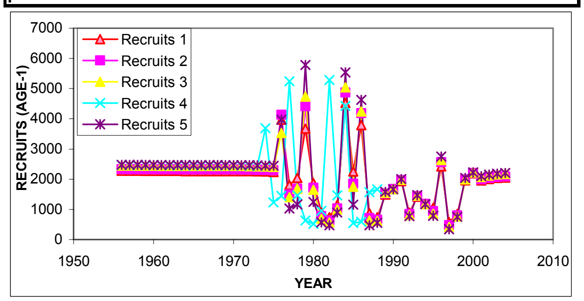
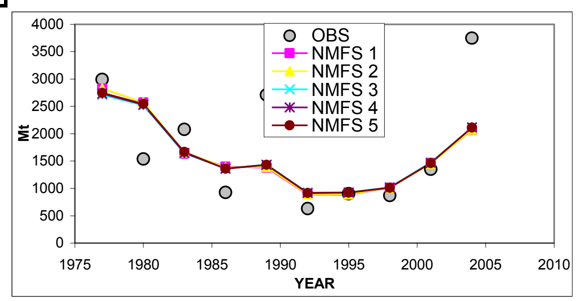


Figure 4. SS2 output for the southern area (LCS) base model: Profile of the base model over the standard deviation of recruitment.; Clockwise from top left: negative log likelihood values, trawl logbook index, NMFS trawl survey, female spawning biomass, recruitment.

SD-r	0.7	0.8	0.9	0.95	1.0
Component	**Run 1**	**Run 2**	**Run 3**	**Run 4**	**Run 5**
total	169.956	169.554	169.732	169.931	170.243
indices	18.9942	18.5505	19.1881	19.1455	19.069
discard	0	0	0	0	0
mean_body_wt	0	0	0	0	0
length_comps	0	0	0	0	0
age_comps	143.52	143.532	143.889	143.911	143.942
size-age	0	0	0	0	0
Equil_catch	1.45E-10	1.69E-10	4.43E-11	6.66E-11	8.2E-11
Recruitment	7.41976	7.45017	6.63348	6.85212	7.20956
Parm_priors	0.021748	0.020426	0.021509	0.022502	0.022647
Parm_devs	0	0	0	0	0
penalties	0	0	0	0	0







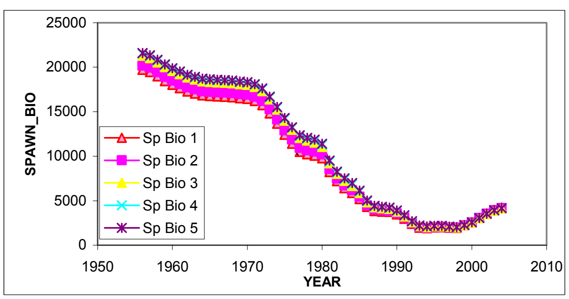
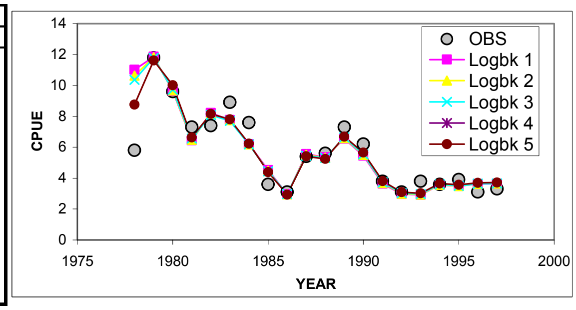
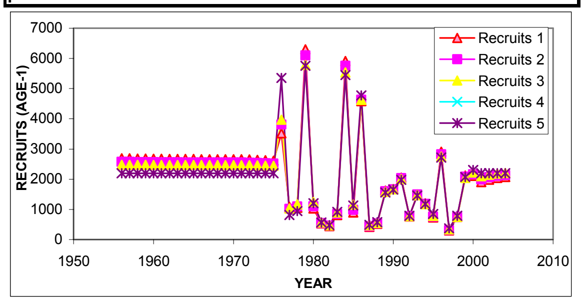
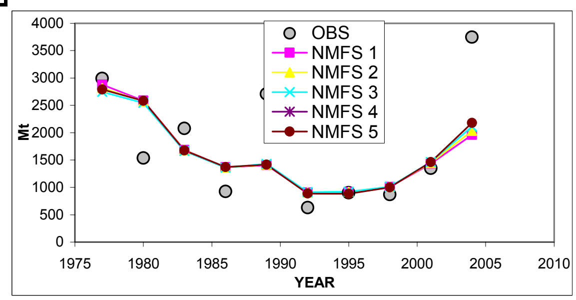


Figure 5. SS2 output for the southern area (LCS) base model: Profile over Beveton-Holt spawner-recruit steepness (*h)*; Clockwise from top left: negative log likelihood values, trawl logbook index, NMFS trawl survey, female spawning biomass, recruitment.

H	0.8	0.85	0.9	0.95	1
Component	**Run 1**	**Run 2**	**Run 3**	**Run 4**	**Run 5**
total	172.7	171.4	170.2		168.1
indices	20.9	19.9	19.1		16.7
discard	0.000	0.000	0.000		0.000
mean_body_wt	0.000	0.000	0.000		0.000
length_comps	0.0	0.0	0.0		0.0
age_comps	143.7	143.7	143.9		143.7
size-age	0.000	0.000	0.000		0.000
Equil_catch	0.000	0.000	0.000		0.000
Recruitment	8.103	7.724	7.210		7.691
Parm_priors	0.023	0.024	0.023		0.021
Parm_devs	0.000	0.000	0.000		0.000
penalties	0.000	0.000	0.000		0.000







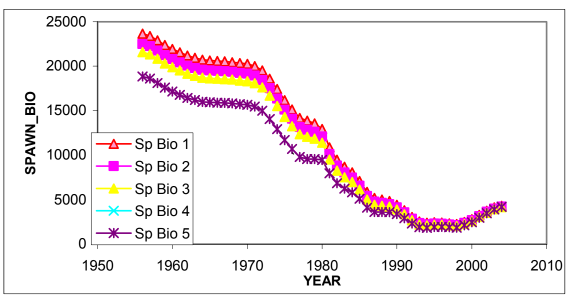
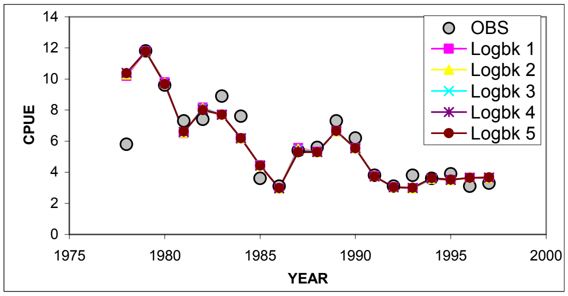
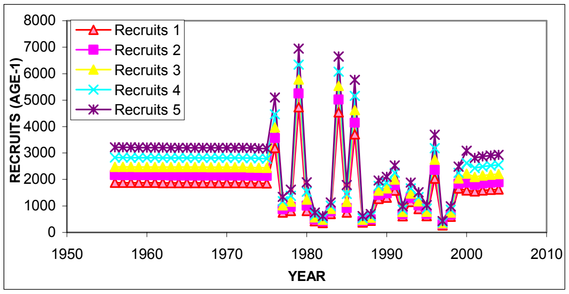
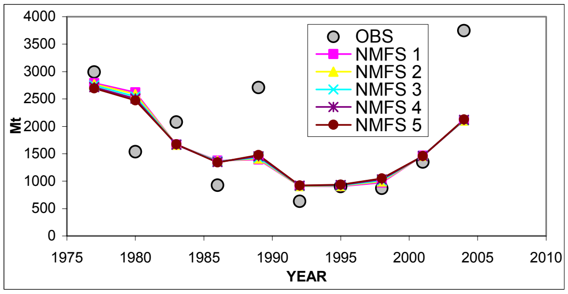


Figure 6. SS2 output for the southern area (LCS) base model: Profile over natural mortality (M); Clockwise from top left: negative log likelihood values, trawl logbook index, NMFS trawl survey, female spawning biomass, recruitment.

M (Fem/Male)	.14/.26	.16/.29	.18/.32	.20/.35	.22/.38
Component	Run 1	Run 2	Run 3	Run 4	Run 5
total	165.988	167.921	170.243	172.943	176.028
indices	19.4506	19.2924	19.069	18.7575	18.4084
discard	0	0	0	0	0
mean_body_wt	0	0	0	0	0
length_comps	0	0	0	0	0
age_comps	138.97	141.218	143.942	147.11	150.658
size-age	0	0	0	0	0
Equil_catch	6.73E-10	9.69E-12	8.2E-11	1.78E-10	1.73E-10
Recruitment	7.54262	7.38731	7.20956	7.05349	6.94112
Parm_priors	0.025065	0.023931	0.022647	0.021433	0.020162
Parm_devs	0	0	0	0	0
penalties	0	0	0	0	0







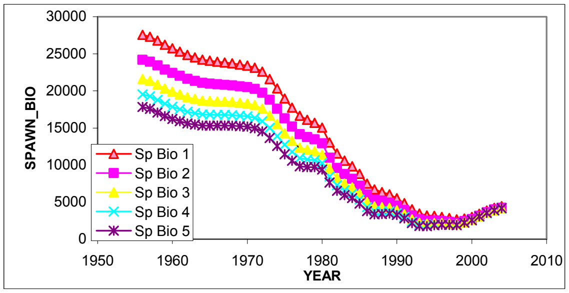
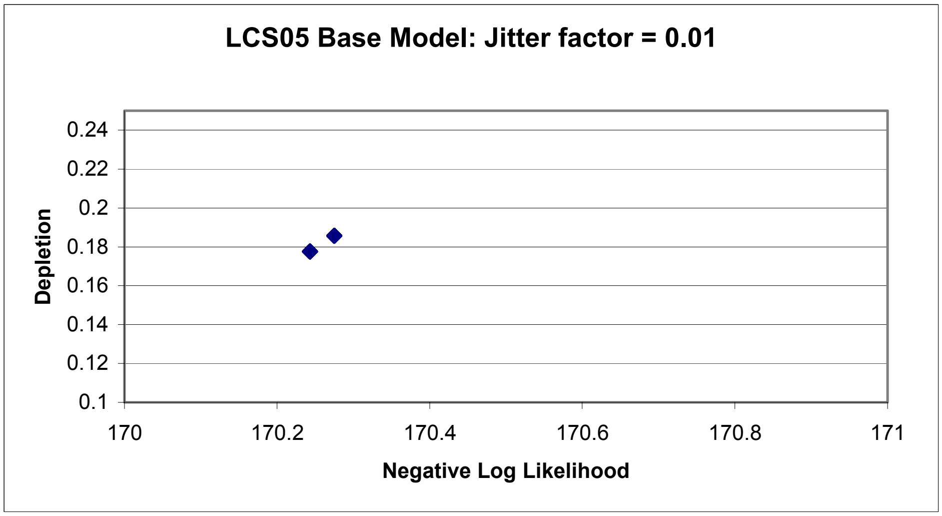
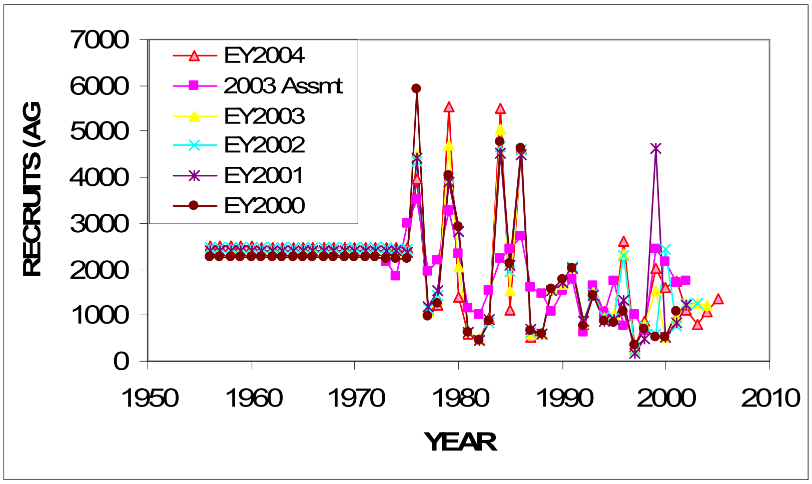


Figure 6a. SS2 output for the southern area (LCS) base model: Model stability test; Results of 30 base-model runs with SS2 jitter factor = 0.01.



Run Number	-Log Likelihood	Depletion
1	170.243	0.17768
2	170.243	0.17768
3	170.243	0.17768
4	170.243	0.17768
5	170.243	0.17768
6	170.243	0.17768
7	170.243	0.17768
8	170.243	0.17768
9	170.243	0.17768
10	170.243	0.17768
11	170.243	0.17768
12	170.243	0.17768
13	170.243	0.17768
14	170.243	0.17768
15	170.243	0.17768
16	170.243	0.17768
17	170.243	0.17768
18	170.275	0.18573
19	170.275	0.18573
20	170.275	0.18573
21	170.275	0.18573
22	170.275	0.18573
23	170.275	0.18573
24	170.275	0.18573
25	170.275	0.18573
26	170.275	0.18573
27	170.275	0.18573
28	170.275	0.18573
29	170.275	0.18573
30	170.275	0.18573

Figure 6b. SS2 output for the southern area (LCS) base model: Retrospective Analysis, obtained by sequentially decrementing end-year from 2004 to 2000; Top: time series of recruitment (number of age 0 fish in thousands), Bottom: time series of spawning biomass (mt).



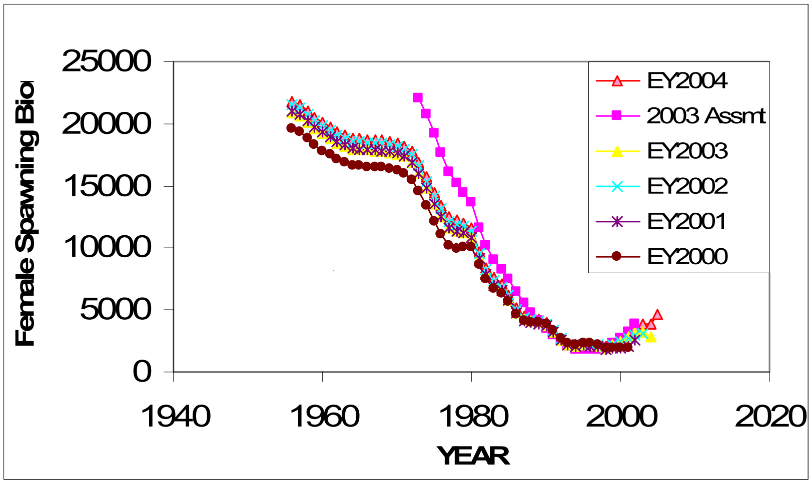


Figure 7. SS2 output for the southern area (LCS) base model: Model fits to commercial fishery catch-at-age.

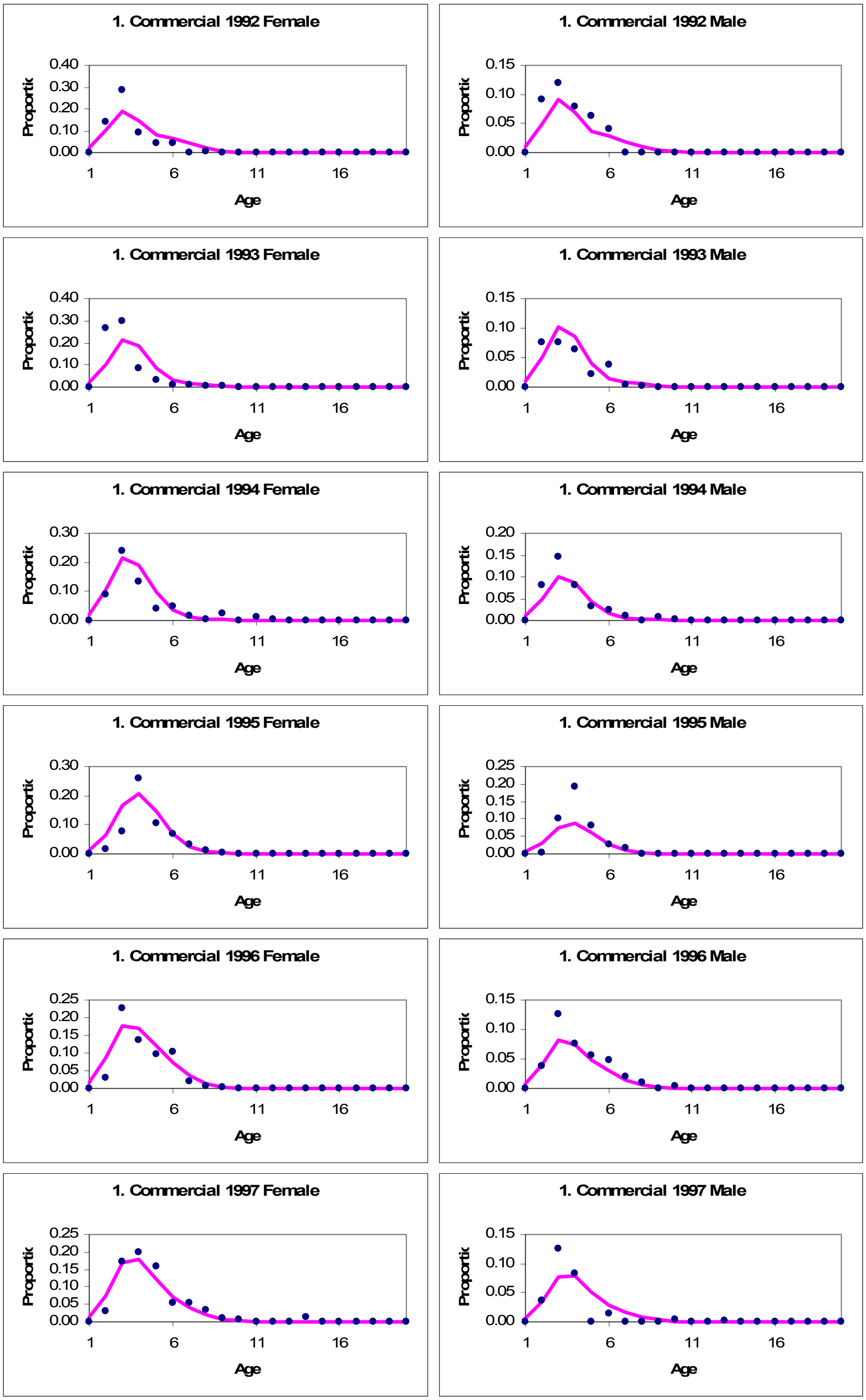


Figure 7, continued. SS2 output for the southern area (LCS) base model: Model fits to commercial fishery catch-at-age.

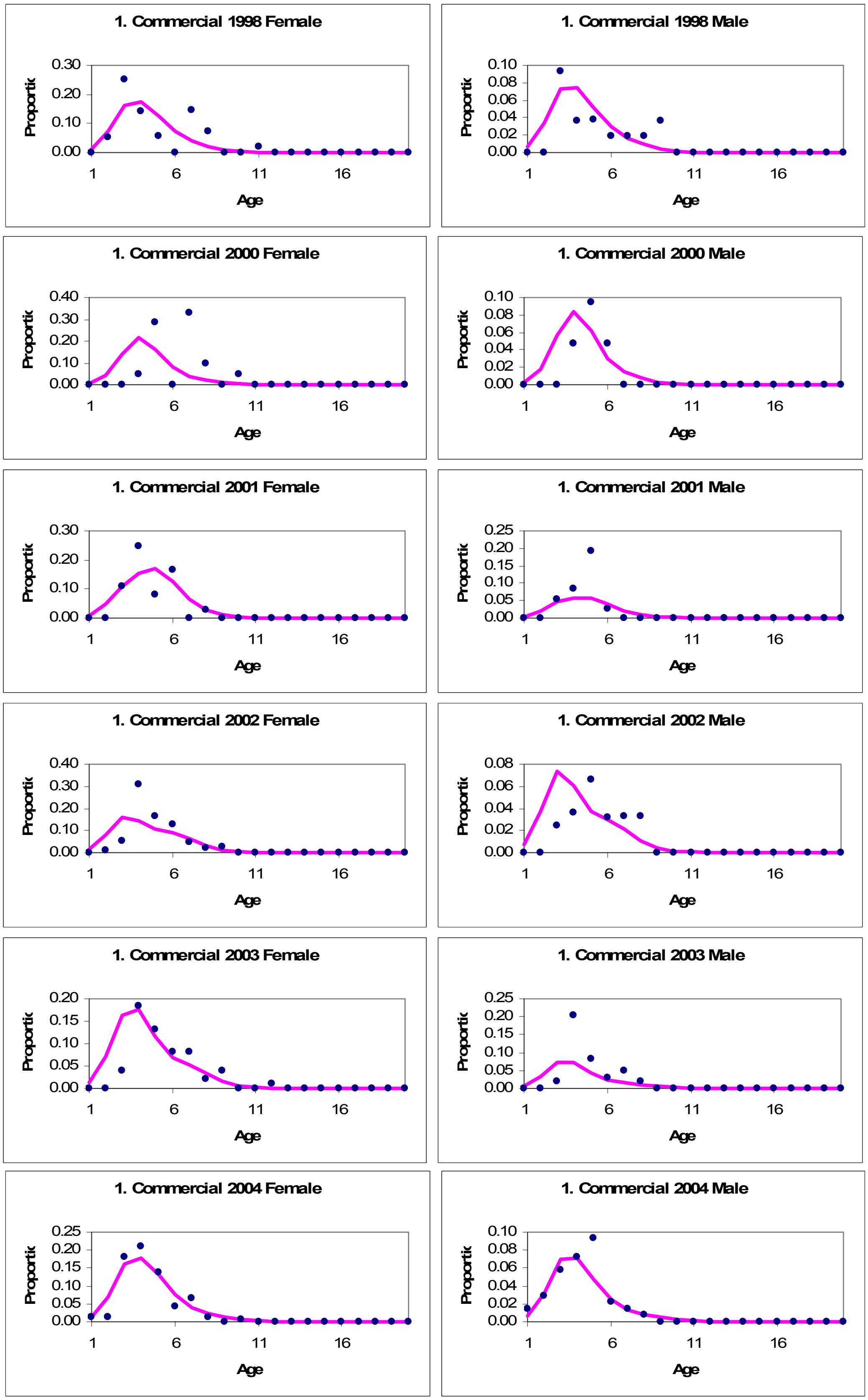


Figure 8. SS2 output for the southern area (LCS) base model: Model fits to recreational fishery catch-at-age.

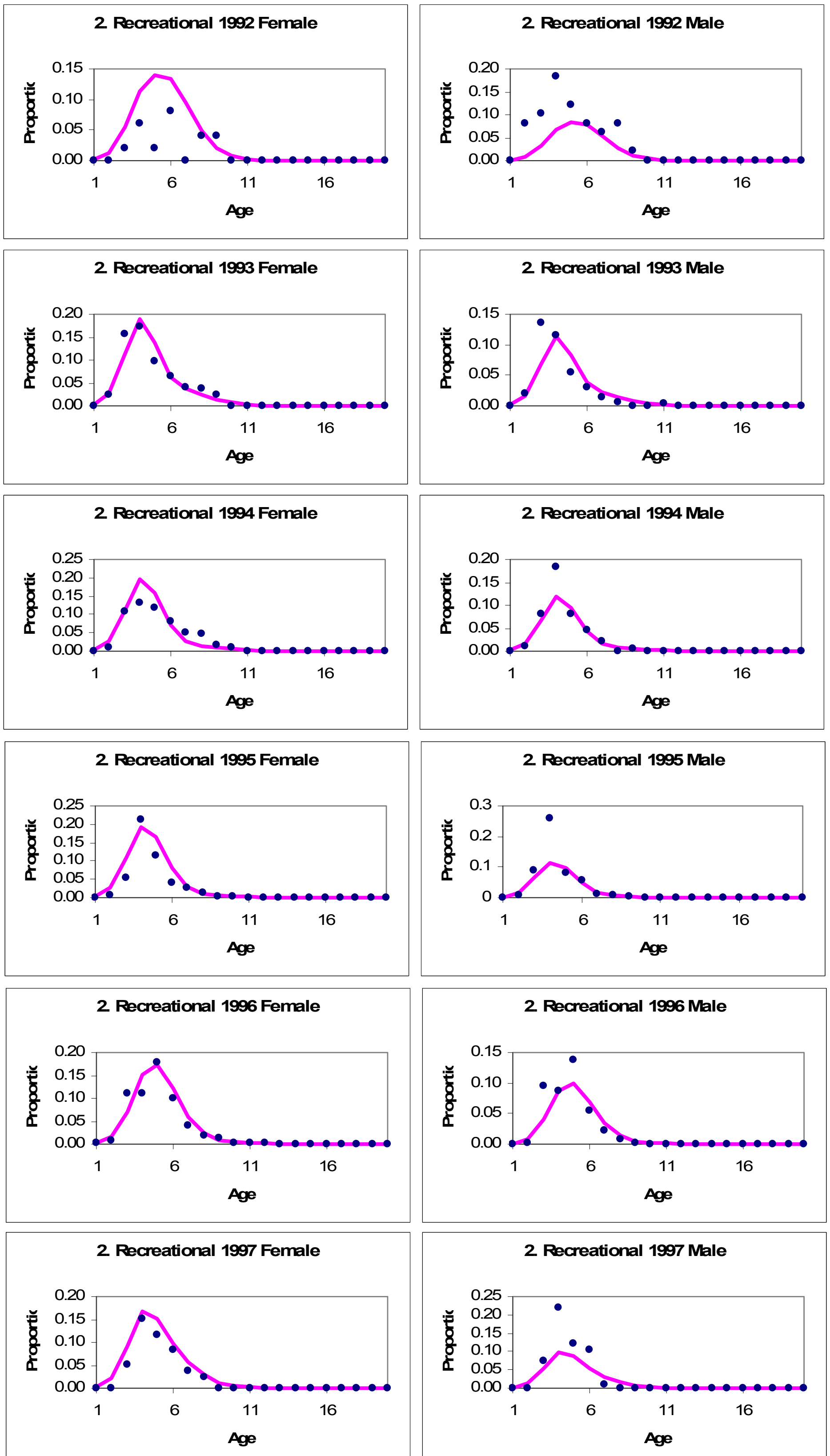


Figure 8, continued. SS2 output for the southern area (LCS) base model: Model fits to recreational fishery catch-at-age.

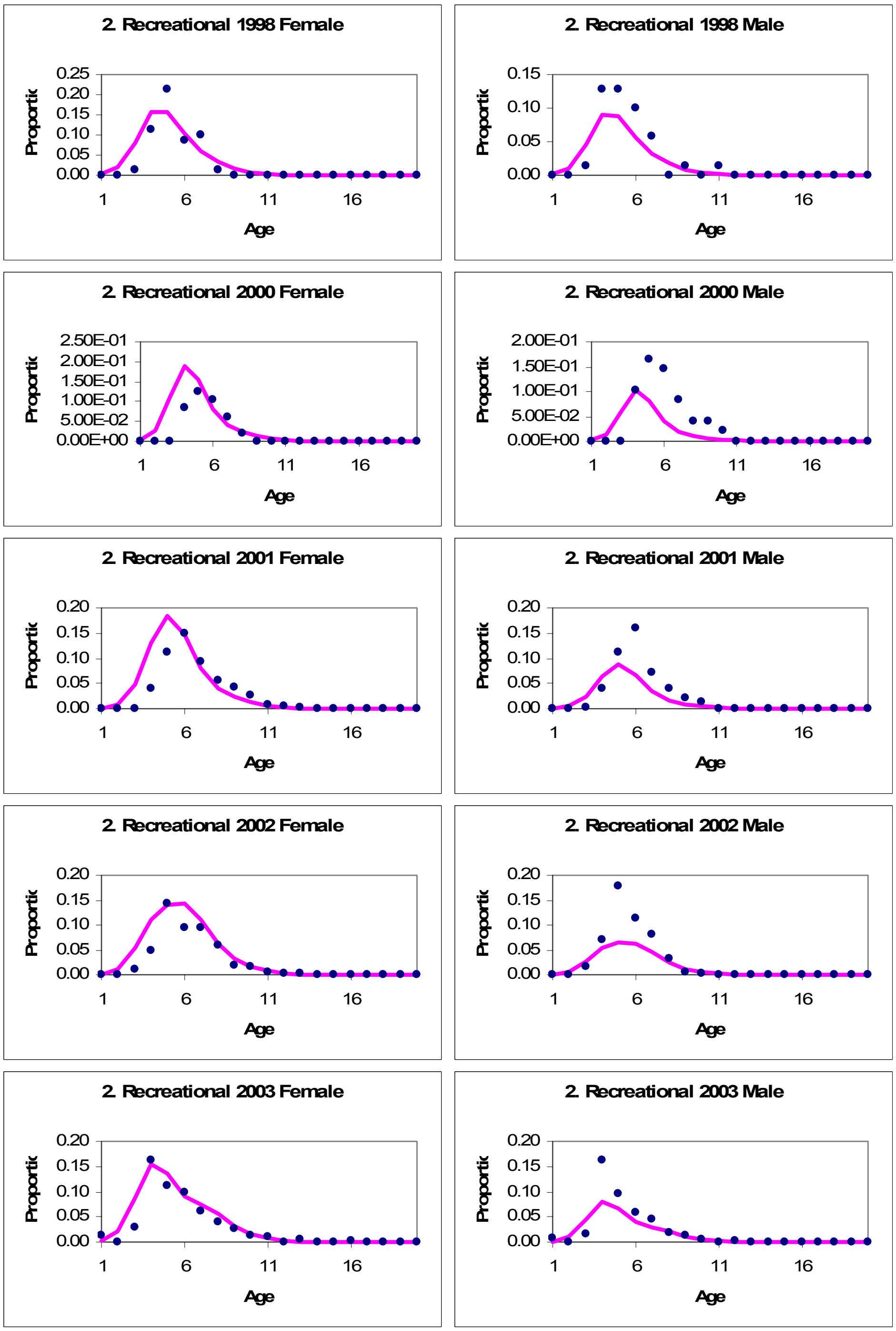
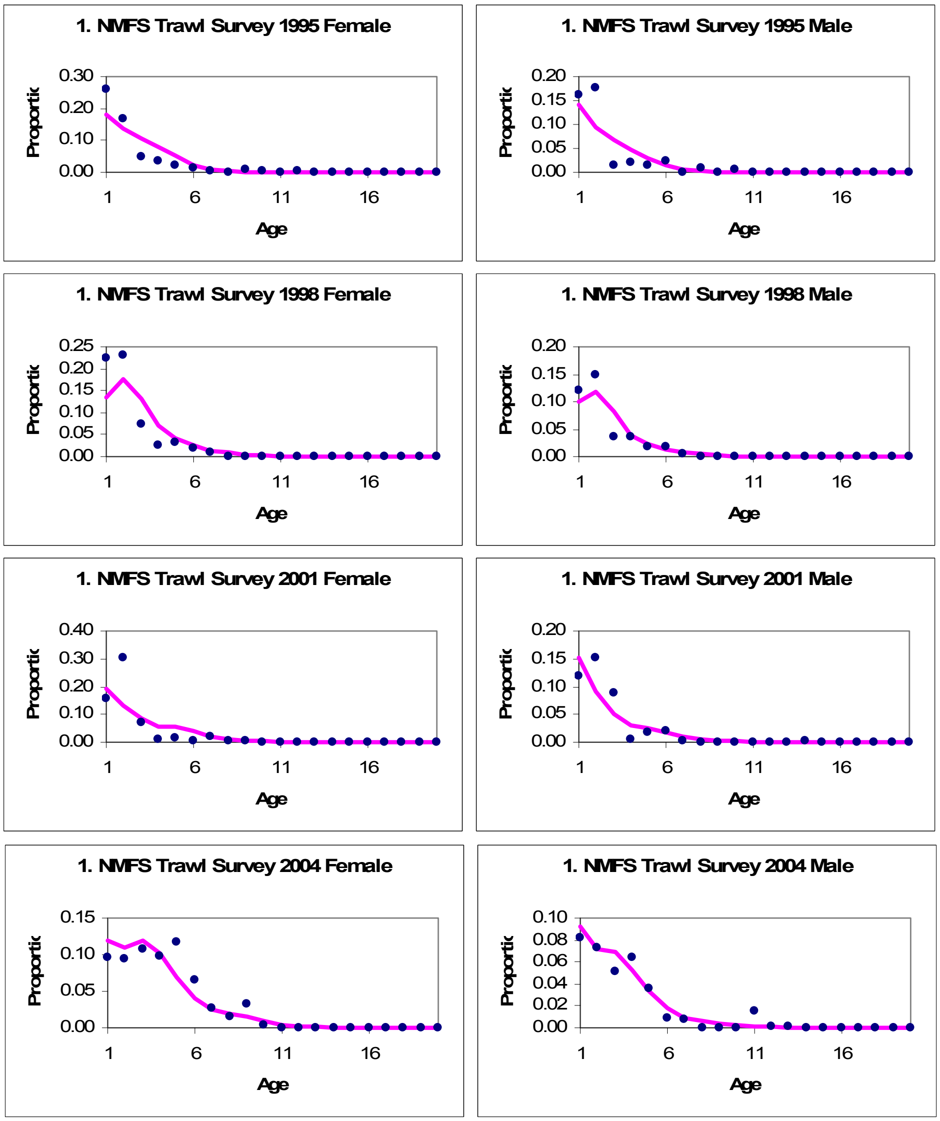


Figure 11. SS2 output for the southern area (LCS) base model: Model fits to NMFS trawl survey catch-at-age.



Filename:LCSCTL05.CTL

```
#  LCSCTL05.ctl: 2005 LCS assessment model
#  datafile:LCSData05.dat
2        #_N_growthmorphs

#_assign_sex_to        each_morph_(1=female;_2=male)
1        2

1        #_N_Areas_(populations)

#_each_fleet/survey_operates_in_just_one_area
#_but_different_fleets/surveys_can        be        assigned_to_share_same_selex(FUTURE_coding)

1        1        1        1        #area_for_each_fleet and each Survey

0 #do_migration_(0/1)
0 #_N_Block_Designs
#_N_Blocks_per_Design(Block_1_always_starts_in_styr)

#Natural_mortality_and_growth_parameters_for_each_morph
2        #_Last_age_for_natmort_young
3        #_First_age_for_natmort_old
1        #_age_for_growth_Lmin
20       #_age_for_growth_Lmax
-4       #_MGparm_dev_phase

#        LO       HI       INIT     PRIOR    PR_type  SD       PHASE    env-variable      use_dev  dev_minyr dev_maxyr
         dev_stddev
# Female natural mortality and growth
         0.05     0.25     0.18     0.0001   0        0.8      -3       0        0        0        0        0.5      0
         0        #M1_natM_young
         -3       3        0        0        0        0.8      -3       0        0        0        0        0.5      0
         0        #M1_natM_old_as_exponential_offset(rel_young)
         10       60       35.1     35       0        10       -2       0        0        0        0        0.5      0
         0        #M1_Lmin
         40       140      107.9    108      0        10       -2       0        0        0        0        0.5      0
         0        #M1_Lmax
         0.01     0.5      0.1449   0.001    0        0.8      -3       0        0        0        0        0.5      0
         0        #M1_VBK
         0.01     0.5      0.0699   0.001    0        0.8      -3       0        0        0        0        0.5      0
         0        #M1_CV-young
         0.01     0.5      -.13116  0        0        0.8      -3       0        0        0        0        0.5      0
         0        #M1_CV-old_as_exponential_offset(rel_young)
# Male natural mortality and growth
         0.01     0.5      0.5754   0.5754   0        0.8      -3       0        0        0        0        0.5      0
         0        #M2_natM_young_as_exponential_offset(rel_morph_1)
         -3       3        0        1.0      0        0.8      -3       0        0        0        0        0.5      0
         0        #M2_natM_old_as_exponential_offset(rel_young)
         -3       3        -.02482  1.0      0        0.8      -3       0        0        0        0        0.5      0
         0        #M2_Lmin_as_exponential_offset
         0        140      -.28624  1.0      0        0.8      -3       0        0        0        0        0.5      0
         0        #M2_Lmax_as_exponential_offset
         0.01     0.5      0.43216  1.0      0        0.8      -3       0        0        0        0        0.5      0
         0        #M2_VBK_as_exponential_offset
         0.01     0.5      -.17699  0        0        0.8      -3       0        0        0        0        0.5      0
         0        #M2_CV-young_as_exponential_offset(rel_CV-young_for_morph_1)
         0.01     0.5      0.98074  0        0        0.8      -3       0        0        0        0        0.5      0
         0        #M2_CV-old_as_exponential_offset(rel_CV-young)

# Add 2+2*gender lines to read the wt-Len and mat-Len parameters
# Female length-weight
         -3       3        0.00000176 0.00000176        0        0.8      -3       0        0        0        0        0.5
         0        0        #Female wt-len-1 a
         -3       3        3.39780  3.39780  0        0.8      -3       0        0        0        0        0.5      0
         0        #Female wt-len-2 b
# Female maturity
         -3       100      60.601   84.6     0        0.8      -3       0        0        0        0        0.5      0
         0        #Female mat-len-1
```

```
	-3	5	-0.155	3.814	0	0.8	-3	0	0	0	0	0.5	0
	0	#Female mat-len-2
# Female fecundity - Same as biomass if intercept = 1 and slope = 0
	-3	3	1.	1.	0	0.8	-3	0	0	0	0	0.5	0
	0	#Female eggs/gm intercept
	-3	3	0.	0.	0	0.8	-3	0	0	0	0	0.5	0
	0	#Female eggs/gm slope
# Male length-weight
	-3	3	0.000003953	0.000003953	0	0.8	-3	0	0	0	0
	0.5	0	0	#Male wt-len-1
	-3	5	3.2149	3.2149	0	0.8	-3	0	0	0	0	0.5	0
	0	#Male wt-len-2

#_allocate_recruits
# pop*gmorph lines For the proportion of each morph in each area
0	1	0.5000	0.2	0	9.8	-3	0	0	0	0	0.5	0	0
	#frac to morph 1 in area 1
0	1	0.5000	0.2	0	9.8	-3	0	0	0	0	0.5	0	0
	#frac to morph 2 in area 1

# pop lines For the proportion assigned to each area
0	1	1	1	0	0.8	-3	0	0	0	0	0.5	0	0
	#frac to area 1

0 #_custom-env_read

#_	0=read_one_setup_and_apply_to_all_env_fxns;	1=read_a_setup_line_for_each_MGparm_with_Env-var>0


0 #_custom-block_read
#_	0=read_one_setup_and_apply_to_all_MG-blocks;	1=read_a_setup_line_for_each_block	x	MGparm_with_block>0

# LO	HI	INIT	PRIOR	Pr_type	SD	PHASE
#-10	10	0.0	0	0	4	4

#_Spawner-Recruitment_parameters

1	# SR_fxn:  1=Beverton-Holt

#LO	HI	INIT	PRIOR	Pr_type	SD	PHASE
1	100	7.825	7.6497	0	99	1	#Ln(R0)
0.2	5	0.90	0.9	0	99	-4	#steepness
0	20	1.0	0.5	0	99	-3	#SD_recruitments
-5	5	0	0	0	99	-3	#Env_link
-5	5	0	0	0	99	-5	#_ln(init_eq_R_multiplier)

0	#env-var_for_link

#	recruitment_residuals
#	start_rec_year	end_rec_year	Lower_limit	Upper_limit	phase
	1976	2000	-15	15	1

#init_F_setupforeachfleet
#LO	HI	INIT	PRIOR	PR_type	SD	PHASE
0	1	0.0141	0.09	0	99	 1
0	1	0.0027	0.09	0	99	 1

#_Qsetup
#_add_parm_row_for_each_positive_entry_below(row_then_column)

#-Float(0/1)	#Do-power(0/1)	#Do-env(0/1)	#Do-dev(0/1)  #env-Var	#Num/Bio(0/1)	for	each
	fleet	and	survey
0	0	0	0	0	1 #Com_1
0	0	0	0	0	1 #Rec_2
0	0	0	0	0	1 #Logbk_3
0	0	0	0	0	1 #NMFS_4

#	LO	HI	INIT	PRIOR	PR_type	SD	PHASE	env-variable
#_SELEX_&_RETENTION_PARAMETERS
```

```
#Selex_type	Do_retention(0/1)	Do_male	Mirrored_selex_number

#Length Selectivity
0	0	0	0	#Com_1
0	0	0	0	#Rec_2
0	0	0	0	#Logbk_3
0	0	0	0	#NMFS_4
#_Age	selectivity

18	0	1	0	#Com_1
18	0	1	0	#Rec_2
15	0	0	1	#Logbk_3
18	0	1	0	#NMFS_4

# 1-8 Com_1 Age Selex for Females
#LO	HI	INIT	PRIOR	PR_type	SD	PHASE	env-variable		use_dev	dev_minyr
1	20	5	0.001	0	99	-3	0	0	0	0	0.5	0	0
	# age@peak - fem
0	2	0	1	0	99	-3	0	0	0	0	0.5	0	0
	# sel@minA
-20	20	0.309	0	0	99	2	0	0	0	0	0.5	0	0
	# asc_infl (logit)
0.1	20	12.341	0.001	0	99	5	0	0	0	0	0.5	0	0
	# asc_slope
-20	20	-9.49	-5	0	99	4	0	0	0	0	0.5	0	0
	# sel@maxA (logit)
-20	20	-2.84	-1.5	0	99	4	0	0	0	0	0.5	0	0
	# desc_infl (logit)
0	2	1.69	0.5	0	99	4	0	0	0	0	0.5	0	0
	# desc_slope
0	40	1.5	1	0	99	-4	0	0	0	0	0.5	0	0
	# width_of_top <= ( maxA - p1 )
# 9-12 Com_1 Age Selex for males relative to females
1	10	5	3	0	99	-2	0	0	0	0	0	0	0
	# Age_@transition - male
-10	10	0.0	3.21	0	99	-4	0	0	0	0	0	0	0
	# ln(mal_sel/fem_sel) @ minL
-10	10	-0.415	-0.20	0	99	4	0	0	0	0	0	0	0
	# ln(mal_sel/fem_sel) @ m1
-10	10	4.134	1	0	99	4	0	0	0	0	0	0	0
	# ln(mal_sel/fem_sel) @ maxL

# 13-20 Rec_2 Age Selex for Females
1	20	4	0.001	0	99	-3	0	0	0	0	0	0	0
	# age@peak - fem
0	2	0	1	0	99	-3	0	0	0	0	0	0	0
	# sel@minA
-10	10	4.162	0	0	99	2	0	0	0	0	0	0	0
	# asc_infl (logit)
0.1	10	0.1	0.001	0	99	-3	0	0	0	0	0	0	0
	# asc_slope
-10	30	-8.14	-5	0	99	4	0	0	0	0	0	0	0
	# sel@maxA (logit)
-10	10	-1.72	-1.5	0	99	4	0	0	0	0	0	0	0
	# desc_infl (logit)
0	20	8.901	0.5	0	99	4	0	0	0	0	0	0	0
	# desc_slope
0	40	1.5	1	0	99	-4	0	0	0	0	0	0	0
	# width_of_top <= ( maxA - p1 )
# 21-24 Rec_2 Age Selex for males relative to females
1	10	4	3	0	99	-2	0	0	0	0	0	0	0
	# Age_@transition - male
-10	10	0.00	1	0	99	-4	0	0	0	0	0	0	0
	# ln(mal_sel/fem_sel) @ minL
-10	10	0.00	1	0	99	-4	0	0	0	0	0	0	0
	# ln(mal_sel/fem_sel) @ m1
-10	10	0.00	1	0	99	-4	0	0	0	0	0	0	0
	# ln(mal_sel/fem_sel) @ maxL

# 25-32 NMFS_4 Age Selex for Females
```

```
1	20	3	0.001	0	99	-2	0	0	0	0	0	0	0
	# age@peak - fem
0	2	0.0	1	0	99	-2	0	0	0	0	0	0	0
	# sel@minA
-20	20	-4.92	0	0	99	2	0	0	0	0	0	0	0
	# asc_infl (logit)
0.1	20	0.101	0.001	0	99	-3	0	0	0	0	0	0	0
	# asc_slope
-20	30	-8.04	-5	0	99	4	0	0	0	0	0	0	0
	# sel@maxA (logit)
-20	30	-1.33	-1.5	0	99	4	0	0	0	0	0	0	0
	# desc_infl (logit)
0	20	9.65	0.5	0	99	5	0	0	0	0	0	0	0
	# desc_slope
0	40	1.0	1	0	99	-5	0	0	0	0	0	0	0
	# width_of_top <= ( maxA - p1 )
# 33-36 NMFS_4 Age Selex for males relative to females
1	10	3	3	0	99	-2	0	0	0	0	0	0	0
	# Age_@transition - male
-10	20	0.00	23.0	0	99	-4	0	0	0	0	0	0	0
	# ln(mal_sel/fem_sel) @ minL
-10	20	-0.06	8.76	0	99	4	0	0	0	0	0	0	0
	# ln(mal_sel/fem_sel) @ m1
-10	20	0.00	-0.22	0	99	-4	0	0	0	0	0	0	0
	# ln(mal_sel/fem_sel) @ maxL

#_custom-env_read
0	#_ 0=read_one_setup_and_apply_to_all_env_fxns;  1=read_a_setup_line_for_each_SELparm_with_Env-var>0
#     except read NO setup lines If no SELparms have Env-var>0
# LO	HI	INIT	PRIOR	PR_type	SD	PHASE
# -10	10	0	0	0	4	4	#Env-parm_setup

#_custom-block_read

0	#_	0=read_one_setup_and_apply_to_all;_1=Custom_so_see_detailed_instructions_for_N_rows_in_Custom_setup


#LO	HI	INIT	PRIOR	PR_type	SD	PHASE

# -10	10	0	0	0	4	4

-4	#_phase_for_selex_parm_devs


1	#_max_lambda_phases:_read_this_Number_of_values_for_each_componentxtype_below

0	#_sd_offset - 0 = omit +log(s) term; 1 = include Log(s) term in Like


#_CPUE_lambdas for each fleet and survey
1	1	1	1
#_discard_lambdas
0	0	0	0
#_meanwtlambda(one_for_all_sources)
0
#_lenfreq_lambdas
0	0	0	0
#_age_freq_lambdas
1	1	0	1
#_size@age_lambdas
1	1	0	1
#_initial_equil_catch
1
#_recruitment_lambda
1.0
#_parm_prior_lambda
1
#_parm_dev_timeseries_lambda
1
# crashpen lambda
```

300
#max F
1.0

999 #_end-of-file

Filename: LCSData05d.DAT

```
# LCSData05d.dat 2005 LCS Assessment
#_Number_of_datafiles: 1
#_start_nudata: 1
#_MODEL_DIMENSIONS
1956 #_styr
2004 #_endyr
1 #_nseas

#_vector_with_N_months_in_each_season
12 #_months/season
1 #_spawn_seas
2 #_Nfleet
2 #_Nsurv

# Labels
Comm1%Sport2%logbk3%NMFS4

# Timing within each season, for each fishery and survey
0.5 0.5 0.5 0.5

2 #_Ngenders
40 #_accumulator_age;_model_always_starts_with_age_0
161.4  40.3 #_init_equil_catch_for_each_fishery

#_catch_biomass(mtons):_columns_are_fisheries _rows_are_year*season
 422    113
 744    114
 726    120
 638     94
 593     85
 653     70
 504     76
 514     83
 379     76
 369    100
 363    134
 426    131
 496    128
 505    98
 695    119
 952    179
1472    269
1614.6      403.1
1734.6      399.1
1447.1      429.1
1415.3      422.1
768.6       284.1
914.2       334.2
1433.9      339.7
```

1275.0	2229
1403.7	1173
1598.9	882
1220.7	589
1046.5	514
752.6	981
601.1	950
981.5	969
1141.2	1054
1357.7	980
1187.7	799
844.4	820
676.1	808
778.0	479
691.1	289
705	300
648	391
736	299
349	279
347	375
120	240
151	226
152	608
100	1125
107	188

30 #_N_cpue_and_surveyabundance_observations
#_year seas index obs se(log)
#Logbook GLM

1978	1	3	5.8	.2
1979	1	3	11.8	.2
1980	1	3	9.6	.2
1981	1	3	7.3	.2
1982	1	3	7.4	.2
1983	1	3	8.9	.2
1984	1	3	7.6	.2
1985	1	3	3.6	.2
1986	1	3	3.1	.2
1987	1	3	5.4	.2
1988	1	3	5.6	.2
1989	1	3	7.3	.2
1990	1	3	6.2	.2
1991	1	3	3.8	.2
1992	1	3	3.1	.2
1993	1	3	3.8	.2
1994	1	3	3.6	.2
1995	1	3	3.9	.2
1996	1	3	3.1	.2
1997	1	3	3.3	.2

#NMFS Trawl Survey no water hauls

1977	1	4	2992.9	.14

```
1980	1	4	1537.3	.31
1983	1	4	2078.7	.33
1986	1	4	925.9	.21
1989	1	4	2708.1	.20
1992	1	4	629.7	.25
1995	1	4	901.3	.27
1998	1	4	870.5	.27
2001	1	4	1346.9	.12
2004	1	4	3745.8	.32

2 #_discard_type
0 #_N_discard_obs

0 #_N_meanbodywt_obs

-1 #_comp_tail_compression
0.0001 #_add_to_comp

42 #_N_LengthBins
28 30 32 34 36 38 40 42 44 46 48 50 52 54 56 58 60 62 64 66 68 70 72 74 76 78 80 82 84 86 88 90 92 94 96 98 100 102 104 106 108 110
0 #_N_Length_obs

20 #_N_age_bins
1 2 3 4 5 6 7 8 9 10 11 12 13 14 15 16 17 18 19 20

2	#_N_ageerror_definitions


0.5	1.5	2.5	3.5	4.5	5.5	6.5	7.5	8.5	9.5	10.5	11.5	12.5	13.5	14.5	15.5	16.5	17.5
	18.5	19.5	20.5	21.5	22.5	23.5	24.5	25.5	26.5	27.5	28.5	29.5	30.5	31.5	32.5	33.5	34.5
	35.5	36.5	37.5	38.5	39.5	40.5
0.001	0.001	0.001	0.001	0.001	0.001	0.001	0.001	0.001	0.001	0.001	0.001	0.001	0.001	0.001	0.001	0.001	0.001
	0.001	0.001	0.001	0.001	0.001	0.001	0.001	0.001	0.001	0.001	0.001	0.001	0.001	0.001	0.001	0.001	0.001
	0.001	0.001	0.001	0.001	0.001	0.001
0.5	1.5	2.5	3.5	4.5	5.5	6.5	7.5	8.5	9.5	10.5	11.5	12.5	13.5	14.5	15.5	16.5	17.5
	18.5	19.5	20.5	21.5	22.5	23.5	24.5	25.5	26.5	27.5	28.5	29.5	30.5	31.5	32.5	33.5	34.5
	35.5	36.5	37.5	38.5	39.5	40.5
0.5	0.715501191	0.809263396	0.903025602	0.996787807	1.090550012	1.184312217	1.278074422	1.371836627
	1.465598832	1.559361037	1.653123242	1.746885447	1.840647652	1.934409857	2.028172062	2.121934267
	2.215696472	2.309458677	2.403220882	2.5	2.6	2.7	2.8	2.9	3	3	3	3	3	3
	3	3	3	3	3	3	3	3	3	3

27 #_N_Agecomp_obs
#Yr Seas Flt/Svy Gender Part Ageerr Lbin_lo Lbin_hi Nsamp datavector(female-male)
#Com_1 Age Comps
1992	1	1	3	0	2	-1	-1	28.9	0	0.138317762	0.28910858	0.090998391	0.041160674
	0.040841257	0	0.006096096	0	0	0	0	0	0	0	0	0	0	0	0
	0	0.091871557	0.120138604	0.079297347	0.062521058	0.039648674	0	0	0	0	0	0
	0	0	0	0	0	0	0	0
1993	1	1	3	0	2	-1	-1	40	0	0.267269601	0.30055667	0.083051851	0.033971697
	0.011877766	0.009168764	0.004727982	0.005224045	0	0	0	0	0	0	0	0	0
```

0 0 0 0.076391509 0.076726831 0.064349688 0.022829594 0.037322709 0.00449579 0.001674108
0.000361396 0 0 0 0 0 0 0 0 0 0 0
1994 1 1 3 0 2 -1 -1 40 0 0.088444854 0.241004546 0.135406074 0.040922956
0.046766227 0.016582109 0.005258632 0.023106223 0.000996545 0.011253719 0.002353445 0 0 0
0 0 0 0 0 0 0.082278053 0.146616837 0.080986678 0.031833427 0.024009571
0.012054763 0.000686715 0.006932412 0.002506215 0 0 0 0 0 0 0 0 0
0
1995 1 1 3 0 2 -1 -1 26.7 0 0.01592892 0.079141173 0.260939008 0.107380111
0.067529984 0.033362611 0.013768495 0.003430881 0 0 0 0 0 0 0 0 0
0 0 0 0.001806499 0.101310109 0.193738276 0.07966953 0.026794072 0.01520033 0 0
0 0 0 0 0 0 0 0 0 0 0
1996 1 1 3 0 2 -1 -1 30.2 0 0.028487848 0.225884259 0.13784627 0.096710465
0.103603503 0.019492079 0.005227274 0.003875154 0 0.001287223 0.001287223 0 0 0 0
0 0 0 0 0 0.037511894 0.125536397 0.075487435 0.056077577 0.047979927 0.020727892
0.009102428 0 0.003875154 0 0 0 0 0 0 0 0 0 0
1997 1 1 3 0 2 -1 -1 40 0 0.030948896 0.173091221 0.198439666 0.160048589
0.053162266 0.055330347 0.033254392 0.009197599 0.007545174 0.001324798 0.000627297 0 0.012159748
0 0 0 0 0 0 0 0.035773462 0.12608761 0.0827361 0 0.013403238 0 0
0 0.004579731 0 0 0.002289865 0 0 0 0 0 0
1998 1 1 3 0 2 -1 -1 28.7 0 0.052758094 0.252758094 0.141998981 0.055379556
0 0.144620444 0.072965587 0 0 0.018896762 0 0 0 0 0 0 0
0 0 0 0.093173081 0.036482794 0.037793525 0.018896762 0.018896762 0.018896762 0.036482794
0 0 0 0 0 0 0 0 0 0 0
2000 1 1 3 0 2 -1 -1 6.1 0 0 0 0.047619048 0.285714286 0
0.333333333 0.095238095 0 0.047619048 0 0 0 0 0 0 0 0 0 0
0 0 0 0.047619048 0.095238095 0.047619048 0 0 0 0 0 0 0 0
0 0 0 0 0 0
2001 1 1 3 0 2 -1 -1 26.2 0 0 0.111111111 0.25 0.083333333 0.166666667
0 0.027777778 0 0 0 0 0 0 0 0 0 0 0 0 0 0
0.055555556 0.083333333 0.194444444 0.027777778 0 0 0 0 0 0 0 0 0
0 0 0 0 0
2002 1 1 3 0 2 -1 -1 24.9 0 0.010993236 0.055145899 0.312995002 0.16780332
0.126693506 0.050341298 0.021860565 0.029239599 0 0 0 0 0 0 0 0 0
0 0 0 0 0.024367271 0.036773629 0.066235952 0.031969028 0.032727894 0.032853801 0
0 0 0 0 0 0 0 0 0 0 0
2003 1 1 3 0 2 -1 -1 9.8 0.0000000000 0.0000000000 0.0408163265 0.1836734694
0.1326530612 0.0816326531 0.0816326531 0.0204081633 0.0408163265 0.0000000000 0.0000000000 0.0102040816
0.0000000000 0.0000000000 0.0000000000 0.0000000000 0.0000000000 0.0000000000 0.0000000000 0.0000000000
0.0000000000 0.0000000000 0.0204081633 0.2040816327 0.0816326531 0.0306122449 0.0510204082 0.0204081633
0.0000000000 0.0000000000 0.0000000000 0.0000000000 0.0000000000 0.0000000000 0.0000000000 0.0000000000
0.0000000000 0.0000000000 0.0000000000 0.0000000000
2004 1 1 3 0 2 -1 -1 13.8 0.0144927536 0.0144927536 0.1811594203 0.2101449275
0.1376811594 0.0434782609 0.0652173913 0.0144927536 0.0000000000 0.0072463768 0.0000000000 0.0000000000
0.0000000000 0.0000000000 0.0000000000 0.0000000000 0.0000000000 0.0000000000 0.0000000000 0.0000000000
0.0144927536 0.0289855072 0.0579710145 0.0724637681 0.0942028986 0.0217391304 0.0144927536 0.0072463768
0.0000000000 0.0000000000 0.0000000000 0.0000000000 0.0000000000 0.0000000000 0.0000000000 0.0000000000
0.0000000000 0.0000000000 0.0000000000 0.0000000000

#Rec_Age Comps
1992 1 2 3 0 2 -1 -1 4.9 0 0 0.020408163 0.06122449 0.020408163
0.081632653 0 0.040816327 0.040816327 0 0 0 0 0 0 0 0 0 0

0 0 0.081632653 0.102040816 0.183673469 0.12244898 0.081632653 0.06122449 0.081632653
0.020408163 0 0 0 0 0 0 0 0 0 0 0
1993 1 2 3 0 2 -1 -1 29.4 0 0.023809524 0.156462585 0.173469388 0.098639456
0.06462585 0.040816327 0.037414966 0.023809524 0 0 0 0 0 0 0 0 0
0 0 0 0.020408163 0.136054422 0.115646259 0.054421769 0.030612245 0.013605442 0.006802721
0 0 0.003401361 0 0 0 0 0 0 0 0 0
1994 1 2 3 0 2 -1 -1 19.6 0 0.010204082 0.107142857 0.132653061 0.117346939
0.081632653 0.051020408 0.045918367 0.015306122 0.010204082 0 0 0 0 0 0 0
0 0 0 0 0.010204082 0.081632653 0.183673469 0.081632653 0.045918367 0.020408163 0
0.005102041 0 0 0 0 0 0 0 0 0 0 0
1995 1 2 3 0 2 -1 -1 40 0 0.005714286 0.053333333 0.215238095 0.114285714
0.04 0.028571429 0.013333333 0.001904762 0.001904762 0 0 0 0 0 0 0 0
0 0 0.001904762 0.00952381 0.091428571 0.260952381 0.08 0.055238095 0.013333333 0.007619048
0.003809524 0.001904762 0 0 0 0 0 0 0 0 0 0
1996 1 2 3 0 2 -1 -1 40 0.001834862 0.00733945 0.110091743 0.110091743
0.179816514 0.100917431 0.040366972 0.020183486 0.012844037 0.003669725 0.001834862 0.001834862 0
0 0 0 0 0 0 0 0 0.001834862 0.095412844 0.088073394 0.137614679
0.055045872 0.022018349 0.00733945 0.001834862 0 0 0 0 0 0 0 0 0
0 0
1997 1 2 3 0 2 -1 -1 21.2 0 0 0.051886792 0.150943396 0.117924528
0.08490566 0.037735849 0.023584906 0 0 0 0 0 0 0 0 0 0
0 0 0 0.075471698 0.221698113 0.122641509 0.103773585 0.009433962 0 0 0 0
0 0 0 0 0 0 0 0 0
1998 1 2 3 0 2 -1 -1 7 0 0 0.014285714 0.114285714 0.214285714
0.085714286 0.1 0.014285714 0 0 0 0 0 0 0 0 0 0 0 0
0 0 0.014285714 0.128571429 0.128571429 0.1 0.057142857 0 0.014285714 0 0.014285714
0 0 0 0 0 0 0 0 0
2000 1 2 3 0 2 -1 -1 4.8 0 0 0 0.083333333 0.125 0.104166667 0.0625
0.020833333 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0
0.104166667 0.166666667 0.145833333 0.083333333 0.041666667 0.041666667 0.020833333 0 0 0
0 0 0 0 0 0 0
2001 1 2 3 0 2 -1 -1 39.6 0 0 0 0.04040404 0.113636364 0.148989899
0.093434343 0.055555556 0.042929293 0.027777778 0.007575758 0.005050505 0.002525253 0 0 0
0 0 0 0 0 0 0.002525253 0.04040404 0.111111111 0.161616162 0.073232323
0.04040404 0.02020202 0.012626263 0 0 0 0 0 0 0 0 0 0
2002 1 2 3 0 2 -1 -1 40 0 0 0.009779951 0.048899756 0.144254279
0.095354523 0.095354523 0.058679707 0.019559902 0.017114914 0.004889976 0.002444988 0.002444988 0
0 0 0 0 0 0 0 0 0.017114914 0.070904645 0.178484108 0.114914425
0.080684597 0.031784841 0.004889976 0.002444988 0 0 0 0 0 0 0 0 0
0
2003 1 2 3 0 2 -1 -1 38.3 0.0130548303 0.0000000000 0.0287206266 0.1618798956
0.1122715405 0.0992167102 0.0626631854 0.0391644909 0.0261096606 0.0130548303 0.0104438642 0.0000000000
0.0052219321 0.0000000000 0.0000000000 0.0026109661 0.0000000000 0.0000000000 0.0000000000 0.0000000000
0.0078328982 0.0000000000 0.0156657963 0.1618798956 0.0966057441 0.0600522193 0.0443864230 0.0182767624
0.0130548303 0.0052219321 0.0000000000 0.0026109661 0.0000000000 0.0000000000 0.0000000000 0.0000000000
0.0000000000 0.0000000000 0.0000000000 0.0000000000

#NMFS Survey Age Comps
1995 1 4 3 0 2 -1 -1 20.8 0.259615385 0.168269231 0.048076923 0.033653846
0.024038462 0.014423077 0.004807692 0 0.009615385 0.004807692 0 0.004807692 0 0 0
0 0 0 0 0 0.163461538 0.177884615 0.014423077 0.019230769 0.014423077 0.024038462
0 0.009615385 0 0.004807692 0 0 0 0 0 0 0 0 0 0

1998	1	4	3	0	2	-1	-1	22.1	0.226244344		0.230769231		0.07239819		0.027149321		
	0.031674208		0.018099548		0.009049774		0	0	0	0	0	0	0	0	0	0	0
	0	0	0.122171946		0.149321267		0.036199095		0.036199095		0.018099548		0.018099548		0.004524887		0
	0	0	0	0	0	0	0	0	0	0	0	0					
2001	1	4	3	0	2	-1	-1	19.7	0.1550315536		0.3071227959		0.0695270333		0.0116955992		
	0.0165350909		0.0074985059		0.0192876990		0.0060990609		0.0024551573		0.0000000000		0.0000000000		0.0000000000		
	0.0000000000		0.0000000000		0.0000000000		0.0000000000		0.0000000000		0.0000000000		0.0000000000		0.0000000000		
	0.1184568491		0.1529891059		0.0881653281		0.0047058503		0.0174812273		0.0193949503		0.0016509308		0.0000000000		
	0.0000000000		0.0000000000		0.0000000000		0.0000000000		0.0000000000		0.0019032620		0.0000000000		0.0000000000		
	0.0000000000		0.0000000000		0.0000000000		0.0000000000										
2004	1	4	3	0	2	-1	-1	40	0.0959900982		0.0939041604		0.1072366420		0.0991207996		
	0.1185247500		0.0656817055		0.0269378914		0.0150281895		0.0320462346		0.0036304377		0.0000000000		0.0007720993		
	0.0000000000		0.0000000000		0.0000000000		0.0000000000		0.0000000000		0.0000000000		0.0000000000		0.0000000000		
	0.0826933184		0.0729663276		0.0511899528		0.0639762723		0.0355712194		0.0091741965		0.0072293031		0.0000000000		
	0.0000000000		0.0000000000		0.0151742864		0.0013515478		0.0018005674		0.0000000000		0.0000000000		0.0000000000		
	0.0000000000		0.0000000000		0.0000000000		0.0000000000										

0 #_N_MeanSize-at-Age_obs
#Yr Seas Flt/Svy Gender Part Ageerr Ignore datavector(female-male)
samplesize(female-male)

0 #_N_environ_variables
0 #_N_environ_obs

999

ENDDATA

Filename: FORECAST.SS2

```
2     # summary age for biomass reporting
1     # 0=skip forecast; 1=normal; 2=force without sdreport required
2     # Do_MSY:  0=skip; 1=calculate; 2=set to Fspr; 3=set to endyear(only
useful if set relative F from endyr)
0.45    # target SPR
12    # number of forecast years
12    # number of forecast years with stddev
1     # emphasis for the forecast recruitment devs that occur prior to endyyr+1
1     # fraction of bias adjustment to use with forecast_recruitment_devs before
endyr+1
0     # fraction of bias adjustment to use with forecast_recruitment_devs after
endyr
0.40  # topend of 40:10 option; set to 0.0 for no 40:10
0.10  # bottomend of 40:10 option
1.0   # OY scalar relative to ABC
1     # for forecast:  1=set relative F from endyr; 2=use relative F read below
# relative Fs used for forecast; rows are seasons; columns are fleets
 # Fleet 1  Fleet 2
0.5   0.5

 # verify end of input harvest rates
 999

 # specified actual catches into the future
 # (negative values are not used, but there must be a sufficient number of
values)
 # fleet1 fleet2
      -1    -1    #year 1     season      1
      -1    -1    #year 2     season      1
      -1    -1    #year 3     season      1
      -1    -1    #year 4     season      1
      -1    -1    #year 5     season      1
      -1    -1    #year 6     season      1
      -1    -1    #year 7     season      1
      -1    -1    #year 8     season      1
      -1    -1    #year 9     season      1
      -1    -1    #year 10    season      1
      -1    -1    #year 11    season      1
      -1    -1    #year 12    season      1
```

Filename: SS2NAMES.NAM

```
LCSData05d.dat
LCSCTL05.CTL
1     #run number
0       # 0=no Parameter read; use the init values in the CTL file; 1=use
SS2.PAR
1     #Show_run_progress_on_console_(0/1/2)

1     #Produce_detailed_.rep_file_(0/1)

0     #_N_nudata
5       #_last_phase
Code_version_:_
10      # burn in for mcmc chain
2       # thinning interval for mcmc chain
.000  # jitter initial parm values
0.01  # push initial parm values away from bounds
-1    # min year for spbio sd_report (negative value sets to styr-2; the virgin
level)
-1    # max year for spbio sd_report (negative value sets to endyr+1)
```

Filename: SS2.STD

index	name	value	std dev
1	SR_parm[1]	7.8253e+000	1.0093e-001
2	rec_dev1	9.8130e-001	8.1864e-001
3	rec_dev1	-2.9828e-001	1.4602e+000
4	rec_dev1	-1.8701e-001	1.4076e+000
5	rec_dev1	1.3178e+000	4.6759e-001
6	rec_dev1	-5.0209e-002	1.4008e+000
7	rec_dev1	-9.1253e-001	8.9844e-001
8	rec_dev1	-1.0959e+000	8.4215e-001
9	rec_dev1	-4.3526e-001	9.0183e-001
10	rec_dev1	1.3479e+000	2.6847e-001
11	rec_dev1	-2.2612e-001	1.1936e+000
12	rec_dev1	1.2091e+000	3.3852e-001
13	rec_dev1	-9.7255e-001	8.6134e-001
14	rec_dev1	-8.5155e-001	6.2008e-001
15	rec_dev1	1.5918e-001	2.2141e-001
16	rec_dev1	2.2158e-001	2.4678e-001
17	rec_dev1	4.3627e-001	2.1651e-001
18	rec_dev1	-4.4759e-001	4.3161e-001
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20	rec_dev1	-1.0736e-001	4.2512e-001
21	rec_dev1	-1.9598e-001	5.8690e-001
22	rec_dev1	7.7800e-001	2.6340e-001
23	rec_dev1	-1.3312e+000	7.8255e-001
24	rec_dev1	-3.1490e-001	5.5140e-001
25	rec_dev1	5.0976e-001	4.2892e-001
26	rec_dev1	2.4425e-001	8.1052e-001
27	init_F[1]	1.4126e-002	2.0234e-003
28	init_F[2]	2.7733e-003	3.6353e-004
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31	selparm[5]	-9.4923e+000	4.0978e+001
32	selparm[6]	-2.8446e+000	4.3940e-001
33	selparm[7]	1.6912e+000	4.2936e+000
34	selparm[11]	-4.1564e-001	1.8407e-001
35	selparm[12]	4.1341e+000	8.8068e+000
36	selparm[15]	4.1625e+000	6.9810e+000
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38	selparm[18]	-1.7296e+000	3.7842e-001
39	selparm[19]	8.9017e+000	3.5655e+001
40	selparm[27]	-4.9271e+000	3.8697e+000
41	selparm[29]	-8.0414e+000	4.8745e+001
42	selparm[30]	-1.3363e+000	4.0499e-001
43	selparm[31]	9.6526e+000	4.2159e+001
44	selparm[35]	-6.0557e-002	2.9147e-001
45	fore_recruitments	3.1086e-001	6.9361e-001
46	fore_recruitments	-1.7140e-001	7.3566e-001
47	fore_recruitments	-5.2324e-001	7.0640e-001
48	fore_recruitments	-2.1473e-001	9.6298e-001
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66	spbio_std	2.1500e+004	2.3789e+003
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98	spbio_std	4.2702e+003	8.0337e+002
99	spbio_std	3.9342e+003	6.6318e+002
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LINGCOD

STAR Panel Report

Alaska Fisheries Science Center
Seattle, Washington
September 26-30, 2005

STAR Panel members:

Steven Berkeley, University of California Santa Cruz, SSC
Martin Dorn (Chair), Alaska Fisheries Science Center, SSC
Ray Conser, Southwest Fisheries Science Center, SSC
Owen Hamel, Northwest Fisheries Science Center, SSC
Robert Mohn (Rapporteur), Center for Independent Experts
Kevin Piner, Southwest Fisheries Science Center
Stephen Ralston, Southwest Fisheries Science Center, SSC

John Devore, Pacific Fisheries Management Council, GMT representative
Peter Leipzig, Fishermen's Marketing Association, GAP representative

STAT Team Members present:

Thomas Jagielo, Washington Department of Fish and Wildlife
Farron Wallace, Washington Department of Fish and Wildlife

Overview

Lingcod has been designated an overfished stock by the Pacific Fishery Management Council and is currently being managed under a rebuilding plan. The assessment divided the stock into a northern component in the Vancouver and Columbia INPFC areas (LCN), and a southern component in the Eureka, Monterey and Conception areas (LCS). The lingcod assessment was initially reviewed by a STAR panel in August 2005. The STAR Panel did not approve the assessment for management advice because of unresolved questions about the LCN model's estimates of a large increase in stock size in recent years. The Panel had difficulty seeing the foundations in the data for estimates of two strong year classes (1999 and 2000 year classes) that apparently were responsible for the increase in abundance. The STAT team agreed to examine the evidence more carefully and present their findings to the September wrap-up panel. During the panel meeting, the STAT team was represented by Tom Jagielo and Farron Wallace. The STAR panel primarily focused on this issue, and did not conduct a full review of the lingcod assessment.

The data used in the lingcod assessment received extensive scrutiny, and a number of sensitivity runs of the LCN model were performed. The Panel found that the commercial age composition, the survey age composition in 2001 and 2004, and the survey biomass estimates in 2001 and 2004 provided at least some support for stronger than usual 1999 and 2000 year classes. Data from the recreational fishery did not support strong 1999 and 2000 year classes. While these data collectively suggest that these two year classes are above average, their absolute magnitude remains uncertain, and it is not unusual for initial estimates of exceptionally strong year classes to drop down as more data become available.

Sensitivity runs indicated that the LCN stock would rebuild strongly even if the 1999 and 2000 year classes are considered average in size. In this scenario, strong rebuilding occurs because of the relatively high productivity of lingcod and the substantial catch reductions in the northern area in recent years. In contrast, catches have not been reduced to the same extent in the southern area, and rebuilding has been much slower. Based on these analyses and sensitivity runs, the Panel accepted the both LCN and LCS models. The models were unchanged from the earlier STAR Panel and are considered to be adequate for management advice. Spawning stock biomass was estimated to be 87% of unfished biomass in 2005 for the northern component, and 24% of unfished biomass for the southern component. The coastwide spawning stock biomass was estimated to be 64% of unfished biomass in 2005.

The Panel is grateful to the STAT team for their cooperation during the meeting. Furthermore, the Panel agreed that both LCN and LCS assessments constituted the best available science and were now acceptable use in management.

Analyses requested by the STAR Panel

1) Provide a sensitivity run with at least one asymptotic selectivity pattern

The Panel was concerned that the model was estimating high proportion of cryptic biomass (i.e., unseen in catch or surveys). The female selectivity pattern for the commercial fishery was considered a good candidate since it was already nearly asymptotic. Sensitivity runs were produced for both LCN and LCS models by assuming an asymptotic selectivity pattern for females in the commercial fishery. In LCN model, the starting biomass fell about 30%, which is consistent with the reported proportion of cryptic biomass presented at the pervious STAR Panel. In LCS model, the run with asymptotic selectivity reduced biomass by about 10%. The Panel did not consider the proportion of cryptic biomass to be excessive.

2) Provide two retrospective analyses. First, remove the shelf survey data for 2004, and then remove both 2004 and 2001 (remove both age composition data and biomass indices). Second, step back through the commercial composition data removing data in 2004 to 2001, sequentially and cumulatively.

It was unclear which data sets were contributing to the estimates of the strong 1999 and 2000 year classes. The retrospective analyses indicated that data from both the 2001 and 2004 shelf survey provide support for the estimates of strong recruitment of the 1999 and 2000 year classes. The commercial age composition data also support estimates of strong recruitment. Somewhat unexpectedly, the LCN stock shows strong rebuilding even with the 2001 and 2004 survey data removed and the 1999 and 2000 year classes assumed to be average. The stock will still rebuild in this scenario because of the relatively high productivity of lingcod and the substantial catch reductions in recent years.

3) Plot average age compositions for the survey and commercial fishery and then superimpose recent age composition

The results showed the 1999 and 2000 year classes were more prominent in comparison to the average age distributions in these data sets. There appeared to be some smearing of year classes in the commercial data, presumably due to ageing error.

4) As a sensitivity test, increase the CV's on the 1986 and 1995 shelf survey biomass estimates

The CV's on the 1986 and 1995 shelf surveys biomass estimates are very small and the panel thought that this may be affecting estimates of recruitment in subsequent years. This was not done due to time constraints.

5) Iteratively balance the model so that input and output sample sizes and standard deviations are similar

The Panel recommended that the abundance indices be balanced first and then the size and age composition data. The STAT team argued that further balancing was not needed since this had been done in the previous assessment model by dividing the input sample sizes by 10. Because the STAT team chose not to rebalance the model, the panel requested a diagnostic plot of effective sample sizes vs input sample sizes. These were presented and the practice of dividing by 10 looked roughly appropriate.

6) Prepare decision table showing the consequences if stock biomass is different than base case
Details about how decision tables were developed for the LCN and LCS models are described below.

Final base-cases models and quantification of uncertainty

The models for the two areas had the following fixed parameters in common:

Natural mortality: Females 0.18, Males 0.32
Recruitment variability: $\sigma_R = 1$
Stock-recruit steepness: $h = 0.90$
Von Bertalanffy growth curves were fitted outside the model. Separate curves were estimated for males and females and for northern and southern areas.

LCN model input data and selectivity patterns

Catch: 1956-2004

Abundance indices:
- Trawl CPUE 1976-1997
- Shelf survey 1977 – 2004

Length frequencies:
- Recreational 1981-1983
- Commercial 1975-1978
- Shelf survey 1986, 1989

Age frequencies:
- Recreational 1980, 1986-2004
- Commercial 1979-2004
- Shelf survey 1992 – 2004

Selectivity
- Commercial fishery – domed or asymptotic
- Recreational fishery - domed
- Shelf survey - domed

LCS input data and selectivity patterns

Catch1956-2004

Abundance indices:
- Trawl CPUE 1978 -1997
- Shelf survey 1977 – 2004

Age frequencies:
- Recreational 1992-1998, 2000-2004
- Commercial 1992-1998, 2000-2004
- Shelf survey 1995-2004

Selectivity
- Commercial fishery – domed
- Recreational fishery - domed
- Shelf survey - domed

For the LCN model, the Panel and STAT team agreed to bracket uncertainty with a single low biomass run obtained by removing the 2001 and 2004 survey data and fishery size and age composition data from 2001 onward. Removal of these data produce estimates of the 1999 and 2000 years classes equal to the long-term average.

For the LCS model, the Panel and STAT team agreed to bracket uncertainty using models with high and low spawning biomass in 2005 that were plus and minus 1.25 standard deviations from the base model. After some experimentation, it was found that catches could be perturbed to obtain the desired low and high spawning biomass levels. Stock forecasts used catches projected by the GMT for 2005 and 2006.

Technical merits and/or deficiencies in assessments

The STAT Team is commended for their effort in producing the large number of analyses before and during the STAR Panel review.

This Panel did not conduct a full review of the lingcod assessment. Examination of model diagnostics (sensitivities, retrospective analyses, residual patterns, etc…) was limited, especially for the LCS model.

Areas of disagreement

There were no significant areas of disagreement within the Panel nor between the Panel and the STAT team.

Unresolved problems and major uncertainties

Due to lingcod's preference for rocky reef habitat, the Panel considered dome-shaped selectivity patterns to be reasonable from a conceptual perspective. However, some of the estimated selectivity patterns were quite angular in appearance with very steep descending slopes. The Panel had concerns both about the biological plausibility of these curves and whether the selectivity parameters had been defined and estimated appropriately. Further evaluation of survey and fishery selectivity patterns was warranted, but the Panel was unable to do so in the time available for review.

Recommendations for future research

1) Considering the independent recruitment trends in recent years between LCN and LCS, an investigation into stock structure should be considered.

2) Generic recommendation: At modeling workshop prior to this year's assessment cycle, there was a general recommendation to use iterative reweighting of input sample sizes and index variances. As a result, there was much more extensive use of these procedures in the assessments conducted this year. Prior experience of West Coast assessment scientists with these procedures was limited, and in some cases reweighting procedures may have been applied uncritically. For example, reducing weights on a survey index and increasing the weight on fishery data seems difficult to justify on first principles. A workshop is needed to assimilate the experience gained from this year's assessments and to develop recommendations for future assessments. Other methodological issues, such as the use of priors in this year's assessments, could also be addressed in the workshop, or a separate workshop.

Stock Assessment of Petrale Sole: 2004

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Executive Summary

Stock: This is a stock assessment of petrale sole (*Eopsetta jordani*) in U.S. waters off California, Oregon, and Washington. Genetic information and stock structure are not well known for this species. Previous assessments of petrale sole in the U.S. Vancouver and Columbia INPFC areas (named the Northern assessment area in this assessment) were conducted by Demory (1984), Turnock et al. (1993), and Sampson and Lee (1999). In this assessment, petrale sole in the Eureka, Monterey and Conception INPFC areas (the Southern assessment area) are assessed separately from those in the Northern assessment area. Data on growth, CPUE, and the geographical distribution of petrale sole along the U.S. Pacific coast support the use of two separate assessment areas.

Catches: Almost all catches of petrale sole have been taken by using trawl gears. Recent petrale sole catch statistics are summarized in Table E-1 and Figure E-1. Monthly catches demonstrate a strong seasonality in the two assessment areas with the catches during the winter months (November to February) being higher than during the summer months (March to October). As a result, the assessment is based on winter and summer fishing seasons with a fishing year that starts on November 1 and ends on October 31. In the northern assessment area, the fisheries are divided into WA-Winter, WA-Summer, OR-Winter and OR-summer fisheries. In the southern assessment area, the fisheries are divided into winter and summer fisheries. For the period 1981–2004, landings (PacFIN database) ranged between 824–1,778 mt in the Northern assessment area and 420–992 mt in the Southern assessment area. Catches for 1956–81 were obtained from Sampson and Lee (1999) based on the HAL database archived in PacFIN system. Pre-1956 catches were estimated from several reports: Heimann and Carlisle (1970) for the Southern assessment area, Cleaver (1951) and Smith (1950) for Oregon, and WDF (1956) and Alverson and Chatwin (1957) for Washington. Discard rates for petrale sole were estimated by Demory (1984) for the period 1977–82, by Sampson and Lee (1999) for the period 1986–87 (based on the studies of Pikitch et al. (1988)), and by the NWFSC Groundfish Observer program for the period 2001–04.

Data and Assessment: A variety of data sources were used in the assessment: 1) biomass indices and length compositions from the NMFS Triennial Surveys in 1980, 1983, 1986, 1989, 1992, 1995, 1998, 2001, and 2004; 2) standardized CPUE time series in 1987–2003 for each fisheries; 3) length compositions, age compositions and mean size-at-age data of ODFW and WDFW commercial landings from the PacFIN BDS database; 4) length and age compositions of California commercial landings from the CALCOM database. However, the STAR Panel and STAT agreed not to use the age composition and mean-size-at-age data for the assessment of the northern area. The data sources included in the assessment were analyzed using the length-and-age structured Stock Synthesis 2 (SS2) Model developed by Dr. Richard Methot (NOAA Fisheries).

Unresolved Problems and Major Uncertainties: The major sources of uncertainty in this stock assessment include: 1) the fact that age data are not consistent between and within ageing laboratories over the years because of the use of different ageing methods in past years, insufficient age samples (particularly in recent years), and the absence of between-laboratory comparison of ageing errors; 2) the impact of recent fishery regulations on the utility of CPUE as an index of relative abundance for recent years (i.e., after 1999); 3) the use of an assumed value for the rate of natural mortality; 4) the impact of sampling and ageing methods on the values for the parameters of the von Bertalanffy growth curve; 5) the lack of historical discard rates and lengths, and 6) the impact of assumptions regarding length-based selectivity and retention curves for fisheries and surveys.

Reference Points: The Pacific Fishery Management Council uses the 40:10 control rule as the default harvest rate policy for groundfish. The target (MSY-proxy) harvest rate for petrale sole is $F_{40\%}$, which is expected to produce a spawning stock biomass that is 40% of the spawning stock biomass expected in the absence of fishing (SB_0). Given the life history of petrale sole, this corresponds to an exploitation rate of 12% and 14%, respectively for the Northern and Southern assessment areas based on the exploitation rates in 2004. At this exploitation rate, the recruits, spawning stock biomass, Maximum Sustainable Yield (MSY), and age 3^+ biomass are:

	Estimates	
	Northern Area	Southern Area
Unfished Spawning Stock Biomass (SB_0)	14,382	15,984
Unfished Summary Biomass, Age 3^+	25,165	28,919
Unfished Recruitment (age0)	12,174	14,829
SB_{MSY}	2,658	4,120
Basis for SB_{MSY}	$B_{40\%}$	$B_{40\%}$
SPR_{MSY}	0.214	0.33
Basis for SPR_{MSY}	$F_{40\%}$	$F_{40\%}$
Exploitation Rate at SPR_{MSY}	0.12	0.14
MSY	1,760	1,404

Stock Biomass: The spawning stock biomass of petrale sole in the Northern assessment area reached the historical low in 1992 (1,267 mt or 8.8% SB_0, Figure E-2), recovered to 1,554 mt (11% SB_0) in 1995 and to 4,960 mt (34% SB_0) in 2005 (Table E-1). The spawning stock biomass of petrale sole in the Southern assessment area reached the historical low in 1986 (1,012 mt or 6% SB_0, Figure E-2), recovered to 1,252 mt (8% SB_0) in 1995 and to 4,467 mt (29% SB_0) in 2005 (Table E-1).

Recruitment: Annual recruitment was treated as stochastic, and estimated as the annual deviations from log-mean recruitment. In the northern area, recruitment decreased since 1980 and reached the historical low in 1989, but generally increased after 1990 (Figure E-2). In the southern area, recruitment decreased through the 1980s, reaching the historical low during 1988, but generally increased after 1990 (Figure E-2).

Exploitation Status: The current assessment indicates that petrale sole was below 25% of SB_0 during 1980-2002 in the northern assessment area (Figure E-2) and during 1974–2004 in the southern assessment area (Figure E-2). The depletion level in 2005 is estimated to be 34% and 29% of SB_0 respectively for the northern and southern areas.

Management Performance: Petrale sole off the U.S. west coast have been managed historically using a coastwide ABC which represents the sum of ABCs calculated for the four INPFC areas (U.S. Vancouver-Columbia, Eureka, Monterey, and Conception; Table E-1). During 1995–2000, the coastwide total annual catch (landings and discard combined) did not exceed the ABC. However, the total annual catch in the Northern assessment area has exceeded the portion of the ABC attributed to that area since 2001.

Forecasts: A 12-year forecast of stock abundance and yield was developed using the base model (Table E-2). The 40:10 control rule reduces forecasted yields in the Southern assessment area below those corresponding to $F_{40\%}$ because the stock is estimated to be lower than the management target of $SB_{40\%}$. The 2004 exploitation rate was used to distribute catches among the four fisheries in the northern assessment area. In contrast, the 5-yr (2000–4) average relative exploitation rate was used to distribute catches between the winter and summer fisheries in the southern area in the southern area.

Decision Table: Decision tables (Table E-3) for the northern and southern assessment areas were constructed using three possible management actions: 1) catches are set at the forecast (40-10 control rule) catch level using low spawning biomass model, 2) catches are set at the forecast catch level using base model, and 3) catches are set at the forecast catch level using high spawning biomass model. The results for 12-year projections of spawning biomass and stock depletion are evaluated for the base model as well as high and low spawning biomass models.

Research and Data Needs: The STAT team identifies the following research needs (not in priority order):

A. Survey age data should be made available. Young individuals are not well represented in the fishery age and length compositions owing to discarding. The 2004 survey age determination data provide the growth parameters used in the assessment model for the northern area It would be beneficial to future assessments if age data from surveys were available because they provide recruitment information as well as age compositions and information about growth.

B. Increase efforts to collect commercial fishery length and age data. Length and age data are sporadic after 1999. Without age data, the ability to estimate year-class strength and the extent of variation in recruitment is compromised. Uncertainty will continue unless additional length and age composition data become available.

C. Age-error matrices. Estimation of the age compositions and mean-size-at-age for petrale sole may be compromised because of the use of different ageing methods over time and sampling designs that differ among the states. Between-agencies age error matrices should be constructed.

D. Effect of fishery regulations. The impacts of trip-limits and other management approaches, such as closed areas, on discards and fishery selectivity requires further study.

E. Studies on stock structure of petrale sole.

F. Collect length compositions for discarded petrale sole.

G. Winter-summer spawning migration should investigated in the field and be incorporated into future assessment models.

Table E-1. A summary of reference point statistics.

Elements		1995	1996	1997	1998	1999	2000	2001	2002	2003	2004	2005
Total Catch (mt)	Coastwide	1,669	1,942	2,061	1,724	1,616	1,892	1,959	2,009	1,832	2,377	
North	Landings	920	932	880	1,015	857	1,059	1,180	1,258	1,270	1,716	
	Predicted Discards*	71	73	70	74	62	78	89	91	87	134	
South	Landings	662	914	1,084	619	680	736	674	644	464	514	
	Predicted Discards	17	23	27	15	17	18	17	16	12	13	
ABC (mt)	Coastwide	2,700	2,700	2,700	2,700	2,700	2,950	2,762	2,762	2,762	2,762	2,736**
	North	1,200	1,200	1,200	1,200	1,200	1,450	1,262	1,262	1,262	1,262	2,045**
	South	1,500	1,500	1,500	1,500	1,500	1,500	1,500	1,500	1,500	1,500	691**
SPR	North	0.2225	0.2258	0.2445	0.2333	0.3062	0.3039	0.3126	0.3241	0.3573	0.3199	
	South	0.2942	0.2425	0.1881	0.3240	0.3129	0.2877	0.3041	0.3453	0.5355	0.6582	
Age3+ Biomass	Coastwide	8,292	8,763	9,313	10,037	10,985	12,005	12,887	15,392	17,956	20,831	23,056
(mt)	North	4,584	4,660	5,153	6,086	6,843	7,782	8,545	10,347	11,343	11,959	12,032
	South	3,708	4,103	4,159	3,951	4,142	4,223	4,343	5,046	6,613	8,872	11,024
Spawing Biomass	Coastwide	2,807	3,165	3,334	3,358	3,784	4,411	4,813	5,178	5,911	7,687	9,628
(mt)	North Estimate	1,554	1,601	1,639	1,779	2,062	2,602	3,038	3,383	3,863	4,631	4,960
	std deviation	166	173	182	197	227	273	324	378	445	543	644
	South Estimate	1,252	1,564	1,695	1,579	1,723	1,809	1,775	1,795	2,048	3,056	4,667
	std deviation	281	311	335	342	363	380	384	401	455	602	888
Recruitment	Coastwide	18,260	15,427	18,141	22,593	49,709	29,184	24,183	19,034	23,499	18,977	22,191
	North Estimate	13,041	10,832	10,966	11,501	23,398	12,239	10,227	11,522	15,546	9,661	11,401
	std deviation	3,143	2,802	3,372	3,612	4,549	3,987	3,530	4,124	6,945	4,836	503
	South Estimate	5,219	4,595	7,175	11,092	26,311	16,945	13,956	7,512	7,953	9,315	10789.9
	std deviation	1,474	1,393	1,731	2,776	6,701	5,191	5,345	3,577	3,764	4,340	1,014
Depletion	Coastwide	9%	10%	11%	11%	12%	15%	16%	17%	19%	25%	32%
	North	11%	11%	11%	12%	14%	18%	21%	24%	27%	32%	34%
	(std deviation)										(4%)	(5%)
	South	8%	10%	11%	10%	11%	11%	11%	11%	13%	19%	29%
	(std deviation)										(4%)	(5%)

Table E-2. 12-yr forecasts for the Northern and Southern assessment areas.

Northern Assessment Area

Year	Age3+ (mt)	SB (mt)	Depletion	age0 (,000)	WA Winter Fishery Total Catch	WA Winter Fishery Retain-ed	WA Winter Fishery Discard-ed	WA Winter Fishery Harvest Rate	WA Summer Fishery Total Catch	WA Summer Fishery Retain-ed	WA Summer Fishery Discard-ed	WA Summer Fishery Harvest Rate	OR Winter Fishery Total Catch	OR Winter Fishery Retain-ed	OR Winter Fishery Discard-ed	OR Winter Fishery Harvest Rate	OR Summer Fishery Total Catch	OR Summer Fishery Retain-ed	OR Summer Fishery Discard-ed	OR Summer Fishery Harvest Rate
2005	12,032	4,960	34%	10,061	353	317	35	4.7%	349	314	35	4.7%	811	730	81	10.9%	583	525	58	7.9%
2006	12,130	4,859	34%	11,378	353	317	35	4.8%	349	314	35	4.8%	811	730	81	10.9%	583	525	58	8.1%
2007	11,718	4,716	33%	11,344	218	196	22	3.0%	213	192	21	2.9%	501	451	50	6.9%	356	321	36	4.8%
2008	11,953	5,077	35%	11,426	239	215	24	3.1%	230	207	23	3.0%	550	495	55	7.2%	385	347	39	5.0%
2009	12,102	5,245	36%	11,461	250	225	25	3.2%	237	213	24	3.0%	574	517	57	7.2%	396	357	40	5.0%
2010	12,170	5,276	37%	11,468	252	226	25	3.2%	238	214	24	3.0%	579	521	58	7.3%	398	358	40	5.0%
2011	12,228	5,299	37%	11,472	252	227	25	3.2%	238	215	24	3.0%	580	522	58	7.3%	399	359	40	5.0%
2012	12,288	5,332	37%	11,478	253	228	25	3.2%	240	216	24	3.0%	583	524	58	7.3%	401	361	40	5.1%
2013	12,343	5,366	37%	11,485	255	230	26	3.2%	242	217	24	3.0%	587	528	59	7.3%	404	364	40	5.1%
2014	12,390	5,396	38%	11,491	257	231	26	3.2%	243	219	24	3.0%	590	531	59	7.3%	406	366	41	5.1%
2015	12,428	5,421	38%	11,496	258	232	26	3.2%	244	220	24	3.0%	594	534	59	7.3%	409	368	41	5.1%
2016	12,458	5,440	38%	11,499	259	233	26	3.2%	245	221	25	3.0%	596	537	60	7.3%	410	369	41	5.1%

Southern Assessment Area

Year	Age3+ (mt)	SB (mt)	Depletion	age0 (,000)	Winter Fishery Total Catch	Winter Fishery Retain-ed	Winter Fishery Discard-ed	Winter Fishery Harvest Rate	Summer Fishery Total Catch	Summer Fishery Retain-ed	Summer Fishery Discard-ed	Summer Fishery Harvest Rate
2004	11,024	4,667	29%	10,790	425	414	11	7.7%	283	276	7	5.2%
2005	12,441	5,973	37%	12,747	425	414	11	6.9%	283	276	7	5.0%
2006	13,258	6,784	42%	13,098	1,052	1,025	26	17.1%	576	562	14	11.4%
2007	12,689	6,413	40%	12,946	934	911	23	17.1%	509	497	13	11.4%
2008	12,189	5,908	37%	12,715	836	815	21	16.7%	465	454	12	11.1%
2009	11,942	5,523	35%	12,518	785	766	20	16.2%	451	440	11	10.8%
2010	11,930	5,339	33%	12,416	781	762	20	16.0%	460	448	11	10.7%
2011	12,043	5,332	33%	12,412	801	781	20	16.0%	474	462	12	10.7%
2012	12,181	5,401	34%	12,451	821	801	21	16.1%	485	473	12	10.7%
2013	12,294	5,478	34%	12,493	835	814	21	16.2%	492	480	12	10.8%
2014	12,370	5,532	35%	12,523	842	821	21	16.2%	495	482	12	10.8%
2015	12,417	5,561	35%	12,538	844	823	21	16.3%	495	483	12	10.9%

Table E-3. The decision tables for petrale sole in the northern, southern and coastwide assessment areas.

Northern Assessment Area

Management Action	Year	40:10 adj. Catch	Low Spawning Biomass Model (Base Model 2004 SB-1.25*SD) SB	Depletion	Base Model (Base Model 2004 SB) SB	Depletion	High Spawning Biomass Model (Base Model 2004 SB+1.25*SD) SB	Depletion
Low catch	2005	2,095	4,038	28%	4,960	34%	5,915	41%
(from Low Spawning	2006	2,095	3,742	26%	4,859	34%	6,035	42%
Biomass Model)	2007	818	3,454	24%	4,716	33%	6,054	42%
	2008	1,001	3,977	28%	5,340	37%	6,780	47%
	2009	1,128	4,344	30%	5,735	40%	7,193	50%
	2010	1,207	4,569	32%	5,937	41%	7,356	51%
	2011	1,267	4,744	33%	6,071	42%	7,424	51%
	2012	1,316	4,888	34%	6,167	43%	7,445	51%
	2013	1,356	5,004	35%	6,230	43%	7,428	51%
	2014	1,388	5,099	36%	6,268	44%	7,383	51%
	2015	1,415	5,174	36%	6,285	44%	7,321	51%
	2016	1,436	5,233	37%	6,286	44%	7,246	50%
Medium catch	2005	2,095	4,038	28%	4,960	34%	5,915	41%
(from Base Model)	2006	2,095	3,742	26%	4,859	34%	6,035	42%
	2007	1,289	3,454	24%	4,716	33%	6,054	42%
	2008	1,405	3,721	26%	5,077	35%	6,512	45%
	2009	1,457	3,867	27%	5,245	36%	6,694	46%
	2010	1,466	3,922	27%	5,276	37%	6,685	46%
	2011	1,469	3,985	28%	5,299	37%	6,643	46%
	2012	1,477	4,062	28%	5,332	37%	6,603	46%
	2013	1,487	4,141	29%	5,366	37%	6,561	45%
	2014	1,497	4,216	29%	5,396	38%	6,516	45%
	2015	1,505	4,285	30%	5,421	38%	6,469	45%
	2016	1,511	4,347	30%	5,440	38%	6,421	44%
High catch	2005	2,095	4,038	28%	4,960	34%	5,915	41%
(from High Spawning	2006	2,095	3,742	26%	4,859	34%	6,035	42%
Biomass Model)	2007	1,754	3,454	24%	4,716	33%	6,054	42%
	2008	1,788	3,470	24%	4,818	34%	6,248	43%
	2009	1,769	3,411	24%	4,776	33%	6,215	43%
	2010	1,720	3,313	23%	4,650	32%	6,047	42%
	2011	1,675	3,270	23%	4,565	32%	5,897	41%
	2012	1,642	3,278	23%	4,533	32%	5,794	40%
	2013	1,614	3,313	23%	4,532	32%	5,722	40%
	2014	1,596	3,362	23%	4,551	32%	5,675	39%
	2015	1,584	3,418	24%	4,581	32%	5,643	39%
	2016	1,575	3,475	24%	4,614	32%	5,621	39%

Table E-3. Continued.

Southern Assessment Area

Management Action	Year	40:10 adj. Catch	Low Spawning Biomass Model (Base Model 2004 SB-1.25*SD) SB	Depletion	Base Model (Base Model 2004 SB) SB	Depletion	High Spawning Biomass Model (Base Model 2004 SB+1.25*SD) SB	Depletion
Low catch	2005	667	3,630	22%	4,667	29%	5,735	43%
(from Low Spawning	2006	667	4,431	26%	5,998	38%	7,863	59%
Biomass Model)	2007	1,628	4,960	30%	6,838	43%	9,070	68%
	2008	1,444	4,498	27%	6,870	43%	9,190	69%
	2009	1,301	4,008	24%	6,691	42%	8,931	67%
	2010	1,237	3,677	22%	6,526	41%	8,595	65%
	2011	1,241	3,557	21%	6,476	41%	8,320	63%
	2012	1,275	3,610	22%	6,543	41%	8,133	61%
	2013	1,307	3,729	22%	6,654	42%	7,988	60%
	2014	1,327	3,827	23%	6,757	42%	7,859	59%
	2015	1,337	3,876	23%	6,835	43%	7,734	58%
	2016	1,340	3,879	23%	6,886	43%	7,612	57%
Medium catch	2005	667	3,630	22%	4,667	29%	5,735	43%
(from Base Model)	2006	667	4,431	26%	5,998	38%	7,863	59%
	2007	1,628	4,960	30%	6,838	43%	9,070	68%
	2008	1,444	4,498	27%	6,467	40%	8,826	67%
	2009	1,301	4,008	24%	5,959	37%	8,269	62%
	2010	1,237	3,677	22%	5,569	35%	7,730	58%
	2011	1,241	3,557	21%	5,380	34%	7,331	55%
	2012	1,275	3,610	22%	5,369	34%	7,078	53%
	2013	1,307	3,729	22%	5,436	34%	6,905	52%
	2014	1,327	3,827	23%	5,510	34%	6,769	51%
	2015	1,337	3,876	23%	5,564	35%	6,651	50%
	2016	1,340	3,879	23%	5,592	35%	6,543	49%
High catch	2005	667	3,630	22%	4,667	29%	5,735	43%
(from High Spawning	2006	667	4,431	26%	5,998	38%	7,863	59%
Biomass Model)	2007	1,628	4,960	30%	6,838	43%	9,070	68%
	2008	1,444	3,934	23%	5,893	37%	8,826	67%
	2009	1,301	3,036	18%	4,965	31%	8,269	62%
	2010	1,237	2,434	15%	4,291	27%	7,730	58%
	2011	1,241	2,146	13%	3,927	25%	7,331	55%
	2012	1,275	2,097	13%	3,820	24%	7,078	53%
	2013	1,307	2,139	13%	3,841	24%	6,905	52%
	2014	1,327	2,151	13%	3,889	24%	6,769	51%
	2015	1,337	2,085	12%	3,918	25%	6,651	50%
	2016	1,340	1,947	12%	3,920	25%	6,543	49%

Table E-3. Continued.

Coastwide

Management Action	Year	40:10 adj. Catch	Low Spawning Biomass Model (Base Model 2004 SB-1.25*SD) SB	Depletion	Base Model (Base Model 2004 SB) SB	Depletion	High Spawning Biomass Model (Base Model 2004 SB+1.25*SD) SB	Depletion
Low catch	2005	2,762	7,667	25%	9,628	32%	11,650	38%
(Projected from Low	2006	2,762	8,173	27%	10,858	36%	13,898	46%
Spawning Biomass	2007	2,446	8,415	28%	11,554	38%	15,124	50%
Model)	2008	2,445	8,475	28%	12,211	40%	15,970	53%
	2009	2,429	8,352	28%	12,426	41%	16,124	53%
	2010	2,444	8,245	27%	12,463	41%	15,951	53%
	2011	2,508	8,301	27%	12,546	41%	15,744	52%
	2012	2,591	8,499	28%	12,710	42%	15,577	51%
	2013	2,662	8,733	29%	12,884	42%	15,416	51%
	2014	2,716	8,926	29%	13,026	43%	15,243	50%
	2015	2,752	9,050	30%	13,121	43%	15,055	50%
	2016	2,775	9,112	30%	13,172	43%	14,857	49%
Medium catch	2005	2,762	7,667	25%	9,628	32%	11,650	38%
(from Base Model)	2006	2,762	8,173	27%	10,858	36%	13,898	46%
	2007	2,916	8,415	28%	11,554	38%	15,124	50%
	2008	2,849	8,220	27%	11,544	38%	15,338	51%
	2009	2,758	7,875	26%	11,204	37%	14,963	49%
	2010	2,702	7,598	25%	10,846	36%	14,415	47%
	2011	2,710	7,542	25%	10,679	35%	13,974	46%
	2012	2,752	7,673	25%	10,701	35%	13,681	45%
	2013	2,794	7,869	26%	10,802	36%	13,466	44%
	2014	2,824	8,043	26%	10,907	36%	13,286	44%
	2015	2,841	8,161	27%	10,985	36%	13,120	43%
	2016	2,851	8,226	27%	11,031	36%	12,964	43%
High catch	2005	2,762	7,667	25%	9,628	32%	11,650	38%
(Projected from High	2006	2,762	8,173	27%	10,858	36%	13,898	46%
Spawning Biomass	2007	3,382	8,415	28%	11,554	38%	15,124	50%
Model)	2008	3,231	7,404	24%	10,711	35%	15,074	50%
	2009	3,070	6,447	21%	9,741	32%	14,484	48%
	2010	2,957	5,746	19%	8,941	29%	13,777	45%
	2011	2,916	5,415	18%	8,492	28%	13,228	44%
	2012	2,917	5,375	18%	8,353	28%	12,872	42%
	2013	2,921	5,451	18%	8,372	28%	12,627	42%
	2014	2,923	5,514	18%	8,440	28%	12,445	41%
	2015	2,921	5,503	18%	8,499	28%	12,294	40%
	2016	2,915	5,422	18%	8,534	28%	12,164	40%

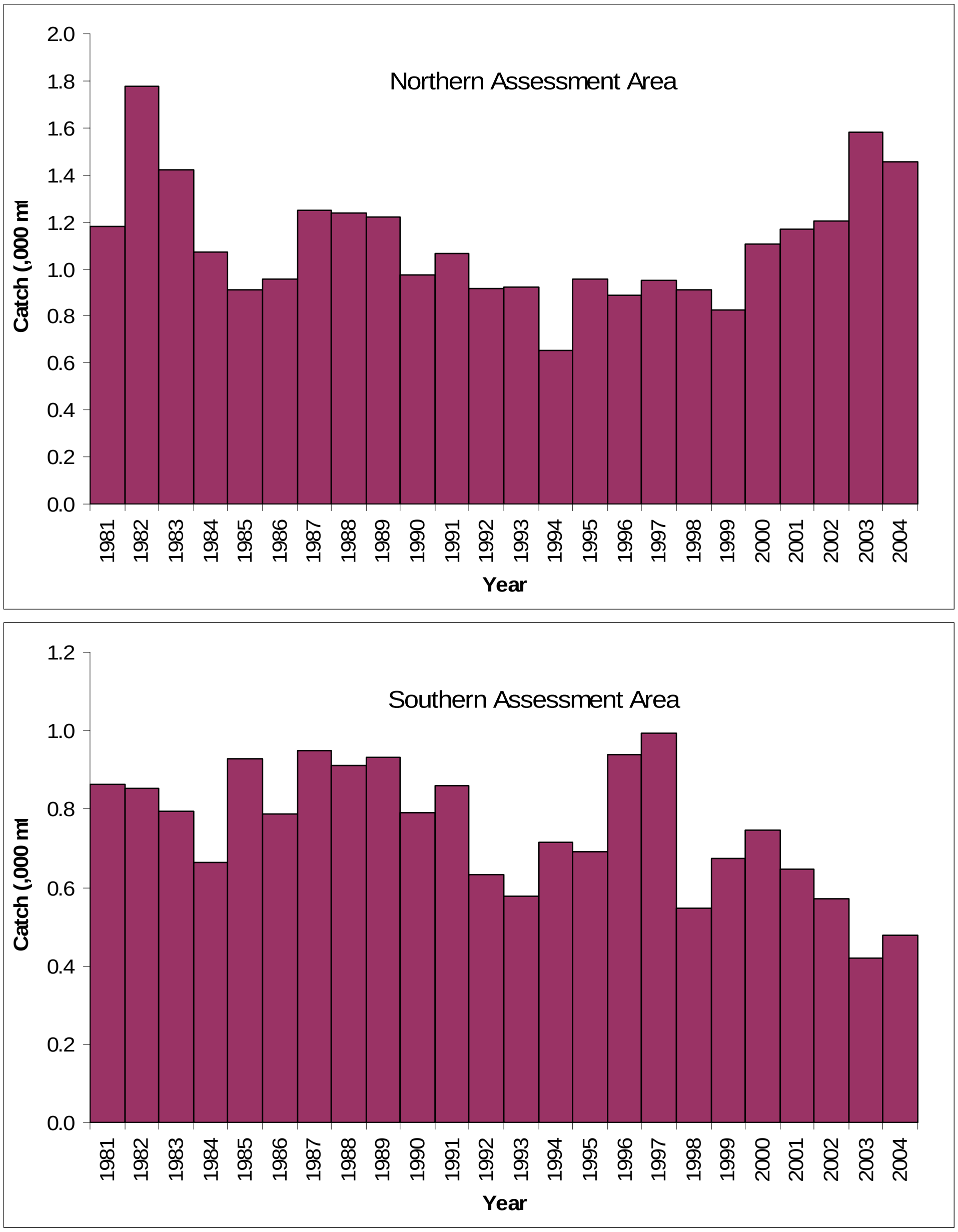

Figure E-1. Annual landings (1982–2004) extracted from the PacFIN database.

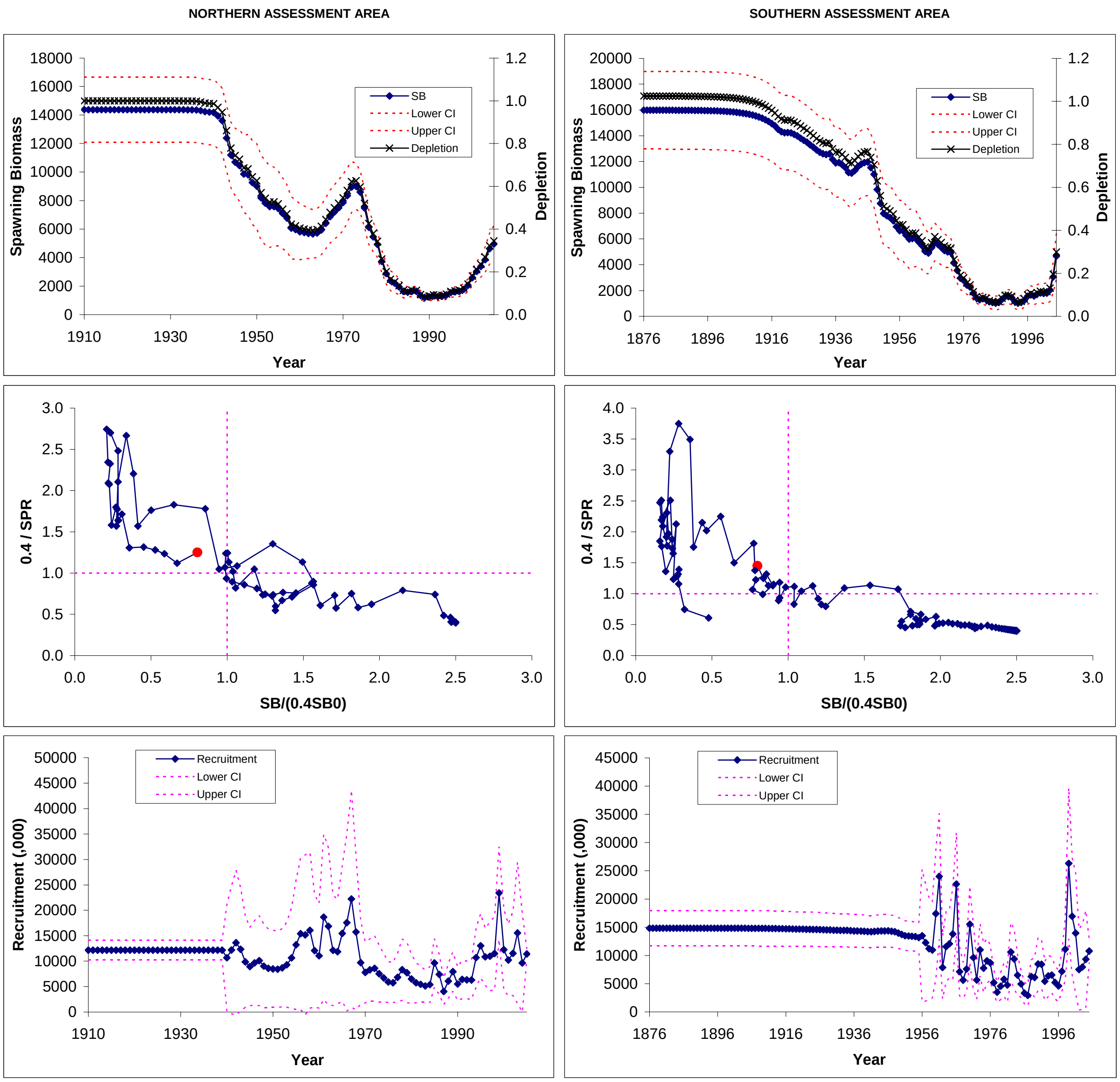

Figure E-2. Trajectories of spawning biomass (SB), depletion, recruitment and spawning potential ratio relative to the proxy target of 40% vs. estimated spawning biomass relative to the proxy 40% level.

PETRALE SOLE

STAR Panel Report

Alaska Fisheries Science Center
Seattle, Washington
September 26-30, 2005

STAR Panel members:

Steven Berkeley, University of California Santa Cruz, SSC
Martin Dorn (Chair), Alaska Fisheries Science Center, SSC
Ray Conser, Southwest Fisheries Science Center, SSC
Owen Hamel, Northwest Fisheries Science Center, SSC
Robert Mohn, Center for Independent Experts
Kevin Piner (Rapporteur), Southwest Fisheries Science Center
Stephen Ralston, Southwest Fisheries Science Center, SSC

John DeVore, Pacific Fisheries Management Council, GMT representative
Peter Leipzig, Fishermen's Marketing Association, GAP representative

STAT Team Members present:

Han-Lin Lai, Northwest Fisheries Science Center
Jason Cope, University of Washington

Overview

The petrale sole assessment was initially reviewed by the flatfish Stock Assessment Review Panel (STAR) in April 2005. The assessment divided the stock into a northern component in the Vancouver and Columbia INPFC areas, and a southern component in the Eureka, Monterey and Conception areas. The STAR Panel did not approve the northern area assessment for management because new age data were given to the STAT team during the meeting and there was insufficient time during the meeting to evaluate and incorporate the data into the assessment. The STAT team agreed to prepare a revised assessment for the September wrap-up panel.

The southern area assessment was considered suitable for management advice by the April STAR Panel, but subsequent work to finalize the assessment raised questions about the convergence of the base model. The SSC recommended that the southern petrale assessment also be reviewed by the wrap-up panel to address these concerns. The SSC also wanted to be able to request southern model runs if issues raised in the review of the northern model were also relevant to the southern model. During the September wrap-up panel, the STAT team was represented by Han-Lin Lai and Jason Cope.

The STAR Panel and STAT teams agreed on base models and bracketing model runs to quantify uncertainty for both northern and southern components of the stock. Petrale sole in the north was estimated to be at 34% of unfished spawning stock biomass in 2005. In the south, the stock was estimated to be at 29% of unfished spawning stock biomass. Biomass trends were qualitatively similar in both areas, and also showed consistency with petrale sole trends in Canadian waters. Both stocks were estimated to have been below the Pacific Council's overfished threshold of 25% of unfished biomass from the mid-1970s until very recently. Estimated harvest rates were in excess of the target fishing mortality rate of F40% during this period as well. Petrale sole in both areas showed large recent increases in stock size, which is consistent with the strong upward trend in the shelf survey biomass index.

In comparison to previous assessments of petrale sole, this assessment represents a significant change in our perception of petrale sole stock status. For example, in the 1999 assessment, spawning biomass stock biomass in 1998 was estimated to be at 39% of unfished stock biomass. The current assessment now estimates biomass in 1998 to have been at 12% of unfished stock biomass. An extended period of low stock abundance followed by a rapid increase was a consistent feature of model results regardless of geographic area, model configuration, or selection of input data. Nevertheless, this pattern of extreme stock dynamics is difficult to reconcile with the long-term stability of the petrale sole fishery, and the Panel recommends exploration of this issue in future assessments.

The Panel is grateful to the STAT team for their cooperation during the meeting. Furthermore, the Panel agreed that both assessments constituted the best available science and were now acceptable for use in management.

Northern area model

Analyses requested by the STAR Panel

1) Provide a plot of the proportion of positive tows in the data used to generate the fishery CPUE indices

Reason: The CPUE indices in the model did not include the binomial component of the delta GLM due to convergence problems. The CPUE time series was based on only the GLM model for the positive tows.

Outcome: The proportion of positive tows showed an upward trend after 2000. Had it been possible to include the binomial part of the delta GLM, the upward trend in the CPUE index would likely have been magnified, and would be more consistent with the shelf survey biomass trend. The increase in the proportion of positive tows may be a result of changes in fishing practice due to management restrictions. The Panel concluded that it would not be appropriate to use the GLM analysis for positive tows in the model.

2) Develop a simplified model for petrale sole

The Panel requested a simple model with the following characteristics: a) all fisheries should have the same selectivity pattern, b) all selectivity patterns should be asymptotic, c) all length data should correspond to one of the fisheries, d) super years should be removed and year specific composition information should be maintained, e) each length composition should be given an equal effective sample size, f) the age data and the mean size at age data should be removed, g) the model should be a combined sex model, h) the 2004 survey data should be used to estimate growth parameters which should then be subsequently be fixed in the model, i) the original four CPUE time series and the shelf survey should be used in the model, j) the retention component of the model should be removed and zero discard should be assumed and k) recruitment deviations should be estimated over the entire modeled period, and the standard errors of the recruitment deviations should be used to determine which years had information to allow estimation of recruitment. A second model run was requested where recruitment deviations were estimated only for the period for which there is information to inform the model.

Reason: In the draft assessment there were many issues concerning the modeling of multiple fisheries with dome-shaped selectivity patterns using sex-specific age data from different agencies. These issues had not been resolved in the draft document, and were unlikely to be resolved in the time available for review. Model convergence was slow and erratic, suggesting that the model may be overparameterized given the quality and quantity of available data. The complexity of the assessment model was an impediment to understanding the model's basic properties, and the Panel hoped that radical simplification of model structure would help clarify matters.

Outcome: The simple model fit the data nearly as well as the more complex model. Fits to the fishery length composition appeared adequate. The fit to the shelf survey time series was excellent, but the fit the post-2000 fishery CPUE indices was poor. However, the reliability of post-2000 CPUE index is questionable due to changes in fishing practices. Biomass trends were similar to the complex model. It appeared reasonable to begin estimating recruitment deviations in 1940.

3) Do a likelihood profile over the CV of ageing error for the complex model
Reason: The Panel wanted to investigate the effects of the ageing error matrix on model performance. The Panel noted that the current ageing error matrix was based upon a comparison between surface ages and break-and-burn ages, which is an inappropriate measure of ageing precision for ages produced with a single ageing method. There were large and unexplained differences between agencies in the standard deviation of ageing error.
Outcome: The results of the profile indicate that ageing error had little influence on biomass estimates. The current ageing error matrix used in the model resulted in poorer model fits than the runs with a constant CV for ageing error. Based on advice from the STAT team and the results of the likelihood profile, the Panel recommended that an ageing error matrix based on an assumed CV of 10% be used for all data sources.

4) Estimate the growth model using combined male and female data
Reason: The simple model with combined sexes had used the female growth parameters.
Outcome: The combined sex growth model appeared to be nearly linear. The estimates of K (0.09) are smaller and Lmax (57.4 cm) larger than that female growth parameters.

5) Add discard to the total catch rather than attempting to model it separately
Reason: The data on discard of petrale sole are sparse and the historical records are of uncertain quality. The STAT team suggested that a discard rate of 10% in summer and 5% in winter were reasonable assumptions. This approach had been adopted for the southern area model at the previous STAR Panel
Outcome: The Panel and STAT team agreed that this was appropriate but alternative methods should be explored in future assessments.

6) Run both complex and simple models using the CPUE time series from the previous assessment and incorporating the requests 3, 4 and 5.
Reason: The CPUE time series in the previous assessment was derived from a GLM analysis that used all the data including zero tows, and the index ends in 1997 prior to the management restrictions that may have changed fishing practices.
Outcome: Panel and STAT team agreed this was appropriate.

7) Include sex-specific growth and sex-specific length composition data in the simple model.
Reason: This was based upon a recommendation from the STAT team. There is a 10 cm difference in maximum length between males and females and the STAT team wanted to capture this biological difference.
Outcome: The simple split-sex model converges and model fits indicate this is a reasonable base case. Surprisingly, the fits to the length composition were not noticeably better than the combined sex model.

8) Prepare decision table showing the consequences if stock biomass is higher or lower than the base case

Details about how the decision table was developed are described below.

Final base model and quantification of uncertainty

The base model is a split-sex model developed using Stock Synthesis 2. The model begins in 1908, a generation prior to the first substantial catch. Recruitment deviations were estimated starting in 1940. Four fisheries were modeled (Oregon summer and winter and Washington summer and winter) with the fishing year beginning November 1. Data used to fit the model included the fishery CPUE time series from the previous assessment (ending in 1997), and the shelf survey biomass time series (1980-2004) with the fishing year beginning November 1. The fishery CPUE series was taken from the previous assessment and ended in 1997. Length composition data from each fishery (1960-2004) and the shelf survey (1986-2004) were also used.

The model used a single asymptotic selectivity pattern for all fisheries and sexes. Length composition data from the different fisheries were treated as replicate observations with the same fishery selectivity (without super years). The shelf survey was also modeled with an asymptotic selectivity pattern. Discard was treated as a constant fraction of catch (10% summer and 5% winter) and included with the catch. Growth was fixed in the model based on estimates from the 2004 shelf survey length-at-age data. Natural mortality and recruitment variability (σ_R) were fixed, but stock recruit steepness (h) was estimated.

The Panel and STAT team agreed to bracket uncertainty using models with high and low spawning biomass in 2004 that were plus and minus 1.25 standard deviations from the base model spawning biomass. After some experimentation, it was found that the 2004 estimate of the shelf survey could be perturbed to obtain the desired low and high spawning biomass levels. Stock forecasts used catches projected by the GMT for 2005 and 2006 since attaining the OY is considered unlikely.

Southern area model

Analyses requested by the STAR Panel

During the meeting the STAT team noticed that the base model had an inappropriate prior for survey catchability and that recruitment deviations were being estimated at a later phase than is optimal. Changing these model configurations removed the discrepancy in the likelihood profile that was the primary source of unease about the southern area assessment.

1) Estimate recruitments deviations only for the time period when there is information about recruitment strength
Reason: The original assessment estimated recruitment deviations from the start of the model in 1876. There is no information about recruitment strength until the 1950s.
Outcome: The standard deviation of the recruitment residuals indicated that data were informative about recruitment strength during the period 1956-2004. The Panel and the

STAT team agreed that estimating recruitment residuals during this period was appropriate.

2) Examine the 2001 and 2004 shelf survey length data for evidence of strong year classes
Reason: The Panel was looking for support in the data for the model estimate of a strong 1999 year class.
Outcome: The STAT team presented figures of the survey and summer fishery size composition. There is some evidence of a mode corresponding to the 1999 year class, but it is not particularly compelling. The large survey biomass estimate in 2004 is evidently the primary signal that the model is responding to.

3) Provide a table of parameters identifying which parameters were estimated and which were fixed
Reason: The Panel was uncertain about how the model was configured
Outcome: The table was provided to the Panel.

4) Do a sensitivity run with the survey length composition removed
Reason: To determine if this data source is driving the estimated strength of the 1999 year class.
Outcome: Other data in the model tended to support the estimate of a strong 1999 year class, but the support was relatively weak and inconsistent.

5) Provide a model run that does not estimate recruitment deviations after 1998
Reason: To obtain a lower bracketing model to quantify uncertainty in the assessment.
Outcome: As expected this run did give a somewhat more pessimistic assessment result, but an alternative method to bound uncertainty was adopted (see below).

6) Compare predicted growth from the model and the mean length at age by sex from the 2004 survey
Reason: To evaluate whether the model estimates of growth are reasonable.
Outcome: This request could not be done at the meeting because the data were not readily available.

7) Prepare decision table showing the consequences if stock biomass is actually higher or lower than the base case
Details about how the decision table was prepared are described below.

Final base model and quantification of uncertainty

The base model is a split-sex model developed using Stock Synthesis 2. The model begins in 1874, approximately one generation prior to the first substantial catch. Recruitment deviations were estimated in 1956-2004. Two fisheries were modeled (winter and summer) with the fishing year beginning November 1. Data used to fit the model included two fishery CPUE time series (summer and winter), and the shelf survey biomass index (1980-2004). Length composition data from each fishery (1962-2004) and the shelf survey (1980-2004) were also used.

Sex-specific domed-shaped selectivity patterns were used to model both the summer fishery and shelf survey. For the winter fishery, an asymptotic selectivity was assumed for females and domed-shaped selectivity for males. Discard was treated as a constant fraction of catch (2.5% in both summer and winter) and included with the catch. Growth parameters were estimated in the model. Natural mortality and recruitment variability (σ_R) were fixed, but stock recruit steepness (h) was estimated.

The Panel and STAT team agreed to bracket uncertainty using models with high and low spawning biomass in 2004 that were plus and minus 1.25 standard deviations from the base model spawning biomass. After some experimentation, it was found that the 2004 estimate of the shelf survey could be perturbed to obtain the desired low and high spawning biomass levels. Stock forecasts used the pre-specified OYs for 2005 and 2006 since attaining the OY in 2005 was considered likely by the GMT.

Areas of Disagreement

There were no areas of disagreement between the Panel and STAT team.

Technical Merits and Deficiencies

The Panel recognizes that that simple northern assessment model leaves out details that could significantly improve model fits to different data sources. Nevertheless the Panel concluded that the simple base model would provide reliable management advice until the data and modeling issues can be adequately addressed.

Unresolved Problems and Major Uncertainties

The Panel did not have time to consider alternative methods of including discard in the model. A simple assumption of a constant percent discard was agreed to by the Panel and STAT team, primarily because of concerns about the reliability of historical discard estimates. This relatively crude approach assumes that discard and landed catch have the same length distribution, but it is likely that discard is primarily market (i.e., size) based.

The comparability of data collected by different agencies was an issue in this and previous assessments of petrale sole. The initial approach to model Oregon and Washington fisheries separately seemed to accentuate the difficulties rather than to resolve them. Any real difference in the fishery or in the biology of the targeted fish is confounded with differences in sampling and ageing procedures.

Apparent shifts in ageing criteria (break and burn and surface ageing) and poor model fits caused the Panel to question the reliability of the age data. The Panel recommended that all age composition data be removed from the model, however this should be considered an interim solution that needs to be revisited in future assessments.

Recommendations

1) Appropriate comparisons are needed to estimate ageing error. Potential drifts in the ageing criteria over time also should also be examined.

2) Reanalysis of the fishery CPUE data should be attempted using models that can accommodate both zero and positive tows. Although the CPUE indices appeared consistent with shelf survey biomass trends, consideration should be given to the potential impact of management restrictions on fishing practice.

3) Petrale sole stock trends were similar in both northern and southern areas. A single coastwide assessment should be considered.

Rebuilding Update for Pacific Ocean Perch

October 6, 2005

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1. Introduction

The Pacific Fishery Management Council (PFMC) adopted Amendment 11 to its Groundfish Management Plan in 1998. This amendment established a definition for an overfished stock of 25% of the unfished spawning biomass ($0.25B_0$). NMFS determined that a rebuilding plan was required for Pacific ocean perch (*Sebastes alutus*) in March 1999 based on the most recent stock assessment at that time (Ianelli and Zimmerman, 1998). The PFMC began developing a rebuilding plan for Pacific ocean perch (based upon a rebuilding analysis; August 1999; A. MacCall, pers. comm.) and submitted this plan to NMFS in February 2000. However, NMFS deferred adoption of the plan until the stock assessment was updated and reviewed, which was later that year (Ianelli *et al.*, 2000). Punt (2002) conducted a rebuilding analysis for Pacific ocean perch based on the stock assessment conducted by Ianelli *et a*l. (2000) that was consistent with the Terms of Reference for rebuilding analyses developed by the PFMC SSC (SSC, 2001; revised in 2005).

A new stock assessment for Pacific ocean perch stock was conducted in 2003 (Hamel *et al*., 2003), and updated in 2005 (Hamel, 2005). This assessment, similar to that of Ianelli *et al*. (2000), involved fitting an age-structured population dynamics model to catch, catch-rate, length-frequency, age-composition, and survey data. Ianelli *et al*. (2000), Hamel *et al*. (2003), and Hamel (2005) present results based on maximum likelihood and Bayesian estimation frameworks. A rebuilding analysis was conducted by Punt (2002), based upon the estimates corresponding to the maximum of the posterior density function (the MPD estimates) from Model 1c of Ianelli *et al*. (2000) because the STAR panel that evaluated the 2000 Pacific Ocean perch stock assessment selected this model variant as the “best assessment” (PFMC, 2000). In contrast, the STAR panel that evaluated the 2003 assessment of Pacific ocean perch endorsed both the MPD estimates and the distributions for the model outputs that arose from the application of the MCMC algorithm to sample equally likely parameter vectors from the posterior distribution (PFMC, 2003). Punt et al. (2003) conducted a rebuilding analysis with runs based upon both the MPD estimates and the MCMC outputs. The council adopted a rebuilding plan based upon the results of the MCMC analysis (sampling from the full Bayesian posterior). For this update to the previous rebuilding analysis for Pacific ocean perch, selections are taken to be the same as those on which the rebuilding analysis conducted by Punt et al. (2005) was based. Analyses using the MPD estimates are conducted for comparison.

2. Specifications

2.1 Selection of B_0

It is common to define B_0 in terms of the recruitment in the first years of the assessment period. However, this rebuilding analysis and those of Punt (2002) and Punt et al. (2003) determines B_0 from the fitted stock-recruitment relationship because this seems inherently more consistent with the assumptions underlying the original stock assessment. The MPD estimate of B_0 is 37,838 units of spawning output[1] while the posterior median and 90% intervals for B_0 are 35,371 and (28,022; 44,866). These values for B_0 are slightly lower than those on which the previous rebuilding analysis was based (MPD: 39,198, posterior: 37,230 (29,035; 47,393)). The MPD estimate of the depletion of the spawning output at the start of 2005 is 0.234 (2003: 0.254) while the posterior median and 90% intervals are 0.276 (0.198; 0.371) (2003: 0.277 (0.201; 0.384)).

2.2 Generation of future recruitment

Recruitment in the assessment and projection models for Pacific ocean perch relate to the abundance of animals aged 3 years. The assessment of Pacific ocean perch by Hamel *et al*. (2003) and its update

[1] Spawning output is defined in terms of mt of mature females.

(Hamel, 2005) both include the assumption that, *apriori*, recruitment is related to spawning output according to a Beverton-Holt stock-recruitment relationship. The rebuilding analysis conducted by Punt et al. (2003) included three approaches: basing the projections on resampling historical recruitments or from those for the years 1965-2001, basing the projections on resampling historical recruits per spawner for those same years, or assuming a Beverton-Holt spawner recruit relationship. The first approach was chosen by the council for the final rebuilding plan.

Figure 1 plots the MPD estimates of recruitment and recruits / spawning output from the assessments conducted by Hamel *et al*. (2003) and Hamel (2005). The rationale for generating future recruitment by sampling historical recruitment for rebuilding analysis conducted by Punt (2002) was that 1965-1998 was a period of relative stability in recruitment. In contrast to recruitment, recruits / spawning output showed an increasing trend over time. The situation is now slightly more complicated because there is no longer an obvious increasing trend in recruits / spawning output with time for either the 2003 or 2005 assessments, nor are the recruitments completely stable. In keeping with the previous decision, resampling historical recruitment (now from the years 1965-2003) is used exclusively for the analyses in this document. Hamel (2005) estimated steepness for Pacific ocean perch to be 0.55.

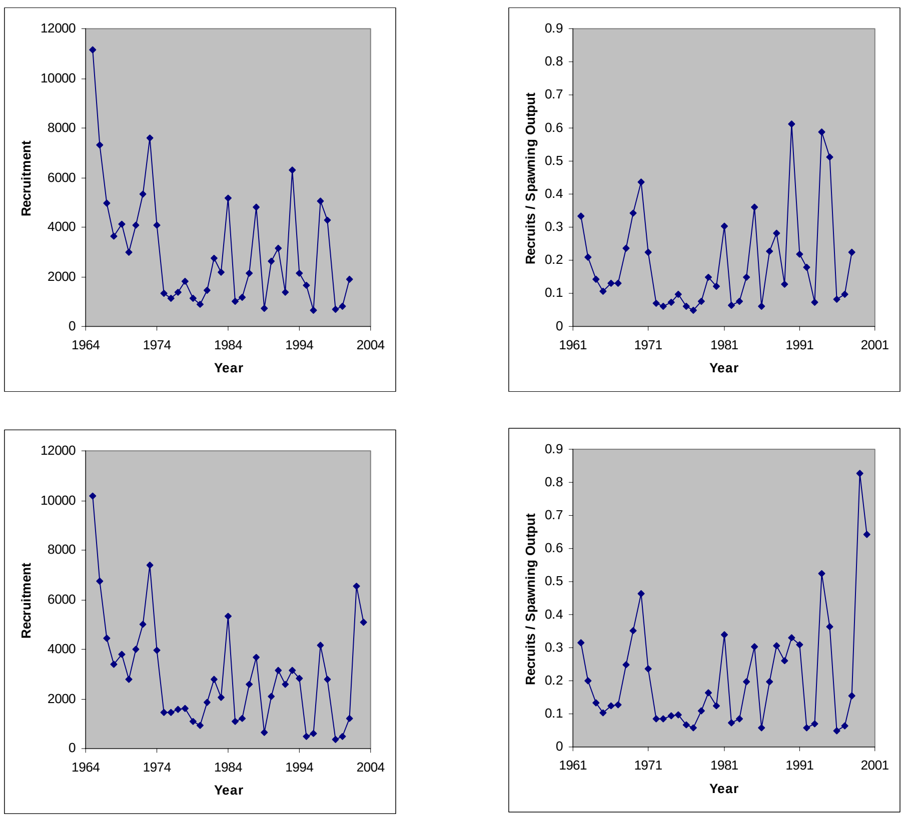

Figure 1: Recruitment and recruits per spawner for assessments of Pacific ocean perch conducted in 2003 and 2005 (upper and lower panels respectively).

2.3 Mean generation time

The mean generation time is defined as the mean age weighted by net spawning output (see Figure 2 for a plot of net spawning output *versus* age based on the MPD estimates). The best estimate of the mean generation time for the full posterior is 28 years, and for the MPD it is 29 years. These are unchanged from the 2003 rebuilding analysis.

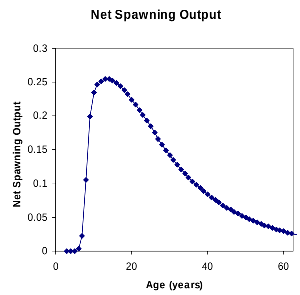

Figure 2: MPD relationship between net spawning output and age for Pacific Ocean perch.

2.4 The harvest strategies

Table 1 summarizes those options considered in the analyses of this paper. These include calculating the probability of rebuilding by T_{target} and T_{max} from the last rebuilding analysis or by a recalculated T_{max} assuming the same rebuild SPR as in the previous analysis (cases 1, 3, and 5). The rebuild SPR of 0.696 was calculated from the rebuild fishing mortality of 0.0257 computed by Punt et al. (2003) and other biological parameters from the 2003. Cases 2, 4, and 6 involve recalculating the SPR given a 50% probability of rebuilding by T_{target} or a 70% probability of rebuilding by T_{max}. Case 7 estimates the probability of rebuilding by the previous T_{max} given that the catch series adopted by the council following the 2003 rebuilding analysis is continued. Case 8 uses the median catch series from case 4. These 8 cases are also explored using the MPD results for comparison.

Table 1: Harvest strategy options considered in this document.

Case	Future recruitment	T_{max}	$SPR_{rebuild}$	P_{max}
1	Recruits	2026	0.696	Re-estimated
2	Recruits	2026	Re-estimated	0.5
3	Recruits	2042	0.696	Re-estimated
4	Recruits	2042	Re-estimated	0.7
5	Recruits	Re-estimated	0.696	Re-estimated
6	Recruits	Re-estimated	Re-estimated	0.7
7	Recruits	2042	2003 catch series	Re-estimated
8	Recruits	2042	Case 4 catch series	Re-estimated

2.5 Other specifications

The calculations of this document were performed using Version 2.8 of the rebuilding software developed by Punt (2005) and the results are based on 1,000 Monte Carlo replicates (analyses based on the MPD estimates) and 3,000 Monte Carlo replicates (analyses based on 1,000 random samples from the full Bayesian posterior distribution). The selection of 1,000 replicates is based on the evaluation of Monte Carlo precision conducted by Punt (2002). The analyses based on full posterior distribution involve 3 simulations for each of 1,000 samples for the posterior.

The definition of "recovery by year *y*" in this analysis is that the spawning output reaches $0.4B_0$ by year *y* (even if it subsequently drops below this level due to recruitment variability). Appendix 1 lists the MPD estimates for the biological and technological parameters and the age-structure of the population at the start of 2000 / 2005, while Appendix 2 lists the MPD time-series of recruitment and spawning output. The input to the rebuilding program for cases 3 and 4 is given as Appendix 3. The catch for 2005 and 2006 were set to 447 mt (the Council-selected *OYs* for 2005-2006).

3. Results

3.1 Time-to-recovery

Figure 3 shows the distribution for the number of years beyond the year 2000 that it would have taken to recover to $0.4B_0$ had there been no harvest since 2000. Results are shown for analyses based on the MPD estimates (left panel) and the full Bayesian posterior (right panel). As expected, the distribution based on the full Bayesian posterior has a much longer tail than that based on the MPD estimates. The median time to recover to 0.4 B_0 in the absence of catches with 50% probability is termed $T_{\min}$. The values for $T_{\min}$ (15 and 19 years respectively for the full Bayesian and MPD results) are greater than the value of $T_{\min}$ from the previous rebuilding analysis (14 and 17 years respectively). If $T_{\max}$ is determined using the new information on the depletion level and the age-structure of the population in 2000, it changes only slightly from 2042 to 2043 if the calculations are based on the full Bayesian estimates but increases to 2048 if the calculations are based on the MPD results.

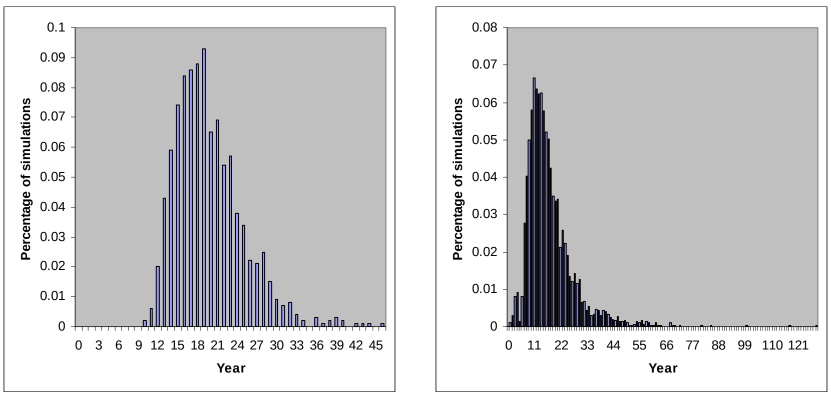

Figure 3: Time to recover to $0.4B_0$ in the absence of catches from 2000 on for the base-case analysis. The results based on the MPD estimates are shown in the left panel and those based on full Bayesian posterior in the right panel.

3.2 OYs and fishing mortalities

Table 2 gives summary statistics from the 2003 rebuilding plan and the current analysis for full posterior and MPD results. Tables 3 and 4 list some key output statistics for six rebuild strategies (probabilities of recovery in the maximum allowable rebuild period of 0.5, 0.7, the 40-10 rule, the ABC rule, the strategy of setting SPR from 2007 equal to 0.696, and going forward with the chosen strategy from the previous rebuilding analysis). Table 3 lists results based on the full Bayesian posterior. Results are shown for each of the analysis options outlined in Table 1. Table 4 lists results based on the MPD estimates.

Table 2: Summary statistics.

Case	2003	Bayesian	MPD
Year in which rebuilding commenced	2000	2000	2000
Present year	2003	2005	2005
Tmin	14 years	15 years	19 years
Mean generation time	28 years	28 years	29 years
Tmax	2042	2043	2048

Table 3: Five management-related quantities for various rebuild strategies for the projections based on the full posterior distribution.

Scenario / Quantity	*Rebuild Strategy*				
	P_{max}=0.5	Defined	P_{max}=0.7	40-10 rule	ABC rule
2003 Rebuilding analysis (T_{max}=2042)					
Fishing mortality rate			0.0257		
SPR			0.696		0.500
OY_{2004} (mt)			443.6	612.6	979.9
P_{max}			70.1	38.9	27.9
T_{target}			2026.4	N/A	N/A
Cases 1/2 (T_{max}=2026)					
Fishing mortality rate	0.0304				
SPR	0.633	0.696			0.500
OY_{2007} (mt)	521.7	397.0		514.5	900.0
P_{max}	50.0	59.7		34.2	26.7
T_{target}	2026.0	2021.4		N/A	N/A
Cases 3/4 (T_{max}=2042)					
Fishing mortality rate			0.0290		
SPR		0.696	0.644		0.500
OY_{2007} (mt)		397.0	498.1	514.5	900.0
P_{max}		78.2	70.0	48.5	38.0
T_{target}		2021.4	2025.0	N/A	N/A
Cases 5/6 (T_{max}=2043)					
Fishing mortality rate			0.0295		
SPR		0.696	0.640		0.500
OY_{2007} (mt)		397.0	505.9	514.5	900.0
P_{max}		78.9	70.0	49.0	38.6
T_{target}		2021.4	2025.4	N/A	N/A
Cases 7/8 (T_{max}=2042)					
Fishing mortality rate					
SPR		N/A	N/A		
OY_{2007} (mt)		449.0	498.0		
P_{max}		74.3	68.2		
T_{target}		2021.3	2024.8		

4. Selection of a preferred variant

The Council interim choice for P_{max} is 70%. The 2007 OYs in Tables 3 and 4, based upon either this P_{max} or the previous SPR, range from 356 to 506 mt. Table 5 shows 10 year projections for the 6 requested runs (Cases 1-6). The 2007 OY from the previous adopted rebuilding plan is 449 mt, within the range of the current estimates. Appendix 4 lists the annual catches (2007+) for five of the harvest strategies in Tables 3 and 4, for cases 3, 4, and 7, including the Pmax = 0.7, the 2003 catch series, SPR = 0.696, the 40-10 rule and the ABC rule. Appendix 5 lists the annual median spawning output for those five rebuilding strategies. Appendix 6 lists the annual median spawning output relative to B_{40} for the five rebuilding strategies. Appendix 7 lists the annual median ABC for the five rebuilding strategies.

Table 4: Five management-related quantities for various rebuild strategies for the projections based on the MPD estimates

Scenario / Quantity	*Rebuild Strategy*				
	P_{max}=0.5	Defined	P_{max}=0.7	40-10 rule	ABC rule
2003 Rebuilding analysis (T_{max}=2042)					
Fishing mortality rate			0.0218		
SPR			0.0731		0.500
OY_{2004} (mt)			334.7	449.3	840.5
P_{max}			69.9	12.2	2.0
T_{target}			2031.6	N/A	N/A
Cases 1/2 (T_{max}=2026)					
Fishing mortality rate	0.0149				
SPR	0.783	0.696			0.500
OY_{2007} (mt)	230.2	356.4		449.3	840.5
P_{max}	50.0	27.9		4.4	0.7
T_{target}	2026.0	2032.6		N/A	N/A
Cases 3/4 (T_{max}=2042)					
Fishing mortality rate			0.0231		
SPR		0.696	0.696		0.500
OY_{2007} (mt)		356.4	356.5	449.3	840.5
P_{max}		70.1	70.0	14.2	4.5
T_{target}		2032.6	2032.6	N/A	N/A
Cases 5/6 (T_{max}=2048)					
Fishing mortality rate			0.0256		
SPR		0.696	0.673		0.500
OY_{2007} (mt)		356.4	394.2	449.3	840.5
P_{max}		78.1	70.0	17.9	6.0
T_{target}		2032.6	2035.6	N/A	N/A
Case 7 (T_{max}=2042)					
Fishing mortality rate					
SPR		N/A	N/A		
OY_{2007} (mt)		449.0	357.0		
P_{max}		57.6	67.9		
T_{target}		2037.5	2032.3		

Figures 5 and 6 contrast the time-trajectory of the probability of recovery and of catch for 5 rebuild strategies, with T_{max} = 2042: Probability of recovery equals 0.7, the 2003 rebuilding plan catch series, zero catch, the 40-10 rule and the ABC rule. Figure 5 shows the results based upon the full Bayesian posterior, and Figure 6 shows the results based upon the MPD figures.

Table 5: Ten year catch/OY projections for the six requested runs.

Year	Run 1	Run 2	Run 3	Run 4	Run 5	Run 6
P	0.597	0.5	0.782	0.7	0.789	0.7
SPR	0.696	0.633	0.696	0.644	0.696	0.640
F	0.0231	0.0304	0.0231	0.0290	0.0231	0.0295
T_{max}			**2042**	**2042**	**2043**	**2043**
T_{target}	**2026**	**2026**	2021	2025	2021	2025
2007	397	522	397	498	397	506
2008	412	538	412	514	412	522
2009	431	561	431	536	431	544
2010	455	588	455	564	455	572
2011	473	609	473	583	473	591
2012	482	617	482	592	482	600
2013	488	621	488	597	488	605
2014	498	633	498	608	498	616
2015	508	643	508	618	508	626
2016	519	655	519	630	519	638

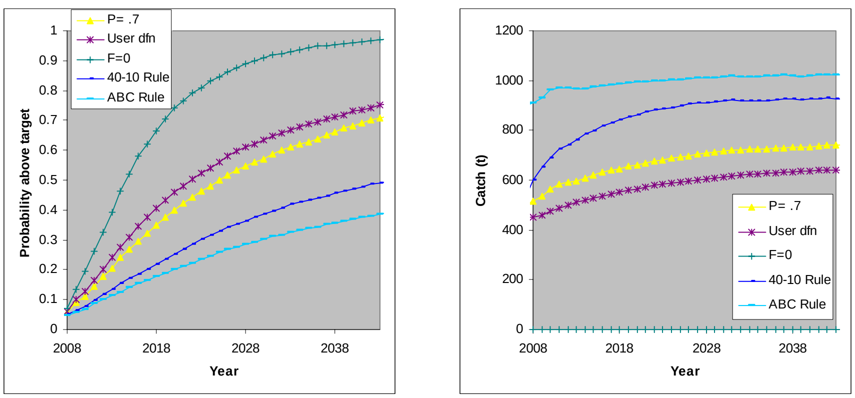

Figure 5: Time trajectories of the probability of recovery and catch for five rebuild strategies by T_{max} = 2042 based upon the full Bayesian posterior.

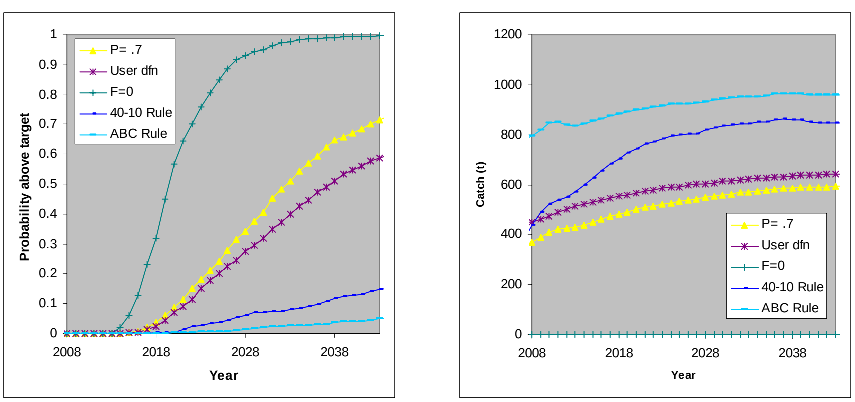

Figure 6: Time trajectories of the probability of recovery and catch for five rebuild strategies by T_{max} = 2042 based upon the MPD results.

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Appendix 1 : Biological and technological parameters used for the rebuilding analyses based on the MPD estimates.

Age	Fecundity	Weight (kg)	Selectivity	Natural mortality	*N* (2000)	*N* (2005)
3	0.000	0.169	0.001	0.0514	490	1385
4	0.000	0.241	0.003	0.0514	353	1316
5	0.000	0.317	0.012	0.0514	2511	4595
6	0.004	0.396	0.048	0.0514	3578	5608
7	0.028	0.474	0.163	0.0514	479	981
8	0.137	0.550	0.383	0.0514	384	378
9	0.274	0.622	0.598	0.0514	2028	271
10	0.339	0.690	0.810	0.0514	2071	1917
11	0.375	0.752	1.000	0.0514	1554	2703
12	0.404	0.809	0.992	0.0514	1697	357
13	0.431	0.861	0.933	0.0514	1006	283
14	0.454	0.908	0.860	0.0514	269	1480
15	0.475	0.950	0.860	0.0514	1360	1503
16	0.494	0.987	0.860	0.0514	842	1127
17	0.510	1.021	0.860	0.0514	344	1233
18	0.525	1.050	0.860	0.0514	270	733
19	0.538	1.076	0.860	0.0514	1143	196
20	0.550	1.099	0.860	0.0514	386	992
21	0.560	1.119	0.860	0.0514	464	614
22	0.569	1.137	0.860	0.0514	268	251
23	0.576	1.153	0.860	0.0514	118	197
24	0.583	1.166	0.860	0.0514	122	834
25+	0.589	1.178	0.860	0.0514	3405	3475

Appendix 2 : MPD historical series of spawning output and recruitment.

Year	Recruitment (age 3)	Spawning output
1956	3701	33537
1957	46180	32332
1958	4026	31204
1959	18498	30754
1960	8784	30435
1961	4151	30558
1962	3554	32282
1963	4872	33901
1964	14223	33527
1965	10177	33191
1966	6753	30670
1967	4433	21919
1968	3381	16088
1969	3795	14210
1970	2783	15892
1971	3984	16714
1972	4994	17089
1973	7387	17255
1974	3967	16928
1975	1468	16669
1976	1460	16736
1977	1586	16708
1978	1636	17112
1979	1108	16983
1980	938	16470
1981	1855	15632
1982	2803	14828
1983	2046	14243
1984	5319	13121
1985	1096	12094
1986	1215	11228
1987	2593	10597
1988	3660	10254
1989	635	9921
1990	2100	9527
1991	3152	9139
1992	2583	8592
1993	3133	8365
1994	2837	7970
1995	501	7652
1996	591	7578
1997	4178	7607
1998	2784	7763
1999	372	7902
2000	490	7925
2001	1206	8012
2002	6543	8222
2003	5093	8640
2004	1385	8846
2005	1385	8846

Appendix 3 : The input file for the base-case rebuilding analysis

```
#Title
POP Re2005
# Number of sexes
1
# Age range to consider (minimum age; maximum age)
3 25
# Number of fleets
1
# First year of projection
2005
# Year declared overfished
2000
# Is the maximum age a plus-group (1=Yes;2=No)
1
# Generate future recruitments using historical recruitments (1)  historical recruits/spawner (2)  or a stock-recruitment (3)
1
# Constant fishing mortality (1) or constant Catch (2) projections
1
# Fishing mortality based on SPR (1) or actual rate (2)
1
# Pre-specify the year of recovery (or -1) to ignore
35
# Fecundity-at-age
# 3 4 5 6 7 8 9 10 11 12 13 14 15 16 17 18 19 20 21 22 23 24 25
3.84E-06 4.03E-05 0.000392248 0.003560962 0.028260766 0.1374925 0.273954602 0.338584679 0.375081501 0.404469053 0.430553194
0.453991276 0.4749965 0.493739 0.510395 0.52515 0.53818 0.549655 0.559745 0.568595 0.576345 0.58313 0.589055
# Age specific information (Females then males) weight  selectivity
0.169105 0.240603 0.317273 0.395966 0.474162 0.54997 0.62206 0.689572 0.752022 0.80921 0.861146 0.907988 0.949993 0.987478 1.02079 1.0503
1.07636 1.09931 1.11949 1.13719 1.15269 1.16626 1.17811
        0.000903593     0.003300729     0.012388376     0.047593441     0.163229009     0.382540283
        0.598099334     0.809628096     1       0.991963314     0.932527674     0.860131135     0.860131135
        0.860131135     0.860131135     0.860131135     0.860131135     0.860131135     0.860131135
        0.860131135     0.860131135     0.860131135     0.860131135
# M and current age-structure
0.0513825 0.0513825 0.0513825 0.0513825 0.0513825 0.0513825 0.0513825 0.0513825 0.0513825 0.0513825 0.0513825 0.0513825 0.0513825
        0.0513825 0.0513825 0.0513825 0.0513825 0.0513825 0.0513825 0.0513825 0.0513825 0.0513825 0.0513825
1385.26 1315.86 4595.37 5607.68 981.432 378.161 271.302 1916.72 2703.19 357.442 282.7   1480.32 1503.2
        1126.99 1233.43 733.158 195.904 991.757 614.288 250.854 197.062 833.566 3475.15
# Age-structure at declaration
        490.092 353.044 2511.34 3578.08 479.42  383.831 2028.39 2071.01 1553.79 1696.58 1006.08 268.582
        1359.69 842.181 343.918 270.169 1142.81 385.819 464.475 268.23  118.46  122.402 3405
# Year for Tmin Age-structure
2000
# Number of simulations
3000
#  recruitment and biomass
# Number of historical assessment years
51
# Historical data
# year recruitment spawner in B0 in R project in R/S project
1955    4917.35 37837.7 1       0       0
1956    3701.21 33536.7 0       0       0
1957    46180.4 32331.7 0       0       0
1958    4025.69 31204   0       0       0
1959    18497.7 30753.6 0       0       1
1960    8784.3  30435.3 0       0       1
1961    4150.88 30557.9 0       0       1
1962    3553.65 32281.5 0       0       1
1963    4871.81 33900.7 0       0       1
1964    14222.6 33527.1 0       0       1
1965    10177   33191.1 0       1       1
1966    6752.62 30670.1 0       1       1
1967    4433.1  21918.6 0       1       1
1968    3381.03 16087.5 0       1       1
1969    3795.42 14209.6 0       1       1
1970    2783.04 15892.2 0       1       1
1971    3984.48 16713.8 0       1       1
1972    4994.01 17089   0       1       1
1973    7386.61 17255.1 0       1       1
1974    3966.51 16928.4 0       1       1
```

1975	1467.6	16669.2	0	1	1
1976	1459.93	16735.7	0	1	1
1977	1585.72	16707.5	0	1	1
1978	1636.11	17112.3	0	1	1
1979	1107.56	16982.5	0	1	1
1980	937.97	16469.5	0	1	1
1981	1854.81	15631.7	0	1	1
1982	2802.99	14828.1	0	1	1
1983	2046.46	14242.8	0	1	1
1984	5318.98	13120.6	0	1	1
1985	1096.11	12093.5	0	1	1
1986	1214.67	11228	0	1	1
1987	2592.61	10596.6	0	1	1
1988	3660.31	10253.9	0	1	1
1989	634.96	9920.8	0	1	1
1990	2100.48	9527.23	0	1	1
1991	3152.13	9138.56	0	1	1
1992	2582.58	8591.56	0	1	1
1993	3132.81	8365.16	0	1	1
1994	2836.94	7969.99	0	1	1
1995	501.47	7652.18	0	1	1
1996	590.583	7577.77	0	1	1
1997	4177.68	7607.47	0	1	1
1998	2783.69	7762.58	0	1	1
1999	371.673	7901.71	0	1	1
2000	490.092	7925.14	0	1	1
2001	1206.17	8012.21	0	1	1
2002	6543.38	8221.56	0	1	1
2003	5092.95	8639.65	0	1	1
2004	1385.26	8846.15	0	0	0
2005	1385.26	8845.86	0	0	0

```
# Number of years with pre-specified catches
2
# catches for years with pre-specified catches
2005	447
2006	447
# Number of future recruitments to override
0
# Process for overriding (-1 for average otherwise index in data list)
# Which probability to product detailed results for (1=0.5; 2=0.6; etc.)
3
# Steepness sigma-R Auto-correlation
0.550651	1	0
# Target SPR rate (FMSY Proxy)
0.5
# Target SPR information: Use (1=Yes) and power
0	20
# Discount rate (for cumulative catch)
0.1
# Truncate the series when 0.4B0 is reached (1=Yes)
0
# Set F to FMSY once 0.4B0 is reached (1=Yes)
0
# Percentage of FMSY which defines Ftarget
0.9
# Maximum possible F for projection (-1 to set to FMSY)
-1
# Conduct MacCall transition policy (1=Yes)
0
# Definition of recovery (1=now only;2=now or before)
2
# Results for rec probs by Tmax (1) or 0.5 prob for various Ttargets (2)
1
"# Definition of the ""40-10"" rule"
10	40
# Produce the risk-reward plots (1=Yes)
0
# Calculate coefficients of variation (1=Yes)
0
# Number of replicates to use
10
# Random number seed
```

```
-99004
# Conduct projections for multiple starting values (0=No;else yes)
1
# File with multiple parameter vectors
mcmcreb.dat
# Number of parameter vectors
1000
# User-specific projection (1=Yes); Output replaced (1->9)
1	5	0	0.1
# Catches and Fs (Year; 1/2/3 (F or C or SPR); value); Final row is -1
2007	3	0.696
-1	-1	-1
# Split of Fs
2005	1
-1	1
# Time varying weight-at-age (1=Yes;0=No)
0
# File with time series of weight-at-age data
HakWght.Csv
```

Appendix 4 : Median annual catches (mt) for five rebuilding strategies.

(a) Projections based on the full posterior estimates; Future recruitment = recruits

Year	Prob=0.7	2003 Prj	SPR=0.696	40-10 rule	ABC rule
2007	498	449	397	514	900
2008	514	450	412	599	911
2009	536	460	431	654	931
2010	564	474	455	689	961
2011	583	488	473	724	970
2012	592	500	482	741	972
2013	597	512	488	762	967
2014	608	521	498	784	967
2015	618	529	508	797	973
2016	630	537	519	817	977
2017	638	544	528	828	981
2018	645	553	535	841	986
2019	655	559	545	855	990
2020	661	565	551	861	994
2021	668	572	558	873	995
2022	678	578	566	880	998
2023	682	584	572	886	999
2024	688	588	578	892	1001
2025	693	591	583	899	1005
2026	698	596	588	904	1007
2027	704	601	593	911	1012
2028	709	604	599	911	1010
2029	712	607	603	915	1013
2030	715	613	607	918	1014
2031	719	616	609	920	1017
2032	720	619	612	918	1017
2033	724	624	615	918	1017
2034	724	626	616	919	1015
2035	726	628	619	919	1020
2036	728	630	621	922	1020
2037	730	632	623	926	1023
2038	733	634	625	925	1019
2039	733	637	626	922	1016
2040	734	637	627	928	1017
2041	737	639	630	925	1022
2042	740	641	632	931	1021
2043	742	642	633	927	1022
2044	741	642	634	926	1024
2045	741	644	634	929	1019
2046	745	644	638	929	1025
2047	746	647	639	928	1026
2048	747	646	641	921	1022
2049	746	647	640	926	1022
2050	746	649	640	926	1023

(b) Projections based on the MPD estimates; Future recruitment = recruits

Year	Prob=0.7	2003 Prj	SPR=0.696	40-10 rule	ABC rule
2007	357	449	356	370	780
2008	370	450	370	437	793
2009	390	460	390	490	818
2010	411	474	411	521	846
2011	422	488	422	537	851
2012	425	500	425	550	841
2013	429	512	429	569	835
2014	439	521	439	599	842
2015	450	529	450	626	853
2016	461	537	461	653	864
2017	472	544	472	680	874
2018	483	553	482	702	884
2019	491	559	491	727	893
2020	501	565	501	743	898
2021	508	572	508	761	903
2022	514	578	514	771	912
2023	522	584	522	784	915
2024	528	588	527	793	922
2025	534	591	534	798	922
2026	538	596	538	801	923
2027	542	601	542	804	928
2028	549	604	549	817	933
2029	554	607	554	825	938
2030	558	613	557	834	944
2031	562	616	562	840	948
2032	569	619	568	842	951
2033	571	624	571	843	950
2034	574	626	574	850	952
2035	577	628	577	853	956
2036	582	630	582	858	963
2037	586	632	585	863	962
2038	588	634	588	860	963
2039	590	637	590	858	962
2040	589	637	589	851	959
2041	590	639	590	847	960
2042	591	641	590	849	958
2043	593	642	592	847	958
2044	594	642	594	849	959
2045	595	644	595	853	960
2046	598	644	598	858	961
2047	600	647	600	851	962
2048	599	646	599	854	965
2049	603	647	602	852	965
2050	603	649	603	852	963

Appendix 5 : Time trajectories of median spawning output for five rebuilding strategies.

(a) Projections based on the full posterior estimates; Future recruitment = recruits

Year	Prob=0.7	2003 Prj	SPR=0.696	40-10 rule	ABC rule
2007	9775	9775	9775	9775	9775
2008	10469	10500	10518	10444	10258
2009	10892	10934	10989	10830	10490
2010	11092	11183	11244	10931	10489
2011	11328	11460	11528	11119	10533
2012	11581	11755	11832	11255	10598
2013	11776	12010	12078	11382	10637
2014	12003	12276	12366	11505	10678
2015	12226	12544	12620	11630	10714
2016	12413	12786	12857	11692	10757
2017	12571	12956	13051	11853	10815
2018	12747	13139	13258	11919	10884
2019	12912	13358	13474	12025	10982
2020	13109	13580	13706	12095	10988
2021	13210	13749	13841	12158	11019
2022	13332	13900	14004	12204	11074
2023	13436	14054	14159	12275	11127
2024	13553	14215	14274	12311	11155
2025	13676	14347	14430	12364	11207
2026	13797	14453	14590	12386	11212
2027	13906	14585	14729	12424	11232
2028	13984	14727	14839	12453	11258
2029	14030	14829	14901	12424	11253
2030	14060	14921	14946	12453	11234
2031	14136	15008	15034	12447	11233
2032	14210	15097	15117	12475	11249
2033	14279	15147	15208	12503	11263
2034	14305	15196	15266	12536	11314
2035	14319	15247	15319	12544	11340
2036	14385	15297	15355	12512	11360
2037	14415	15372	15410	12536	11350
2038	14458	15425	15462	12550	11342
2039	14529	15450	15561	12575	11373
2040	14551	15488	15591	12569	11383
2041	14568	15545	15611	12542	11373
2042	14587	15595	15657	12496	11341
2043	14593	15636	15676	12512	11362
2044	14604	15667	15696	12515	11378
2045	14604	15684	15689	12512	11357
2046	14637	15710	15726	12520	11386
2047	14650	15663	15739	12539	11417
2048	14703	15770	15800	12553	11394
2049	14672	15789	15780	12541	11387
2050	14691	15773	15806	12551	11391

(b) Projections based on the MPD estimates; Future recruitment = recruits

Year	Prob=0.7	2003 Prj	SPR=0.696	40-10 rule	ABC rule
2007	9147	9147	9147	9147	9147
2008	9881	9835	9881	9874	9671
2009	10344	10259	10344	10304	9923
2010	10481	10362	10482	10391	9851
2011	10593	10444	10594	10449	9756
2012	10806	10627	10807	10606	9769
2013	11080	10868	11080	10823	9862
2014	11376	11131	11376	11049	9974
2015	11626	11347	11627	11228	10068
2016	11878	11562	11879	11417	10162
2017	12152	11811	12153	11587	10269
2018	12415	12030	12416	11767	10394
2019	12671	12270	12672	11914	10507
2020	12912	12487	12913	12026	10579
2021	13084	12675	13085	12139	10637
2022	13252	12828	13254	12188	10715
2023	13432	12985	13434	12272	10727
2024	13599	13161	13600	12346	10819
2025	13773	13284	13775	12385	10867
2026	13865	13398	13867	12391	10875
2027	13988	13504	13990	12407	10919
2028	14135	13657	14137	12505	10964
2029	14289	13796	14291	12551	11036
2030	14427	13912	14429	12608	11097
2031	14529	14038	14530	12625	11155
2032	14655	14102	14657	12644	11168
2033	14727	14212	14728	12665	11180
2034	14829	14340	14831	12705	11235
2035	14943	14438	14945	12731	11303
2036	15029	14484	15031	12770	11328
2037	15100	14587	15102	12784	11316
2038	15169	14648	15171	12754	11338
2039	15182	14662	15184	12732	11305
2040	15177	14676	15179	12704	11315
2041	15271	14704	15274	12681	11282
2042	15290	14755	15292	12706	11272
2043	15305	14744	15307	12683	11312
2044	15363	14818	15365	12698	11319
2045	15367	14825	15369	12718	11330
2046	15445	14881	15447	12724	11354
2047	15498	14941	15501	12712	11305
2048	15449	14960	15451	12729	11309
2049	15523	14944	15526	12713	11365
2050	15530	15034	15532	12731	11317

Appendix 6 : Time trajectories of median spawning output relative to target for five rebuilding strategies.

(a) Projections based on the full posterior estimates; Future recruitment = recruits

Year	Prob=0.7	2003 Prj	SPR=0.696	40-10 rule	ABC rule
2007	0.69	0.69	0.69	0.69	0.69
2008	0.75	0.75	0.75	0.75	0.73
2009	0.78	0.78	0.78	0.77	0.75
2010	0.79	0.80	0.80	0.78	0.75
2011	0.80	0.81	0.82	0.79	0.75
2012	0.82	0.83	0.84	0.80	0.75
2013	0.84	0.85	0.86	0.81	0.75
2014	0.85	0.87	0.88	0.82	0.76
2015	0.86	0.89	0.89	0.83	0.77
2016	0.88	0.90	0.91	0.83	0.77
2017	0.89	0.92	0.93	0.84	0.77
2018	0.90	0.93	0.94	0.84	0.77
2019	0.92	0.94	0.96	0.85	0.78
2020	0.93	0.96	0.97	0.85	0.78
2021	0.93	0.97	0.97	0.86	0.78
2022	0.94	0.98	0.99	0.86	0.78
2023	0.95	0.99	1.00	0.86	0.78
2024	0.96	1.00	1.01	0.86	0.78
2025	0.97	1.01	1.02	0.86	0.79
2026	0.97	1.02	1.03	0.87	0.79
2027	0.98	1.03	1.04	0.87	0.79
2028	0.99	1.04	1.04	0.87	0.79
2029	0.99	1.04	1.05	0.87	0.79
2030	1.00	1.05	1.06	0.87	0.79
2031	1.00	1.06	1.06	0.87	0.80
2032	1.01	1.06	1.07	0.87	0.80
2033	1.01	1.07	1.08	0.87	0.79
2034	1.01	1.07	1.08	0.87	0.79
2035	1.01	1.07	1.08	0.87	0.80
2036	1.01	1.08	1.08	0.88	0.80
2037	1.01	1.08	1.09	0.87	0.80
2038	1.02	1.08	1.09	0.87	0.80
2039	1.02	1.08	1.09	0.88	0.80
2040	1.03	1.09	1.10	0.88	0.81
2041	1.03	1.09	1.10	0.88	0.81
2042	1.03	1.10	1.11	0.88	0.80
2043	1.03	1.10	1.11	0.88	0.80
2044	1.04	1.10	1.11	0.88	0.80
2045	1.04	1.10	1.11	0.88	0.80
2046	1.04	1.10	1.12	0.88	0.80
2047	1.04	1.10	1.12	0.87	0.80
2048	1.04	1.11	1.12	0.87	0.80
2049	1.04	1.11	1.11	0.87	0.80
2050	1.04	1.11	1.12	0.87	0.80

(b) Projections based on the MPD estimates; Future recruitment = recruits

Year	Prob=0.7	2003 Prj	SPR=0.696	40-10 rule	ABC rule
2007	0.61	0.61	0.61	0.61	0.61
2008	0.65	0.65	0.65	0.65	0.64
2009	0.69	0.68	0.69	0.68	0.66
2010	0.69	0.69	0.69	0.69	0.65
2011	0.70	0.69	0.70	0.69	0.65
2012	0.72	0.70	0.72	0.70	0.65
2013	0.73	0.72	0.73	0.72	0.65
2014	0.75	0.74	0.75	0.73	0.66
2015	0.77	0.75	0.77	0.74	0.67
2016	0.79	0.77	0.79	0.76	0.67
2017	0.81	0.78	0.81	0.77	0.68
2018	0.82	0.80	0.82	0.78	0.69
2019	0.84	0.81	0.84	0.79	0.70
2020	0.86	0.83	0.86	0.80	0.70
2021	0.87	0.84	0.87	0.80	0.70
2022	0.88	0.85	0.88	0.81	0.71
2023	0.89	0.86	0.89	0.81	0.71
2024	0.90	0.87	0.90	0.82	0.72
2025	0.91	0.88	0.91	0.82	0.72
2026	0.92	0.89	0.92	0.82	0.72
2027	0.93	0.89	0.93	0.82	0.72
2028	0.94	0.90	0.94	0.83	0.73
2029	0.95	0.91	0.95	0.83	0.73
2030	0.96	0.92	0.96	0.84	0.74
2031	0.96	0.93	0.96	0.84	0.74
2032	0.97	0.93	0.97	0.84	0.74
2033	0.98	0.94	0.98	0.84	0.74
2034	0.98	0.95	0.98	0.84	0.74
2035	0.99	0.96	0.99	0.84	0.75
2036	1.00	0.96	1.00	0.85	0.75
2037	1.00	0.97	1.00	0.85	0.75
2038	1.01	0.97	1.01	0.85	0.75
2039	1.01	0.97	1.01	0.84	0.75
2040	1.01	0.97	1.01	0.84	0.75
2041	1.01	0.97	1.01	0.84	0.75
2042	1.01	0.98	1.01	0.84	0.75
2043	1.01	0.98	1.01	0.84	0.75
2044	1.02	0.98	1.02	0.84	0.75
2045	1.02	0.98	1.02	0.84	0.75
2046	1.02	0.99	1.02	0.84	0.75
2047	1.03	0.99	1.03	0.84	0.75
2048	1.02	0.99	1.02	0.84	0.75
2049	1.03	0.99	1.03	0.84	0.75
2050	1.03	1.00	1.03	0.84	0.75

Appendix 7 : Time trajectories of ABC for five rebuilding strategies.

(a) Projections based on the full posterior estimates; Future recruitment = recruits

Year	Prob=0.7	2003 Prj	SPR=0.696	40-10 rule	ABC rule
2007	900	900	900	900	900
2008	930	932	935	927	911
2009	970	976	980	965	931
2010	1017	1026	1031	1006	961
2011	1043	1059	1063	1025	970
2012	1063	1082	1087	1040	972
2013	1075	1096	1103	1042	967
2014	1089	1112	1121	1054	967
2015	1112	1137	1150	1068	973
2016	1128	1157	1167	1076	977
2017	1141	1173	1187	1085	981
2018	1159	1195	1206	1093	986
2019	1178	1217	1230	1100	990
2020	1191	1232	1245	1107	994
2021	1204	1249	1262	1110	995
2022	1215	1262	1276	1114	998
2023	1225	1274	1291	1119	999
2024	1235	1288	1304	1121	1001
2025	1244	1302	1315	1124	1005
2026	1252	1314	1326	1128	1007
2027	1261	1321	1336	1129	1012
2028	1271	1333	1349	1131	1010
2029	1273	1344	1353	1134	1013
2030	1276	1353	1359	1138	1014
2031	1285	1359	1368	1133	1017
2032	1286	1365	1370	1132	1017
2033	1292	1371	1377	1134	1017
2034	1297	1376	1384	1138	1015
2035	1301	1382	1390	1140	1020
2036	1307	1383	1398	1141	1020
2037	1311	1389	1401	1137	1023
2038	1314	1396	1409	1137	1019
2039	1313	1401	1408	1135	1016
2040	1318	1403	1413	1139	1017
2041	1320	1406	1416	1141	1022
2042	1324	1411	1420	1141	1021
2043	1329	1412	1427	1142	1022
2044	1332	1414	1429	1140	1024
2045	1335	1417	1435	1142	1019
2046	1339	1420	1438	1142	1025
2047	1338	1425	1442	1140	1026
2048	1335	1428	1439	1135	1022
2049	1333	1425	1438	1132	1022
2050	1334	1426	1438	1131	1023

(b) Projections based on the MPD estimates; Future recruitment = recruits

Year	Prob=0.7	2003 Prj	SPR=0.696	40-10 rule	ABC rule
2007	780	780	780	780	780
2008	811	807	811	810	793
2009	853	846	853	850	818
2010	900	889	900	892	846
2011	924	911	924	911	851
2012	930	914	930	912	841
2013	939	921	939	916	835
2014	960	939	960	932	842
2015	985	961	985	951	853
2016	1010	983	1010	970	864
2017	1032	1003	1032	984	874
2018	1056	1024	1056	999	884
2019	1075	1042	1075	1011	893
2020	1097	1060	1097	1020	898
2021	1111	1077	1112	1029	903
2022	1126	1089	1126	1036	912
2023	1142	1104	1142	1042	915
2024	1154	1117	1154	1047	922
2025	1168	1126	1168	1049	922
2026	1178	1137	1178	1051	923
2027	1187	1145	1187	1056	928
2028	1201	1160	1201	1058	933
2029	1212	1166	1213	1064	938
2030	1221	1178	1221	1071	944
2031	1231	1186	1231	1072	948
2032	1245	1195	1245	1074	951
2033	1249	1203	1249	1075	950
2034	1256	1213	1256	1078	952
2035	1263	1221	1264	1082	956
2036	1274	1227	1274	1082	963
2037	1281	1235	1281	1083	962
2038	1286	1244	1286	1082	963
2039	1291	1248	1291	1081	962
2040	1289	1248	1290	1079	959
2041	1291	1245	1291	1078	960
2042	1292	1248	1292	1079	958
2043	1296	1251	1296	1076	958
2044	1300	1254	1300	1077	959
2045	1302	1254	1302	1078	960
2046	1309	1263	1309	1079	961
2047	1313	1268	1313	1079	962
2048	1311	1269	1311	1080	965
2049	1318	1272	1319	1078	965
2050	1319	1275	1319	1079	963

Rebuilding Analyses for Overfished Groundfish Stocks

STAR Panel Meeting Report
September 26-30, 2005
NOAA Fisheries
Alaska Fisheries Science Center
Seattle, Washington

STAR Panel:
Martin Dorn – NOAA Fisheries, AFSC (Chair)
Steve Ralston – NOAA Fisheries, SWFSC
Owen Hamel – NOAA Fisheries, NWFSC
Tom Jagielo – WDFW, Olympia, WA
Kevin Piner – NOAA Fisheries, SWFSC
Ray Conser – NOAA Fisheries, SWFSC
Steve Berkeley – Long Marine Laboratory, UCSC, Santa Cruz, CA
Bob Mohn – Center for Independent Experts (outside reviewer)

PFMC:
John DeVore – Groundfish Management Team (GMT), PFMC
Pete Leipzig – Groundfish Advisory Panel (GAP), PFMC

STAT Teams:
Jean Rogers – NOAA Fisheries, NWFSC
Alec MacCall – NOAA Fisheries, SWFSC
Xi He – NOAA Fisheries, SWFSC
Owen Hamel – NOAA Fisheries, NWFSC
Kevin Piner – NOAA Fisheries, SWFSC
Rick Methot – NOAA Fisheries, S&T, Seattle
Farron Wallace – WDFW, Montesano, WA
Tien-Shui Tsou – WDFW, Olympia, WA

Introduction

At the September 2005 PFMC meeting in Portland, the Council took action on agenda item F.7, which dealt with developing procedures for evaluating progress towards attaining rebuilding targets when overfished stocks have been re-assessed. This year 23 stock assessments have been completed, of which eight pertained to overfished species, including lingcod, widow, canary, yelloweye, bocaccio, POP, cowcod, and darkblotched rockfish. Prior to the September meeting authors of these assessments were provided instructions and guidance that requested them to complete a series of rebuilding "runs" as outlined in Agenda Item F.7a, Attachment 1, September 2005). The six runs were:

Run #	Prob(recovery)	By	Based on
#1 (default)	Estimated	Current T_{TARGET}	Current SPR
#2 (T_{TARGET} with 50% prob)	0.5	Current T_{TARGET}	Estimated SPR
#3 (#1 based on T_{MAX})	Estimated	Current T_{MAX}	Current SPR
#4 (#2 based on T_{MAX})	P_0	Current T_{MAX}	Estimated SPR
#5 (#3 with re-estimated T_{MAX})	Estimated	T_{MAX} (re-estimated)	Current SPR
#6 (#4 with re-estimated T_{MAX})	P_0	T_{MAX} (re-estimated)	Estimated SPR

In addition, the Council adopted a policy (see Agenda Item F.7.c, Supplemental GMT Report, September 2005, *Alternative 5*) for revising harvest rates when progress was deemed to be inadequate. The essence of the adopted policy is to maintain the current rebuilding harvest rate (SPR) when: (1) the probability of recovery by the existing T_{target} is greater than 45% and (2) the probability of recovery by the existing T_{target} is less than 55% ***or*** the probability of recovery by T_{max} is less than 80%[1]. In situations where the first condition is not met, rebuilding is deemed inadequate and the harvest rate would be lowered, if possible within the constraints imposed by the existing T_{target}. If, however, rebuilding was determined to be impossible by T_{target}, even if all fishing was eliminated, the plan could be revised. Conversely, if the second of these conditions is false (i.e., P_{target} > 55% and P_{max} > 80%) then the Council retained the option to increase the rebuilding harvest rate, as long as P_{max} did not fall below 80%.

Assuming the runs were completed, the first condition can be evaluated by examining the results of Run #1. Specifically, if the estimated probability of recovery by the existing T_{target} is greater than 0.45 then progress is considered adequate. If progress is inadequate, results from run #2 can be used to determine the harvest rate that will allow recovery by

[1] At the time this report was prepared there was uncertainty regarding whether the T_{max} referred to in *Alternative 5* pertained to the old (current) T_{max} or the new (re-estimated) value. Pending clarification of this issue by the Council and the GMT, results from Runs #3 and #5 should be used to evaluate whether or not rebuilding progress is sufficiently ahead of schedule such that the harvest rate could be increased.

T_{target}. Furthermore, the second condition can be evaluated by examining results of Runs #1, #3, and #5 to determine the estimated probability of recovery by T_{max} if fishing continues at the current rate (see footnote 1).

The SSC groundfish sub-committee met the week of September 26-30, 2005 at the Alaska Fisheries Science Center, Sand Point Facility and reviewed rebuilding analyses for 6 of the overfished stocks (bocaccio, cowcod, darkblotched rockfish, Pacific Ocean perch, widow rockfish, and yelloweye rockfish) . A rebuilding analysis for lingcod was not conducted because results from this year's stock assessment indicate that the stock has recovered to the $B_{40\%}$ target level, at least on a coastwide basis, which is how the stock is managed by the PFMC. In addition, the rebuilding analysis for canary rockfish was completed in the week that followed the meeting and it was reviewed by panelists by email. What follows are stock-specific summaries and rebuilding projections pertaining to the seven remaining overfished groundfish stocks (including canary rockfish but excluding lingcod), which the review panel collectively endorses as being the best available scientific information.

Bocaccio

A new rebuilding analysis for bocaccio was presented to the review panel by Dr. Alec MacCall. Using the Council's *Alternative 5* as a criterion for assessing adequacy of progress, results from the bocaccio analysis indicate that rebuilding is barely adequate based upon the T_{target} calculated from the previous rebuilding analysis (see Run #1a where the probability of rebuilding by T_{target} = 2027 is 46%), but is actually behind schedule relative to the T_{target} that was ultimately adopted in Amendment 16-3 to the groundfish FMP (see Run #1b where the probability of rebuilding by T_{target} = 2023 is 24%). This discrepancy was revealed during the latest rebuilding analysis and is apparently due to mis-specification of the start year to which the 23 year rebuilding target was added (2000 instead of 2004). Rebuilding is slightly behind schedule according to Run #1a due to small changes in estimates of recruitments. Rebuilding is significantly behind schedule based upon Run #1b, but would be behind schedule based upon the previous rebuilding analysis as well, which leads to a paradoxical situation. If the intent of the Council was to adopt a 70% probability of rebuilding by T_{max}, which is linked directly to T_{target} = 2027, then results from Runs #1a and #2a should take precedence and T_{target} in the rebuilding plan should be revised.

The updated estimate of T_{max} is unchanged from the last analysis (2032). In all rebuilding runs, both 2005 and 2006 were given projected catch of 150 mt instead of the OY values based upon the advice of the GMT representative on the panel. Future recruitments were projected using recruits-per-spawner, which method is supported by the modeled steepness of 0.211 in the 2005 assessment.

There have been many changes in the management of bocaccio and management performance has recently been very good. Given the highly variable nature of this stock there could be changes in management based upon future rebuilding analyses. For example, there are preliminary indications that the 2003 year-class is relatively strong.

	Bocaccio			10 Year Projections				
Year	Run #1a	Run #1b	Run #2a	Run #2b	Run #3	Run #4	Run #5	Run #6
P	0.458	0.24	0.50	0.50	0.678	0.70	0.678	0.70
SPR	0.692	0.692	0.717	0.883	0.692	0.705	0.692	0.705
F	0.0498	0.0498	0.045	0.0166	0.0498	0.0475	0.0498	0.0475
T	T_{target}=2027	T_{target}=2023	T_{target}=2027	T_{target}=2023	T_{max}=2032	T_{max}=2032	T_{max}=2032	T_{max}=2032
2007	314	314	284	106	314	300	314	300
2008	316	316	287	109	316	302	316	302
2009	334	334	304	118	334	319	334	319
2010	359	359	328	129	359	344	359	344
2011	388	388	356	142	388	373	388	373
2012	425	425	390	158	425	408	425	408
2013	462	462	426	175	462	444	462	444
2014	498	498	460	192	498	479	498	479
2015	535	535	495	211	535	516	535	516
2016	567	567	526	228	567	547	567	547

footnote: case "a" is for T_{target}=2027 based on P_0=0.70; case "b" is for FMP T_{target}=2023

Cowcod

Based on the new stock assessment parameters, the rebuilding analysis indicates that the stock is rebuilding ahead of schedule (see Run #1 where the probability of rebuilding by T_{target} = 0.81). Moreover, at the current SPR the stock has a 82% probability of rebuilding to the target by the current (old) T_{max} (Run #3) and a 75% probability of rebuilding by the new, re-estimated T_{max} (Run #5). Hence, there is ambiguity as to whether or not rebuilding is sufficiently ahead of schedule so as to allow for an increase of the harvest rate as specified under *Alternative 5* (see footnote 1). However, because: (1) the rebuilding "surplus" is very small (i.e., 82% is not much greater than 80%), (2) the specified OYs are quite small in magnitude, and (3) results from Runs #3 and #5 are identical, in practice the discrepancy is unlikely to affect cowcod management to any appreciable degree. The STAR panel also notes that the increase in the probability of rebuilding is not due to a change in stock condition, but is a result of structural changes in the model, primarily the use of a spawner-recruit model to estimate recruitments.

The rebuilding analysis for cowcod was presented to the STAR panel by Dr. Kevin Piner. The stock assessment that forms the basis for this rebuilding plan is much simpler than most of the other stock assessments that have been conducted recently, and thus contains very few input parameters on which to model uncertainty. The previous rebuilding analysis was based on the 1999 stock assessment (Butler *et al.*, 1999), which used a delay-difference model. The new rebuilding analysis is based on a new assessment conducted in 2005 (Piner *et al.*, 2005), wherein recruitment is described by a Beverton and Holt spawner-recruit model. To incorporate uncertainty into the rebuilding projections, a range of steepness values were entered into the model, centered on the base case value (h=0.5) with a symmetrical range bounded by h=0.25 and h=0.75 and standard deviation = 0.1. Recruitments are re-sampled from this synthetic posterior with the frequency determined by this probability distribution.

	Cowcod		10 Year Projections			
Year	Run #1	Run #2	Run #3	Run #4	Run #5	Run #6
P	0.81	0.50	**0.82**	0.60	**0.75**	0.60
SPR	0.78	0.601	0.78	0.63	0.78	0.69
F	0.009	0.021	0.009	0.019	0.009	0.015
T	T_{target}=2090	T_{target}=2090	T_{max}=2099	T_{max}=2099	T_{max}=2074	T_{max}=2074
2007	6	12	**6**	11	**6**	9
2008	6	13	**6**	11	**6**	9
2009	6	13	**6**	11	**6**	9
2010	6	13	**6**	12	**6**	9
2011	6	13	**6**	12	**6**	9
2012	6	13	**6**	12	**6**	10
2013	6	13	**6**	12	**6**	10
2014	7	13	**7**	12	**7**	10
2015	7	14	**7**	12	**7**	10
2016	7	14	**7**	13	**7**	10

Darkblotched Rockfish

The 2005 assessment of darkblotched rockfish resulted in a number of major changes to the model. In particular, the natural mortality rate was increased from 0.05 to 0.07 yr^{-1}, which had a strong influence on rebuilding projections. For example, the $F_{50\%}$ harvest rate rose from 0.0319 to 0.0463, representing a 45% increase. In addition, the new estimate of T_{min} is now 8 years and the generation time has dropped from 33 to 24 years, resulting in a decline of T_{max} from 2044 to 2033. In the rebuilding analysis a variety of projections were completed, including all four scenarios outlined in the SSC Terms of Reference for Rebuilding Analysis. In the 2003 analysis the preferred alternative was to invoke the environmental hypothesis and to project population growth by re-sampling recruits. The same approach was taken this year (model labeled A1).

Results of the darkblotched rockfish rebuilding analysis were presented by Dr. Jean Rogers via conference call and are summarized in the table below. The projections show that the stock is rebuilding substantially ahead of schedule (see Run #1, probability of rebuilding before the current T_{target} = 0.962). Note that the existing rebuilding SPR is 0.50 because the ABC (calculated at $F_{50\%}$) was actually lower than the rebuilding yield. Thus, the ABC set a cap on harvest during rebuilding.

Another peculiarity with darkblotched rockfish is that the revised assessment now indicates that rebuilding could occur within 10 years (by 2011). If required to do so, results from Run #7 provide the Council with the needed information. This scenario is presented for completeness, although it should be emphasized that for the last few years the Council has been operating under a policy wherein T_{target} = 2030. Imposing a new estimate of T_{min} at this point effectively moves the finish line midway through rebuilding.

	Darkblotched Rockfish		10 Year Projections				
Year	Run #1	Run #2	Run #3	Run #4	Run #5	Run #6	Run #7
P	0.962	0.50	0.986	0.90	0.972	0.90	0.50
SPR	0.500	0.381	0.500	0.434	0.500	0.461	missing
F	0.0463	0.0701	0.0463	0.0583	0.0463	0.0531	0.032
T	T_{target}=2030	T_{target}=2030	T_{max}=2044	T_{max}=2044	T_{max}=2033	T_{max}=2033	T_{max}=2011
2007	456	> ABC	456	> ABC	**456**	> ABC	**317**
2008	487	> ABC	487	> ABC	**487**	> ABC	**343**
2009	500	> ABC	500	> ABC	**500**	> ABC	**355**
2010	519	> ABC	519	> ABC	**519**	> ABC	**373**
2011	530	> ABC	530	> ABC	**530**	> ABC	**385**
2012	538	> ABC	538	> ABC	**538**	> ABC	**395**
2013	546	> ABC	546	> ABC	**546**	> ABC	**403**
2014	553	> ABC	553	> ABC	**553**	> ABC	**412**
2015	558	> ABC	558	> ABC	**558**	> ABC	**418**
2016	560	> ABC	560	> ABC	**560**	> ABC	**422**

Pacific Ocean Perch (POP)

The new POP rebuilding analysis completed and presented by Dr. Owen Hamel indicates that the stock is rebuilding ahead of schedule, despite being slightly more depleted. At the current rate of rebuilding, there is nearly a 60% probability of rebuilding to the old T_{target} at the old SPR (Run #1). Moreover, there is a 78% probability of rebuilding by the old T_{max} (Run #3) and there is a 79% probability of rebuilding by the new T_{max}. Thus, there is no rebuilding "surplus" as defined under *Alternative 5*, regardless of which T_{max} is used (see footnote 1). Accelerated rebuilding of the POP stock is due primarily to recent above average year-classes entering the fishery. The new rebuilding analysis is based on a stock assessment update. As in the previous assessment, the new analysis is based on re-sampling from historical recruitments (1965-2003) using the MCMC algorithm (Punt, 2002). The principal differences between the previous assessment and the new one is the inclusion of updated fishery age and length composition data, new survey age data, and the removal of water hauls from the triennial survey data. The new rebuilding analysis indicates that the stock is slightly more depleted than estimated in the 2003 assessment (2005 depletion = 27.6% of B_0, whereas 2003 depletion = 27.7%). Other revisions include a slightly lower estimated value for B_0 and an increase in T_{max} from 2042 to 2043 in the new rebuilding projections.

Depending on the interpretation of T_{max}, Runs #3 and #5 in the table below conform to the GMT's recommendations and Council adopted policy (*Alternative 5*). Note, however, that the time series of catch from each of these two runs is identical.

	Pacific Ocean Perch		10 Year Projections			
Year	Run #1	Run #2	Run #3	Run #4	Run #5	Run #6
P	0.597	0.50	0.782	0.70	0.789	0.70
SPR	0.696	0.633	0.696	0.644	0.696	0.640
F	0.0231	0.0304	0.0231	0.0290	0.0231	0.0295
T	T_{target}=2021	T_{target}=2021	T_{max}=2042	T_{max}=2042	T_{max}=2043	T_{max}=2043
2007	397	522	**397**	498	**397**	506
2008	412	538	**412**	514	**412**	522
2009	431	561	**431**	536	**431**	544
2010	455	588	**455**	564	**455**	572
2011	473	609	**473**	583	**473**	591
2012	482	617	**482**	592	**482**	600
2013	488	621	**488**	597	**488**	605
2014	498	633	**498**	608	**498**	616
2015	508	643	**508**	618	**508**	626
2016	519	655	**519**	630	**519**	638

Widow Rockfish

The new widow rockfish rebuilding analysis indicates that rebuilding is much ahead of schedule (Run #1 probability of rebuilding by current T_{target} = 96%). The probability of rebuilding by the old T_{max} is also substantially greater than 80% (P = 98%), as is the probability of rebuilding by the new T_{max} (P = 94%). Thus, both indicate there is a rebuilding "surplus" that could be considered under *Alternative 5* by determining the harvest that would rebuild with 80% probability (see footnote 1). However, results from that type of analysis are presently only available for the new T_{max} scenario (see Run #7).

Accelerated rebuilding is due to changes in the 2005 model that affect estimates of steepness and depletion, both of which are greater than in the 2003 assessment. For example, the previous rebuilding analysis estimated a rebuilding fishing mortality rate of 0.0093, equivalent to an SPR of 0.936, whereas the new SPR estimate is 0.834. The panel also requested that 40:10 OY projections be included in the table. However, due to the low estimated productivity of widow rockfish, this harvest control rule may be overly aggressive, as the proxy harvest rate ($F_{50\%}$) is apparently too high to maintain the stock near the $B_{40\%}$ target level.

Dr. Xi He presented results of four different assessment models, including the base model (Model T2), which was characterized by natural mortality of 0.125 and steepness of 0.28. Depletion rate in this base model is 31.1%, versus 22.4% in 2003 assessment. It is noteworthy that the new assessment indicates that the stock never fell below the $B_{25\%}$ minimum stock size threshold and may therefore never have been overfished. Three methods of generating future recruitments were considered including: (1) a Beverton-Holt spawner-recruit curve (as the base case), (2) recruits-per-spawner, and (3) recruits-per-spawner with pre-specified 2005-2007 (3-year old) recruitments based on estimates from the Santa Cruz survey (2002-2004). The panel accepted the STAT team's use of the spawner-recruit curve (method 1) for generating future recruitments and that the base model (T2) be used for all analyses.

	Widow Rockfish		10 Year Projections					
Year	Run #1	Run #2	Run #3	Run #4	Run #5	Run #6	Run #7	40:10
P	0.9625	0.50	0.9765	0.60	0.9395	0.60	0.80	<0.001
SPR	0.936	0.798	0.936	0.81	0.936	0.834	0.886	N/A
F	0.0093	0.0354	0.0093	0.0329	0.0093	0.0283	0.0188	N/A
T	T_{target}=2038	T_{target}=2038	T_{max}=2042	T_{max}=2042	T_{max}=2033	T_{max}=2033	T_{max}=2033	N/A
2007	447	1683	**447**	1568	**447**	1352	**903**	4249
2008	464	1716	**464**	1601	**464**	1385	**931**	4161
2009	466	1696	**466**	1586	**466**	1375	**930**	3899
2010	460	1650	**460**	1544	**460**	1343	**913**	3583
2011	453	1606	**453**	1505	**453**	1311	**895**	3305
2012	447	1575	**447**	1476	**447**	1287	**881**	3102
2013	448	1564	**448**	1468	**448**	1282	**880**	2980
2014	448	1556	**448**	1460	**448**	1277	**878**	2875
2015	452	1561	**452**	1467	**452**	1283	**884**	2805
2016	454	1557	**454**	1463	**454**	1282	**885**	2729

Yelloweye Rockfish

A yelloweye rockfish presentation was made to the panel by Mr. Farron Wallace and Dr. Tien-Shui Tsou. They reported that the existing estimate of SPR from the rebuilding analysis conducted in 2002 was based on an improperly specified length at 50% maturity (40 cm rather than 42 cm). Moreover, the STAT team was unable to recover the final 2002 rebuilding files that would be needed to recreate the exact SPR used in the 2002 rebuilding plan. Nonetheless, an effort was made to estimate the 2002 rebuilding SPR using the existing rebuilding fishing mortality rate ($F=0.0153\ yr^{-1}$), which yielded a value of 0.591. The 2005 stock assessment update of yelloweye rockfish largely resulted in changes to life history parameters, including growth, aging error, maturity, fecundity, and selectivity. Collectively, these changes would be expected to have a significant effect on the rebuilding SPR rate, all other things being equal. As a result, the review panel concluded that rebuilding runs #1, #3, and #5, which utilize the old estimate of SPR, were not essential and that efforts to improve estimation of this statistic should be abandoned.

Rebuilding projections for yelloweye rockfish were based on parametric sampling from the spawner-recruit curve, as was the 2002 analysis. Results of the analyses are presented in the following table. Note that run #1, which measures the probability of rebuilding by the current T_{target} using the existing SPR rate, indicates that rebuilding is impossible. In order to maintain the current T_{target} stipulated in Amendment 16-3 to the groundfish FMP, the SPR must be increased from 0.591 to 0.754 (see Run #2). Run #6 describes a rebuilding scenario consistent with the new stock assessment and the Council's original intent (i.e., $P_0 = 0.8$).

	Yelloweye Rockfish		10 Year Projections			
Year	Run #1	Run #2	Run #3	Run #4	Run #5	Run #6
P	0.00	0.50	0.001	0.80	0.003	0.80
SPR	0.591	0.764	0.591	0.744	0.591	0.717
F	0.0233	0.0118	0.0233	0.0129	0.0233	0.0143
T	T_{target}=2058	T_{target}=2058	T_{max}=2071	T_{max}=2071	T_{max}=2080	T_{max}=2080
2007	34.6	**16.8**	34.6	18.5	34.6	**21.0**
2008	34.7	**17.0**	34.7	18.8	34.7	**21.3**
2009	34.9	**17.3**	34.9	19.0	34.9	**21.5**
2010	35.0	**17.5**	35.0	19.2	35.0	**21.7**
2011	35.1	**17.7**	35.1	19.4	35.1	**22.0**
2012	35.2	**17.9**	35.2	19.6	35.2	**22.2**
2013	35.4	**18.1**	35.4	19.9	35.4	**22.4**
2014	35.5	**18.3**	35.5	20.1	35.5	**22.6**
2015	35.7	**18.6**	35.7	20.3	35.7	**22.9**
2016	35.9	**18.8**	35.9	20.6	35.9	**23.1**

Canary Rockfish

The canary rockfish stock assessment was reviewed initially at a STAR panel held at the NWFSC Montlake Laboratory August 15-19th and was subsequently considered by the SSC at its meeting in Portland from September 19-21st. At that time, several concerns were raised and the assessment was referred to the "mop-up" STAR panel for further consideration. At that meeting Dr. Richard Methot presented results from the canary rockfish assessment and interacted with members of the panel to address their concerns. Ultimately, two models were presented that were considered equally plausible by the SSC and both were carried into an integrated rebuilding analysis, although that analysis was not completed until after the meeting adjourned. Thus, what is summarized here is drawn from a document prepared by Dr. Methot titled "Updated Rebuilding Analysis for Canary Rockfish Based on Stock Assessment in 2005" that is dated October 2005.

The rebuilding analysis for canary rockfish integrates over a great deal of uncertainty, including that associated with two distinct models, i.e., the *NoDiff* and *Diff* scenarios. Both of these treat selectivity as a function of length, but in the former the selectivity curves of males and females are the same, whereas the latter allows for sex-specific differences in selectivity at the cost of additional parameters. The analysis combined the two models by drawing equally from the model-specific probability distributions of the steepness parameter. Aside from steepness, other sources of uncertainty that were integrated in the analysis were numbers at age in the base year (2004), selectivity patterns, and residual variance in recruitment (σ_r). The blended analysis was endorsed by the panel and estimated that B_0 is 34,155 mt, B_{2005} is 3,176 mt, and that current depletion is 9.4%. Results presented below show that rebuilding is currently ahead of schedule according to the current T_{target} (P = 57%), but not greatly so (Run #3 probability of rebuilding by the old T_{max} is 58.5%, whereas Run #5 probability of rebuilding by the new T_{max} is 55.4%). Following the revision rule adopted by the Council, the current harvest rate would therefore be maintained (Run #5). It is worth noting however, that the new re-estimated T_{max} (at a 60% probability of rebuilding) is now earlier than the existing T_{target}.

	Canary Rockfish		10 Year Projections			
Year	Run #1	Run #2	Run #3	Run #4	Run #5	Run #6
P	0.574	0.50	0.585	0.60	0.554	0.60
SPR	0.887	0.816	0.887	0.903	0.887	0.935
F	missing	missing	missing	missing	missing	missing
T	T_{target}=2074	T_{target}=2074	T_{max}=2076	T_{max}=2076	T_{max}=2071	T_{max}=2071
2007	43.2	73.4	43.2	37.0	**43.2**	24.1
2008	44.5	75.0	44.5	38.1	**44.5**	24.8
2009	45.1	75.8	45.1	38.6	**45.1**	25.3
2010	46.4	77.6	46.4	39.8	**46.4**	26.0
2011	48.6	81.0	48.6	41.7	**48.6**	27.3
2012	51.1	85.0	51.1	43.9	**51.1**	28.8
2013	54.1	89.7	54.1	46.5	**54.1**	30.6
2014	56.5	93.3	56.5	48.6	**56.5**	32.0
2015	58.7	96.7	58.7	50.6	**58.7**	33.3
2016	61.0	100.1	61.0	52.5	**61.0**	34.7

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Updated Rebuilding Analysis for Canary Rockfish Based on Stock Assessment in 2005

October 2005

Richard Methot
National Marine Fisheries Service

Summary

The rebuilding analysis for canary rockfish was first conducted in 2000 based on the 1999 stock assessment then updated in 2002 on the basis of the first coastwide assessment. The 2005 stock assessment, as amended following SSC review in September 2005, included a base model and an alternative model based on a different assumption regarding male-female selectivity. The two models were considered equally plausible by the SSC and both are carried into the rebuilding analysis. By re-sampling from alternative input parameter sets, the rebuilding analysis result now integrates across the two alternate models, the probability profile of different spawner-recruitment steepness levels within each model, and the variability in future recruitments. As a result, this document dated Oct. 7, 2005 is a complete replacement of the preliminary rebuilding analysis presented to the SSC in September.

The mean estimate of the Bzero is 34,155 mt of female spawning biomass and the stock is at 9.4% of this level at the beginning of 2004 when integrated across the steepness profiles for each model. The steepness of the spawner-recruitment relationship, which largely determines the rate of increase in recruitment as the stock rebuilds, is 0.32 in the base model, 0.45 in the alternate model, and has a median estimate of 0.38 and a mean of 0.40. The estimated generation time increased from 19 years in the 2002 model to 23 years due to a decrease in the estimate of natural mortality for older females. The current OY of about 47 mt is not overfishing and the stock is expected to continue rebuilding at that level of harvest. The current rebuilding harvest rate would produce an OY of 43 mt in 2007 and has a 57.4% probability of rebuilding by the current T_{target} (2074) and a 58.5% probability of rebuilding by the current T_{max} (2076). Because this new analysis is now able to incorporate 3 sources of uncertainty, rather than just 1, it takes rather large changes in harvest rate (and short-term OY) to make large changes in the probability of rebuilding. The rate that would produce a 50% probability of rebuilding by T_{target} (2074) is twice the rate that would produce a 60% probability of rebuilding by T_{max} (2076).

Introduction

The stock assessment for canary rockfish in 1999 documented that the stock had declined below the overfished level (25% of B_0) in the northern area (Columbia and U.S. Vancouver INPFC areas; Crone et al., 1999) and in the southern area (Williams et al., 1999). Canary rockfish was determined to be in an “overfished” state on Jan. 1, 2000 and development of a rebuilding plan was initiated while preliminary rebuilding estimates were implemented through adjustments of annual management measures. The first rebuilding analysis (Methot, 2000) used results from the northern area assessment to project rates of potential stock recovery. The stock was found to have extremely low productivity. The initial rebuilding OY for 2001 and 2002 was set at 93 mt based upon a 50% probability of rebuilding by the year 2057 and maintaining a constant catch throughout the rebuilding period. The rebuilding analysis was updated in 2002 (Methot and Piner, 2002) to incorporate the coastwide assessment results and to switch to a constant exploitation rate, as in other west coast groundfish rebuilding plans. The results of the 2002 assessment and rebuilding analysis indicated that the spawning stock abundance, as a percentage of its unfished level, reached a low of 6.6% in 2000, the year of the overfished declaration. By 2002 it had increased to 7.9%. The generation time was calculated to be 19 years. The rate of rebuilding was based on the estimated spawner-recruitment relationship with steepness of 0.33 and sampling lognormally distributed random deviations around this relationship. The time to rebuild with no fishing, T_{min}, was estimated to be year 2057. The T_{max} was calculated to be the year 2076 (2057 plus 19 years for the generation time) and the T_{target} was set to 2074 on the basis of a rebuilding rate that would achieve a 60% probability of rebuilding by 2076. This rebuilding harvest rate produced an OY in 2003 of 41 mt. The rate of rebuilding was most sensitive to the steepness of the spawner-recruitment relationship. In addition, the 2002 analysis demonstrated the sensitivity of the OY to the commercial:recreational allocation because of the difference in selectivity between the two gear groups. Final rebuilding calculations were based upon a 50:50 commercial:recreational split in catch. The rebuilding plan that incorporated these results was completed as Amendment 16 to the groundfish fishery management plan in 2003.

This document presents an updated rebuilding analysis based upon the stock assessment in 2005 (Methot and Stewart, 2005).

Assessment Summary

Methot and Stewart (2005) used data through 2004 and a revised assessment model to update the coastwide assessment of canary rockfish. Primary changes included:

- Addition of the 2004 trawl survey and catch data through 2004
- Recalculation of all historical fishery catch and size/age composition data
- Extend model time series back to 1916
- Include new calibration of ageing method
- Convert from age-based selectivity to size-based selectivity

- Implement the assessment in the ADMB-coded Stock Synthesis 2 using length-based selectivities

This update to the canary rockfish rebuilding analysis incorporates changes made as a result of the SSC review of the canary rockfish assessment, Sept. 27-30, 2005; Seattle, WA. After examining several issues that had not been specifically examined in the assessment (trawl survey catchability, recruitment variability, and juvenile recruitment survey) the SSC recommended no changes to the base model. However, the SSC concluded that the parametric variance around a single base model underestimated the overall uncertainty in the canary rockfish assessment. After re-examining some of the sensitivity analyses included in the assessment, the SSC concluded that an alternative configuration of the male-female selectivity parameters was as plausible as the base model. The two model scenarios are labeled here as Diff (base) and NoDiff (alternate).

NoDiff - The 2002 assessment model had been configured to allow for a difference in the age-selectivity for older females relative to males. Because females grow larger than males and because the model was being shifted to length-selectivity, this pre-STAR model configuration did not allow for a difference in length-selectivity between larger females and males.

Diff – Alternative model configurations considered during the STAR panel meeting disclosed that allowing for a differential selectivity for larger sized female canary rockfish provided a modestly significant improvement in the fit to the overall data set. This difference is allowed in the 3 trawl fisheries (northern Cal, Oregon, and Washington) and the trawl survey and required that 8 additional model parameters be estimated. Because of the improved statistical fit, this model was adopted as the post-STAR base model and used as the basis for the rebuilding analysis.

Another change that occurred at the STAR panel was the extent of re-weighting of data variance on the basis of the model’s goodness-of-fit to the data in preliminary model runs. The post-STAR Diff model had re-weighted all data elements, which resulted in some down-weighting of the trawl survey biomass index. In order to assure consistent performance between the Diff and NoDiff models, the post-SSC configurations continued to allow re-weighting of the age and length composition data, but not the trawl survey biomass index.

After considerable deliberation, the SSC concluded that the Diff base model and the NoDiff alternate model should both be included in the rebuilding analysis as equally probable scenarios and that the uncertainty within each configuration should also be represented in the rebuilding analysis.

Rebuilding Calculations

The rebuilding analysis was conducted using software developed by A. Punt (version 2.8a, April 2005). This software conducts stochastic simulations of future stock abundance and determines levels of future fishing mortality that are consistent with specified probabilities and time frames for rebuilding. The steps when conducting a rebuilding analysis are:

1. Estimation of the unfished level of abundance, B_0 (and hence the rebuilding target, $0.4B_0$);
2. Selection of a method to generate future recruitment;
3. Specification of the mean generation time;
4. Calculation of the minimum rebuilding time, $T_{min;}$
5. Calculation of the maximum possible rebuilding time, $T_{max;}$
6. Identification and analysis of alternative harvest strategies.

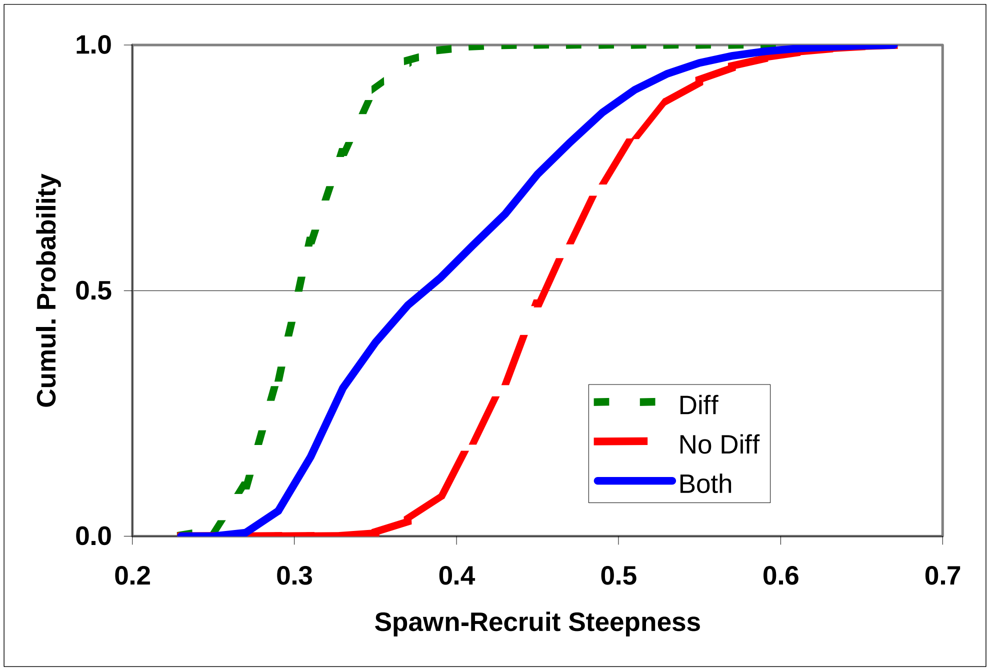
Estimation of B_0

The stock assessment was conducted using the Stock Synthesis 2 software (Methot, 2005). In this model, annual recruitments are defined as deviations from a long-term spawner-recruitment relationship. Thus, this relationship provides the required information about the central tendency of recruitments. A Beverton-Holt relationship was used in the assessment and trial model runs with a Ricker relationship produced nearly identical results. The modeled time series started in 1916, the year in which canary rockfish catch is first detected. This is earlier than the start year of 1941 used in the 2002 assessment. Although the cumulative catch prior to 1941 in the 2005 assessment is similar to the initial equilibrium catch level of 500 mt per annum used in the 2002 assessment, the difference in start year has an effect on the B_0 estimate because of the low spawner-recruitment steepness. With the initial equilibrium catch approach, the R_0 level of recruitment is applied, even though the initial equilibrium catch is reducing the spawning biomass. This is a satisfactory assumption as long as the catch is not too high and the spawner-recruitment steepness is not low. With the long time series approach, the initial equilibrium catch is zero, so no approximation is necessary, and the estimated level of recruitment declines from R_0 as the annual catches reduce the spawning biomass. For canary rockfish, this contributes to a higher level for R_0 in the 2005 assessment than in the 2002 assessment.

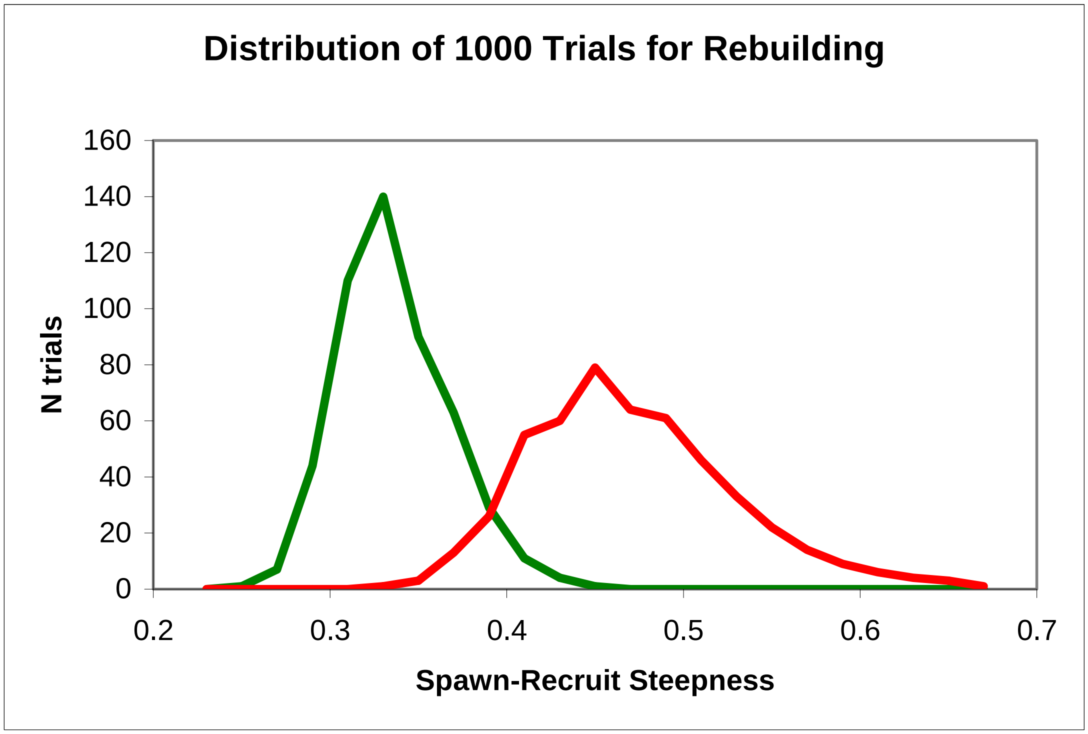
The uncertainty in the Diff model had been characterized both by the parametric estimate of variance for model outputs and by conducting a profile along a range of values for the spawner-recruitment steepness parameter. These alternative estimates of uncertainty were shown in the assessment document to be very similar, although low. The single maximum likelihood estimate from the Diff model (with an estimated steepness of 0.32) was used for the preliminary rebuilding (Sept xx, 2005), and the upper 95% range (steepness = 0.38) was used in a rebuilding run to characterize uncertainty. In order to much more fully characterize the uncertainty, the following procedure was used:

1. conduct a profile on the steepness parameter for the Diff model and for the NoDiff model. Steepness values ranged from 0.23 to 0.67 with a step of 0.02 to create these profiles covering the range over which there was more than negligible probability. The NoDiff model fits better at a higher steepness values and over a broader range. The best-

fitting NoDiff model fits best at a steepness of 0.45 and produces an ending biomass level that is approximately twice as high as the ending biomass in the Diff model.



2. Convert the Diff and NoDiff distributions into discrete frequency distributions with N equal to 500 for each (because they were equally weighted in the SSC's conclusion). Note that the "Both" distribution shown above is for illustration only and is not used subsequently.



	Steepness	Prob	Bzero	B2005	B2005/ Bzero	Rzero
Diff	0.23	0.000	38363	1075	0.028	5593
	0.25	0.001	37429	1235	0.033	5357
	0.27	0.007	36609	1406	0.038	5162
	0.29	0.044	35913	1590	0.044	4994
	0.31	0.110	35312	1788	0.051	4850
	0.33	0.140	34784	2001	0.058	4725
	0.35	0.090	34309	2238	0.065	4622
	0.37	0.063	33894	2474	0.073	4519
	0.39	0.029	33514	2734	0.082	4434
	0.41	0.011	33169	3010	0.091	4359
	0.43	0.004	32854	3302	0.101	4292
	0.45	0.001	32564	3610	0.111	4232
	0.47	0.000	32299	3933	0.122	4179
NoDiff	0.31	0.000	37551	1728	0.046	4988
	0.33	0.001	36854	1975	0.054	4861
	0.35	0.003	36231	2240	0.062	4749
	0.37	0.013	35654	2527	0.071	4653

	0.39	0.026	35160	2826	0.080	4563
	0.41	0.055	34680	3151	0.091	4487
	0.43	0.060	34268	3478	0.102	4416
	0.45	0.079	33863	3839	0.113	4355
	0.47	0.064	33496	4182	0.125	4303
	0.49	0.061	33171	4582	0.138	4249
	0.51	0.046	32866	4974	0.151	4203
	0.53	0.033	32585	5376	0.165	4162
	0.55	0.022	32324	5786	0.179	4124
	0.57	0.014	32082	6203	0.193	4090
	0.59	0.009	31857	6624	0.208	4059
	0.61	0.006	31647	7046	0.223	4031
	0.63	0.004	31451	7469	0.237	4005
	0.65	0.003	31268	7889	0.252	3981
	0.67	0.001	31097	8306	0.267	3959
Means						
Diff	0.336		34703	2089	0.060	4710
NoDiff	0.471		33607	4263	0.128	4320
Both	0.403		34155	3176	0.094	4515

Generation of future recruitment

The estimated spawner-recruitment relationship that tracks the central tendency of recruitment as the stock was fished down over the past few decades also provides a logical basis for estimating future recruitment levels as the stock rebuilds. The estimated steepness of the Beverton-Holt spawner-recruitment relationship was 0.321 (95% confidence interval is 0.26 to 0.38) in the base model reviewed by the STAR panel. This is low, but nearly identical to the estimate in the 2002 assessment (0.33). Other fish species often have steepness levels near 0.7 (Myers, 1999) and Dorn's (2000) meta-analysis of rockfish found a level of approximately 0.67. However, some other west coast groundfish stocks (such as widow rockfish, bocaccio and yelloweye rockfish) have low estimated steepness levels. After the SSC review, the weighting on the trawl survey biomass index was returned to its initial level and the point estimate of steepness in the Diff model increased to 0.329. The probability distribution of steepness for the Diff and NoDiff models is shown in the Table above.

These steepness estimates are conditioned upon the long-term trend in recruitment being due solely to changes in the abundance of spawners. If some of the recruitment downtrend for canary rockfish has been because of long-term shifts in the ocean climate, then it is possible that a future shift in the ocean climate will cause an upward shift in recruitment and future estimates of the spawner-recruitment steepness will be higher and representative of a longer-term environmental average. Until this happens, there is not sufficient contrast in the spawner-recruitment-climate data to separate the effects of long-term climate from the steepness of the spawner-recruitment relationship.

The year-to-year variability of recruitment is also important for the rebuilding analysis. The lognormal standard deviation of recruitment used in the assessment is 0.4, and this level of variability is used in the forecasts of future recruitment. This is a lower level of recruitment variability than observed for several other stocks, but the output level of recruitment variability in the canary assessment is lower still.

The parametric, spawner-recruitment method for forecasting future recruitments has several desirable features and alternatives such as resampling from observed recruits per spawner were not considered. Use of the parametric approach:
Reproduces current low recruitment levels while spawning biomass remains low, thus mimics a recruits per spawner approach;
Smoothly increases mean recruitment (and decreases recruits per spawner) towards the unfished level as spawning biomass increases, thus is fully consistent with the R_0 estimate;
Parametric sampling from the lognormal distribution generates a smoother frequency distribution of future recruitments (in comparison to resampling from the model's time series of annual recruitment deviations) thus provides rebuilding calculations that are less sensitive to individual historical recruitment estimates.

In order to propagate the uncertainty in model structure and the uncertainty in steepness into the rebuilding analysis, the following procedure was followed:

Create 1000 input vectors for the rebuilding program according to the frequency distribution shown above. There are 500 vectors from the Diff model and 500 from the NoDiff model. Each input vector corresponds to an assessment model run with either the Diff or NoDiff configuration and with a steepness value fixed at a value between 0.23 and 0.67, step 0.02. There are 11 unique Diff vectors that get included from 1 to 140 times according to their probability. There are 18 unique NoDiff vectors that get included from 1 to 79 times. Overall, the 19 unique vectors differ in steepness value, numbers at age in the base year (2004) for the rebuilding analysis and, to a lesser degree, in the estimated selectivity patterns for the fisheries.

Run the rebuilding analysis program with 6000 iterations. During these 6000 iterations, the program will cycle through the 1000 input vectors 6 times. Run times were approximately 5 hours. In each iteration, the program simulates a random sequence of future recruitment deviations. The program accumulates and summarizes the results of the 6000 iterations, then produces estimates of B_{zero}, T_{min}, and other rebuilding parameters that includes uncertainty due to model configuration, parameter variability within model configuration (to the extent this is captured by the steepness profile), and variability in future recruitment sequences. This is substantially more inclusive of multiple sources of uncertainty than typical rebuilding analyses, including the preliminary canary rockfish rebuilding analysis which was based on a single Diff run (with steepness near 0.32) and showed a steepness = 0.38 run only as a sensitivity analysis. The new analysis also produces a single average result, but this average integrates across the 3 sources of uncertainty, thus includes the possibility that canary rockfish productivity is much greater or lesser than the current "best" estimate.

In order to better understand the effect of the use of a distribution of steepness values, the new model was run using only the 500 Diff input vectors and with the harvest rate set equal to the current rebuilding rate (SPR=88.7%). This is simply for illustration and does not represent an evaluation because it is only including half of the total possible input possibilities. The median result is similar to the results from the preliminary rebuilding analysis but, as expected, the distribution is much broader so there is a greater probability of rebuilding even with use of just the Diff scenario:

Model	OY in 2007	Median Year to Rebuild	Pr(rebuild by 2076)	Pr(rebuild by 2076 with F=0)
H=0.32	28.4 mt	2119	0%	3.0%
Blend across h distribution	30.8 mt	2098	18.7%	40.8%

Generation Time

Generation time is calculated as the mean age of female spawners, weighted by age-specific spawn production in the absence of fishing mortality. The values used for these calculations are in Table 2. The updated estimate in the 2005 assessment is 23 years. This is 4 years longer than the estimate of 19 years in the 2002 assessment. The increased generation time is primarily due to a lower estimate of natural mortality for older female canary rockfish and partly due to improved estimates of weight-at-age.

Rebuilding Scenarios

In order to project the effect of the fishery on the rate of rebuilding, it is necessary to quantify the fishery's pattern of selectivity and effect on the spawning potential of the stock. The assessment in 2005 stratified the fishery into 10 sectors based on gear (trawl, non-trawl, recreational) and section of the coast. For the purpose of conducting the rebuilding analysis, the latitudinal strata were combined to produce an estimate of gender-specific body weight and age-selectivity for each of the 3 major gear types. The Oregon trawl, Oregon-Washington non-trawl, and Oregon-Washington recreational fisheries were selected to represent these 3 major gear types because they had the greatest catch level in 2004. The resulting selectivity and weight at age are in Table 3.

The relative F for the 3 gear groups was set to 0.112 for trawl, 0.021 for nontrawl and 0.867 for recreational in order to achieve a 50:50 split of catch biomass between recreational and commercial and to preserve the trawl/nontrawl ratio observed in 2004. These proportions of F were obtained from the SS2 assessment model because the rebuilding software does not output the catch biomass for each gear type.

In the assessment model (Methot and Stewart, 2005), it was determined that the fishery exploitation rate for rebuilding corresponded to a SPR of 88.7%.

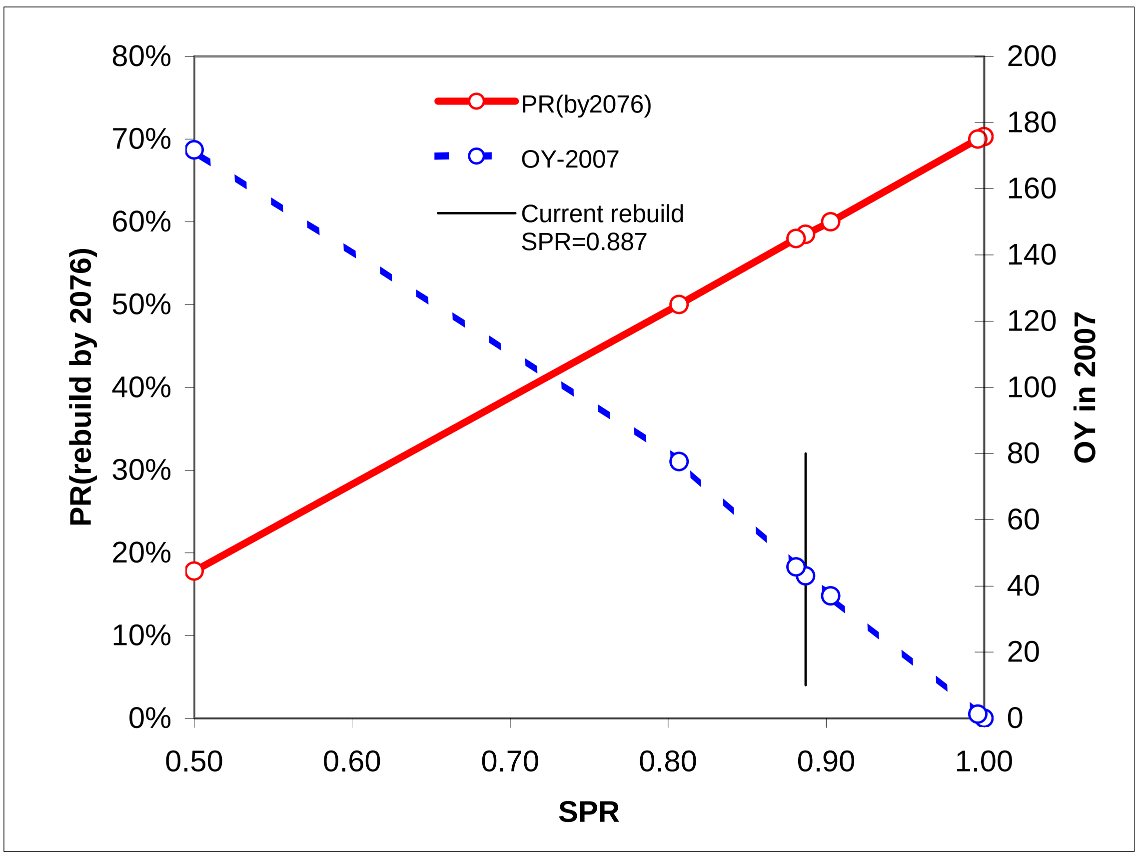
Runs 1 and 3: These two runs determine the probability of rebuilding by the current T_{target} (2074) and T_{max} (2076) if the current harvest rate is continued. In the assessment model (Methot and Stewart, 2005), it was determined that the fishery exploitation rate for rebuilding corresponded to a SPR of 88.7%. At this rate, the probability of rebuilding by the current T_{target} is 57.4% and the probability of rebuilding by the T_{max} is 58.5% as shown in the column labeled *Current*. These two probabilities were 60% and 50% respectively in the 2002 rebuilding analysis, so the probability of rebuilding by T_{target} has increased while the probability of rebuilding by T_{max} has decreased. The two probabilities move closer together in the current analysis because inclusion of more uncertainty causes the probability profile to flatten relative to the steep probability profile that occurred when the only uncertain was in the future recruitment variability. Maintaining the current harvest rate would produce an average OY in 2007 of 43 mt, which is slightly lower than the current 47 mt OY. The OY in 2007 that would correspond to SPR=50% is 171mt, so the current OY is less than a third of the overfishing level. However the harvest rate corresponding to SPR=50% has only a 17.8% chance of rebuilding by 2076. Note that even if F=0, there is only a 70% chance of rebuilding by T_{max} because in the integrated analysis there is a small probability that the stock has very low productivity. Overall, changes in the SPR rate to achieve improvements in the probability of rebuilding above 50% would have a dramatic effect on the OY as shown in the Figure below:

Table xx. Rebuilding runs conducted with the current T_{target} (2074).

RUN	2								1
	50%	60%	70%	80%	90%	Tmid	F=0	40-10 Rule	Current
Fishing rate	0.0298	0.0132	0	0	0	0.0173	0	0	
SPR RATE	0.816	0.914	1.000	1.000	1.000	0.889	0.000	0.000	0.887
OY in 2007	73.4	32.5	0	0	0	42.5	0	0	43.2
Prob to rebuild by T_{max} (2074)	50.0	59.9	68.4	68.4	68.4	57.5	68.4	36.6	57.4
Median year to rebuild	2074	2060	2053	2053	2053	2063	2053	2111	2063

Table xx. Rebuilding runs conducted with the current T_{max} (2076).

RUN		4							3
	50%	60%	70%	80%	90%	Tmid	F=0	40-10 Rule	Current
Fishing rate	0.032	0.015	5E-04	0	0	0.019	0	0	
SPR RATE	80.7%	90.3%	99.6%	100%	100%	88.1%	100%		88.7%
OY in 2007 (mt)	77.6	37	1.3	0	0	45.7	0	0	43.2
Prob to rebuild by T_{max} (2076)	50.0%	59.9%	70.0%	70.3%	70.3%	58.0%	70.3%	37.6%	58.5%
Prob to rebuild by Ttarget (2074)									57.3%
Median year to rebuild	2076	2061	2053	2053	2053	2064	2053	2111	2063



Runs 2 and 4: Run 2 shows that increasing the harvest rate to a level that reduces SPR to 81.6% would create a probability of rebuilding by T_{target} (2074) equal to 50% and would produce an OY equal to 73.4 mt in 2007. Run 4 shows that decreasing the harvest rate to increase SPR to 90.3% would reduce the 2007 OY to 37 mt and increase the probability of rebuilding by T_{max} back to 60%. The movement of these two changes in opposite directions is caused by the shift from a low uncertainty rebuilding projection in 2002 that caused the 50% and 60% probabilities of rebuilding to occur close together in time (2074 and 2076), to an analysis that incorporates more of the uncertainty.

Runs 5 and 6: Recalculation of T_{min} and generation time with the current model (integrating over two scenarios and probability of steepness) produces the following results:

Model	T_{min}	Generation Time	T_{max}
2002	2057	19	2076
2005 – integrated	2048	23	2071

Run 5 - The current harvest rate would produce a 55.4% probability of rebuilding on or before the recalculated T_{max} (2071).
Run 6 - Reducing the harvest rate to SPR=93.5% would restore the 60% probability of rebuilding by T_{max} and would produce an OY of 24.1 mt in 2007.
By interpolation from values in the table below, a harvest rate of 87.8% would produce an OY of 47 mt in 2007 and would result in a probability of rebuilding on or before 2071 of 54.5%.

Table xx. Rebuilding runs conducted with the recalculated T_{max} (2071).

RUN		6						5	
	50%	60%	70%	80%	90%	Tmid	F=0	Current	ABC
Fishing rate	0.0271	0.0097	0	0	0	0.0152	0.000		
SPR RATE	83.1%	93.5%	100.0%	100.0%	100.0%	90.1%		88.7%	50.0%
OY	66.8	24.1	0	0	0	37.4	0	43.2	171.8
Prob to rebuild by Tmax	50.0	60.0	66.0	66.0	66.0	56.8	66.0	55.4	17.8
Median time to rebuild	64	51	45.9	45.9	45.9	54.4	45.9	56.2	-1
Prob overfished after rebuild	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
Median time to rebuild (yrs)	2071.0	2058.0	2052.9	2052.9	2052.9	2061.4	2052.9	2063.2	
Probability above current spawning outptut in 100 years	100.0	100.0	100.0	100.0	100.0	100.0	100.0	100.0	96.7
Probability above current spawning outptut in 200 years	100.0	100.0	100.0	100.0	100.0	100.0	100.0	100.0	96.0
Probability below 0.01B0 in 100 years	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
Probability below 0.01B0 in 200 years	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.1
Lower 5th percentile, spawning output / target in Tmax	0.287	0.395	0.474	0.474	0.474	0.358	0.474	0.343	0.121
Median spawning output / target in Tmax	0.999	1.267	1.445	1.445	1.445	1.180	1.445	1.143	0.514
Upper 5th percentile, spawning output / target in Tmax	1.869	2.185	2.379	2.379	2.379	2.077	2.379	2.034	1.212

SSC Requested Run Summary

Run #	Prob (recovery)	By	Based on	OY in 2007
#1 (default)	Estimated: 57.4%	Current T_{target}(2074)	Current SPR (88.7%)	43.2 mt
#2 (T_{TARGET} with 50% prob)	50%	Current T_{target} (2074)	Estimated SPR (81.6%)	73.4 mt
#3 (#1 based on T_{MAX})	Estimated: 58.5%	Current T_{max} (2076)	Current SPR (88.7%)	43.2 mt
#4 (#2 based on T_{MAX})	P_0 (60%)	Current T_{max} (2076)	Estimated SPR: 90.3%	37.0 mt
#5 (#3 with re-estimated T_{MAX})	Estimated: 55.4%	Estimated T_{max}: 2071	Current SPR (88.7%)	43.2 mt
#6 (#4 with re-estimated T_{MAX})	P_0 (60%)	Estimated T_{max}: 2071	Estimated SPR (93.5%)	24.1 mt

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Table 1 Results of the stock assessment in 2005 using data through 2004. This table is from the base model from the STAR panel. It will be updated to represent the integrated result across the models and steepness profiles.

Year	bio-all	bio-age3+	SpawnBio	Depletion	recruit-0	SPR	Y/R	Catch	Catch/Bio	maxF-fem	maxF-male
Virgin	94350	93854	34921	1.000	4760	1.000	0.000	0.0			
Equil	94350	93854	34921	1.000	4760	1.000	0.000	0.0			
1916	94350	93854	34921	1.000	4760	0.932	0.091	473.9	0.0050	0.0068	0.0064
1917	93849	93355	34698	0.994	4744	0.896	0.137	748.9	0.0080	0.0108	0.0102
1918	93109	92615	34370	0.984	4720	0.890	0.146	794.0	0.0085	0.0116	0.0109
1919	92357	91866	34034	0.975	4696	0.924	0.101	520.0	0.0056	0.0076	0.0072
1920	91899	91410	33820	0.968	4680	0.921	0.106	542.7	0.0059	0.0080	0.0076
1921	91441	90954	33606	0.962	4664	0.932	0.091	458.7	0.0050	0.0068	0.0064
1922	91083	90598	33437	0.957	4651	0.938	0.084	415.4	0.0046	0.0062	0.0059
1923	90779	90296	33294	0.953	4641	0.927	0.098	491.0	0.0054	0.0074	0.0070
1924	90414	89932	33130	0.949	4628	0.931	0.092	456.9	0.0051	0.0069	0.0065
1925	90092	89611	32988	0.945	4617	0.921	0.105	528.7	0.0059	0.0080	0.0076
1926	89710	89230	32824	0.940	4605	0.894	0.140	726.4	0.0081	0.0111	0.0105
1927	89151	88672	32590	0.933	4587	0.908	0.122	615.6	0.0069	0.0094	0.0089
1928	88714	88236	32407	0.928	4573	0.906	0.124	626.6	0.0071	0.0096	0.0091
1929	88278	87802	32228	0.923	4559	0.910	0.120	595.7	0.0067	0.0092	0.0087
1930	87883	87409	32066	0.918	4547	0.894	0.140	709.2	0.0081	0.0110	0.0104
1931	87391	86918	31865	0.912	4531	0.893	0.141	711.1	0.0081	0.0111	0.0105
1932	86911	86440	31671	0.907	4516	0.915	0.113	546.7	0.0063	0.0086	0.0081
1933	86599	86129	31547	0.903	4506	0.927	0.098	466.6	0.0054	0.0074	0.0070
1934	86368	85899	31459	0.901	4499	0.929	0.095	449.7	0.0052	0.0071	0.0067
1935	86153	85685	31380	0.899	4493	0.925	0.100	473.1	0.0055	0.0075	0.0071
1936	85916	85449	31291	0.896	4486	0.927	0.097	459.9	0.0054	0.0073	0.0069
1937	85691	85225	31209	0.894	4479	0.931	0.092	433.1	0.0051	0.0069	0.0066
1938	85492	85026	31138	0.892	4473	0.940	0.080	369.7	0.0043	0.0059	0.0056
1939	85351	84885	31090	0.890	4469	0.945	0.074	336.7	0.0039	0.0053	0.0051
1940	85238	84773	31053	0.889	4467	0.933	0.090	421.6	0.0049	0.0065	0.0064
1941	85040	84575	30982	0.887	4461	0.925	0.101	475.5	0.0056	0.0073	0.0073
1942	84791	84327	30891	0.885	4454	0.936	0.089	412.7	0.0049	0.0057	0.0064
1943	84601	84138	30832	0.883	4449	0.829	0.229	1244.5	0.0147	0.0170	0.0196
1944	83617	83155	30476	0.873	4420	0.749	0.323	1964.5	0.0235	0.0285	0.0313
1945	81987	81529	29856	0.855	4369	0.575	0.507	4141.1	0.0505	0.0601	0.0694
1946	78341	77889	28492	0.816	4253	0.661	0.420	2755.0	0.0352	0.0427	0.0480
1947	76182	75738	27668	0.792	4181	0.742	0.330	1816.2	0.0238	0.0294	0.0323
1948	75024	74588	27223	0.780	4142	0.771	0.298	1540.6	0.0205	0.0246	0.0281
1949	74181	73749	26922	0.771	4115	0.764	0.306	1583.4	0.0213	0.0254	0.0294
1950	73327	72899	26634	0.763	4088	0.706	0.354	1959.1	0.0267	0.0317	0.0359
1951	72130	71705	26226	0.751	4051	0.703	0.356	1936.3	0.0268	0.0329	0.0361
1952	70952	70560	25829	0.740	3213	0.703	0.355	1901.8	0.0268	0.0329	0.0360
1953	69827	69466	25456	0.729	3211	0.714	0.341	1753.3	0.0251	0.0324	0.0335
1954	68869	68534	25128	0.720	3259	0.690	0.369	1948.6	0.0283	0.0361	0.0380
1955	67720	67379	24732	0.708	3356	0.685	0.374	1961.4	0.0290	0.0370	0.0389
1956	66521	66169	24333	0.697	3519	0.676	0.383	1997.5	0.0300	0.0393	0.0404
1957	65243	64873	23911	0.685	3760	0.616	0.449	2575.8	0.0395	0.0517	0.0538
1958	63374	62979	23266	0.666	4061	0.603	0.459	2619.0	0.0413	0.0544	0.0563
1959	61461	61037	22592	0.647	4359	0.612	0.451	2451.6	0.0399	0.0516	0.0543
1960	59723	59278	21968	0.629	4393	0.598	0.458	2479.5	0.0415	0.0530	0.0563
1961	57985	57547	21314	0.610	3904	0.625	0.433	2160.3	0.0373	0.0465	0.0504
1962	56619	56221	20768	0.595	3237	0.614	0.443	2206.7	0.0390	0.0478	0.0530
1963	55309	54969	20207	0.579	2732	0.621	0.435	2070.8	0.0374	0.0473	0.0509
1964	54257	53965	19704	0.564	2493	0.692	0.362	1484.6	0.0274	0.0337	0.0369
1965	53855	53585	19472	0.558	2556	0.651	0.402	1756.4	0.0326	0.0390	0.0446

1966	53209	52930	19206	0.550	2969	0.470	0.578	3616.0	0.0680	0.0835	0.0978
1967	50757	50440	18322	0.525	3563	0.609	0.445	1953.7	0.0385	0.0471	0.0540
1968	49863	49519	18103	0.518	3353	0.562	0.492	2327.4	0.0467	0.0582	0.0672
Year	bio-all	bio-age3+	SpawnBio	Depletion	recruit-0	SPR	Y/R	Catch	Catch/Bio	maxF-fem	maxF-male
1969	48503	48174	17760	0.509	2642	0.650	0.398	1559.2	0.0321	0.0367	0.0442
1970	47822	47529	17700	0.507	2503	0.649	0.393	1524.2	0.0319	0.0362	0.0430
1971	47173	46889	17587	0.504	3009	0.650	0.396	1520.7	0.0322	0.0367	0.0436
1972	46542	46214	17401	0.498	3871	0.629	0.411	1603.9	0.0345	0.0407	0.0459
1973	45785	45420	17113	0.490	3600	0.519	0.519	2481.9	0.0542	0.0693	0.0752
1974	44168	43783	16446	0.471	3646	0.576	0.457	1863.0	0.0422	0.0499	0.0573
1975	43161	42794	16046	0.459	3343	0.570	0.462	1861.8	0.0431	0.0507	0.0589
1976	42193	41872	15655	0.448	2339	0.617	0.409	1459.8	0.0346	0.0400	0.0460
1977	41731	41429	15420	0.442	3052	0.538	0.492	2048.5	0.0491	0.0564	0.0684
1978	40762	40488	14993	0.429	2494	0.426	0.592	3073.8	0.0754	0.0918	0.1094
1979	38836	38605	14192	0.406	1236	0.382	0.627	3460.8	0.0891	0.1093	0.1324
1980	36644	36423	13313	0.381	2636	0.293	0.627	4131.7	0.1128	0.1433	0.1701
1981	33835	33611	12248	0.351	2527	0.336	0.640	3371.6	0.0996	0.1282	0.1508
1982	31717	31497	11498	0.329	1268	0.221	0.697	5374.5	0.1695	0.2438	0.2870
1983	27683	27478	9989	0.286	2135	0.229	0.736	4858.5	0.1755	0.2695	0.3199
1984	24251	24035	8670	0.248	2722	0.330	0.648	2395.8	0.0988	0.1345	0.1609
1985	23106	22910	8332	0.239	876	0.271	0.646	2730.9	0.1182	0.1571	0.1905
1986	21576	21404	7843	0.225	1426	0.299	0.625	2243.7	0.1040	0.1386	0.1671
1987	20486	20358	7488	0.214	1350	0.221	0.670	3147.1	0.1536	0.2265	0.2691
1988	18531	18377	6715	0.192	1667	0.224	0.670	2766.9	0.1493	0.2139	0.2592
1989	16863	16714	6078	0.174	1276	0.186	0.712	3269.8	0.1939	0.2962	0.3632
1990	14667	14528	5209	0.149	1097	0.182	0.701	2751.2	0.1876	0.2788	0.3432
1991	12940	12815	4547	0.130	1245	0.142	0.708	3170.0	0.2450	0.4274	0.5278
1992	10796	10694	3684	0.105	626	0.122	0.689	2822.3	0.2614	0.4832	0.5950
1993	8978	8885	2954	0.085	846	0.124	0.683	2186.6	0.2435	0.4839	0.5687
1994	7748	7662	2456	0.070	990	0.176	0.630	1205.3	0.1556	0.1816	0.2208
1995	7343	7262	2377	0.068	509	0.157	0.599	1190.5	0.1621	0.1803	0.2179
1996	6853	6791	2280	0.065	348	0.111	0.630	1531.3	0.2234	0.2663	0.3266
1997	5959	5918	2013	0.058	336	0.100	0.629	1440.8	0.2418	0.3039	0.3637
1998	5112	5061	1725	0.049	757	0.077	0.627	1513.0	0.2960	0.3973	0.4999
1999	4107	4061	1376	0.039	255	0.121	0.639	856.3	0.2085	0.2642	0.3278
2000	3674	3634	1239	0.035	177	0.496	0.422	180.5	0.0491	0.0567	0.0595
2001	3858	3833	1350	0.039	296	0.623	0.358	123.5	0.0320	0.0333	0.0370
2002	4083	4054	1475	0.042	344	0.688	0.339	103.7	0.0254	0.0260	0.0322
2003	4295	4260	1597	0.046	367	0.828	0.152	48.0	0.0112	0.0199	0.0206
2004	4520	4481	1730	0.050	393	0.877	0.138	37.5	0.0083	0.0079	0.0093
2005	4719	4678	1850	0.053	421			46.8	0.0100		

Table 2. Age-specific natural mortality and female fecundity. Numbers at age (thousands) in 2000 are for the Tmin calculation and numbers at age in 2004 are the basis for projections. These values are from the base model reviewed by the STAR in September 2005. The integrated rebuilding analysis uses 38 (2 models and a range of steepness levels) unique init N vectors to represent alternative outcomes.

	Females				Males		
Age	Fecundity	M	Init N	Init N Tmin	M	Init N	Init N (Tmin)
0	0.00004	0.06	196.31	88.65	0.06	196.31	88.65
1	0.00004	0.06	172.86	120.26	0.06	172.86	120.26
2	0.00004	0.06	152.33	335.91	0.06	152.33	335.91
3	0.00016	0.06	123.56	140.12	0.06	123.56	140.12
4	0.00184	0.06	69.68	136.47	0.06	69.66	136.33
5	0.01202	0.06	93.96	184.11	0.06	93.82	183.10
6	0.05066	0.06	258.78	318.14	0.06	258.06	314.19
7	0.14742	0.064	105.08	230.15	0.06	105.02	226.13
8	0.31891	0.068	98.16	136.29	0.06	98.60	133.17
9	0.55367	0.072	127.00	203.28	0.06	128.65	196.47
10	0.82297	0.077	212.96	127.29	0.06	217.84	121.03
11	1.09879	0.081	150.98	103.58	0.06	155.90	96.17
12	1.36261	0.085	87.95	96.39	0.06	91.49	86.89
13	1.60522	0.089	129.37	57.86	0.06	134.80	50.71
14	1.82361	0.093	80.01	47.42	0.06	83.11	40.75
15	2.018	0.093	64.61	23.21	0.06	66.20	19.74
16	2.19001	0.093	59.89	56.85	0.06	59.98	48.43
17	2.34176	0.093	35.93	33.63	0.06	35.11	29.07
18	2.47539	0.093	29.54	14.41	0.06	28.29	12.78
19	2.59291	0.093	14.49	20.23	0.06	13.74	18.51
20	2.69616	0.093	35.57	14.85	0.06	33.77	14.01
21	2.78678	0.093	21.07	4.96	0.06	20.30	4.79
22	2.86625	0.093	9.04	7.16	0.06	8.94	7.04
23	2.93589	0.093	12.71	6.27	0.06	12.96	6.23
24	2.99684	0.093	9.33	3.46	0.06	9.82	3.45
25	3.05017	0.093	3.12	3.63	0.06	3.36	3.62
26	3.09678	0.093	4.51	2.98	0.06	4.94	2.96
27	3.1375	0.093	3.95	2.25	0.06	4.38	2.21
28	3.17306	0.093	2.18	1.87	0.06	2.43	1.81
29	3.20408	0.093	2.29	1.13	0.06	2.55	1.08
30	3.23114	0.093	1.88	0.75	0.06	2.08	0.70
31	3.25473	0.093	1.42	0.64	0.06	1.56	0.58
32	3.27529	0.093	1.18	0.67	0.06	1.27	0.59
33	3.2932	0.093	0.72	0.60	0.06	0.76	0.52
34	3.30881	0.093	0.47	0.43	0.06	0.49	0.36
35	3.32239	0.093	0.40	0.33	0.06	0.41	0.27
36	3.33422	0.093	0.42	0.28	0.06	0.42	0.22
37	3.34452	0.093	0.38	0.27	0.06	0.37	0.21
38	3.35348	0.093	0.27	0.28	0.06	0.26	0.22
39	3.36128	0.093	0.21	0.31	0.06	0.19	0.23

40	3.36806	0.093	2.25	2.43	0.06	2.06	2.03

Table 3. Age, gender, and fleet-specific body weight and selectivity. Fleet 1 is trawl, fleet 2 in non-trawl, and fleet 3 is recreational.

	Fleet 1 (F)		Fleet 2 (F)		Fleet 3 (F)		Fleet 1 (M)		Fleet 2 (M)		Fleet 3 (M)	
Age	Weight	Selectivity	Weight	Selectivity	Weight	Selectivity	Weight	Selectivity	Weight	Selectivity	Weight	Selectivity
0	0.037	0	0.037	0	0.037	0	0.037	0	0.037	0	0.037	0
1	0.037	0	0.037	0	0.037	0	0.037	0	0.037	0	0.037	0
2	0.053	0	0.05	0	0.062	0.001	0.059	0	0.056	0	0.068	0.001
3	0.166	0.001	0.155	0.002	0.176	0.041	0.182	0.001	0.169	0.002	0.189	0.057
4	0.353	0.005	0.326	0.014	0.309	0.328	0.373	0.006	0.344	0.017	0.322	0.394
5	0.577	0.025	0.536	0.058	0.437	0.78	0.584	0.033	0.544	0.065	0.45	0.845
6	0.792	0.096	0.748	0.159	0.572	0.972	0.78	0.117	0.737	0.166	0.584	1
7	0.986	0.233	0.947	0.321	0.714	0.879	0.953	0.276	0.914	0.317	0.723	0.893
8	1.166	0.405	1.137	0.505	0.854	0.691	1.108	0.474	1.077	0.484	0.858	0.714
9	1.339	0.56	1.321	0.67	0.997	0.513	1.25	0.66	1.23	0.634	0.989	0.552
10	1.51	0.672	1.502	0.794	1.157	0.377	1.382	0.801	1.372	0.75	1.122	0.427
11	1.679	0.742	1.679	0.877	1.345	0.281	1.506	0.893	1.504	0.834	1.262	0.335
12	1.843	0.78	1.849	0.93	1.558	0.217	1.62	0.949	1.624	0.89	1.406	0.27
13	2.001	0.799	2.012	0.961	1.776	0.177	1.724	0.979	1.732	0.928	1.545	0.225
14	2.148	0.807	2.164	0.978	1.982	0.151	1.817	0.993	1.829	0.952	1.672	0.195
15	2.285	0.809	2.306	0.988	2.166	0.134	1.9	0.999	1.914	0.968	1.783	0.173
16	2.41	0.807	2.437	0.993	2.328	0.123	1.973	1	1.988	0.978	1.878	0.159
17	2.523	0.804	2.556	0.996	2.469	0.116	2.036	0.998	2.053	0.985	1.958	0.148
18	2.626	0.8	2.663	0.998	2.593	0.111	2.091	0.996	2.109	0.989	2.026	0.141
19	2.718	0.795	2.759	0.999	2.702	0.107	2.138	0.993	2.157	0.992	2.083	0.135
20	2.801	0.791	2.845	0.999	2.797	0.105	2.178	0.989	2.198	0.994	2.132	0.131
21	2.875	0.786	2.921	1	2.88	0.103	2.212	0.986	2.233	0.995	2.172	0.127
22	2.941	0.782	2.988	1	2.953	0.102	2.241	0.983	2.263	0.996	2.206	0.125
23	2.999	0.778	3.047	1	3.016	0.101	2.266	0.981	2.288	0.997	2.235	0.123
24	3.051	0.775	3.1	1	3.072	0.1	2.287	0.979	2.31	0.998	2.259	0.121
25	3.097	0.772	3.146	1	3.121	0.099	2.305	0.977	2.328	0.998	2.28	0.12
26	3.137	0.769	3.186	1	3.163	0.099	2.32	0.975	2.343	0.998	2.297	0.119
27	3.172	0.766	3.221	1	3.2	0.098	2.332	0.974	2.356	0.999	2.311	0.118

28	3.203	0.764	3.252	1	3.232	0.098	2.343	0.973	2.367	0.999	2.324	0.117
29	3.23	0.762	3.279	1	3.261	0.098	2.352	0.972	2.376	0.999	2.334	0.117
30	3.254	0.76	3.303	1	3.285	0.097	2.36	0.971	2.384	0.999	2.342	0.116
31	3.275	0.759	3.324	1	3.307	0.097	2.366	0.97	2.39	0.999	2.35	0.116
32	3.293	0.757	3.342	1	3.325	0.097	2.371	0.97	2.396	0.999	2.356	0.116
33	3.309	0.756	3.357	1	3.342	0.097	2.376	0.969	2.401	0.999	2.361	0.115
34	3.323	0.755	3.371	1	3.356	0.097	2.38	0.969	2.404	0.999	2.365	0.115
35	3.335	0.754	3.383	1	3.368	0.097	2.383	0.968	2.408	0.999	2.369	0.115
36	3.345	0.753	3.394	1	3.379	0.097	2.386	0.968	2.41	0.999	2.372	0.115
37	3.355	0.753	3.403	1	3.388	0.097	2.388	0.968	2.413	0.999	2.374	0.115
38	3.363	0.752	3.41	1	3.396	0.097	2.39	0.968	2.415	0.999	2.376	0.115
39	3.37	0.752	3.417	1	3.403	0.096	2.392	0.967	2.416	0.999	2.378	0.115
40	3.376	0.751	3.423	1	3.41	0.096	2.393	0.967	2.418	0.999	2.38	0.115

Table xx. Projection Table. Note that decades of 2030-2060 are compressed.

	Catch				Spawning Biomass					Pr(Rebuilt)				
	Run-4		Run-2	Run-6		Run-4		Run-2	Run-6		Run-4		Run-2	Run-6
Year	P=0.6 by 2076	Current	P=0.5 by 2074	P=0.6 by 2071	F=0	P=0.6 by 2076	Current	P=0.5 by 2074	P=0.6 by 2071	F=0	P=0.6 by 2076	Current	P=0.5 by 2074	P=0.6 by 2071
2007	37.0	43.2	73.4	24.1	3091	3091	3091	3091	3091	0.000	0.000	0.000	0.000	0.000
2008	38.1	44.5	75.0	24.8	3240	3227	3225	3215	3232	0.000	0.000	0.000	0.000	0.000
2009	38.6	45.1	75.8	25.3	3368	3341	3336	3314	3350	0.000	0.000	0.000	0.000	0.000
2010	39.8	46.4	77.6	26.0	3484	3440	3433	3398	3455	0.000	0.000	0.000	0.000	0.000
2011	41.7	48.6	81.0	27.3	3601	3539	3529	3479	3560	0.000	0.000	0.000	0.000	0.000
2012	43.9	51.1	85.0	28.8	3723	3641	3627	3561	3669	0.001	0.000	0.000	0.000	0.001
2013	46.5	54.1	89.7	30.6	3827	3723	3706	3623	3759	0.004	0.001	0.001	0.001	0.002
2014	48.6	56.5	93.3	32.0	3946	3819	3798	3698	3863	0.006	0.004	0.004	0.002	0.005
2015	50.6	58.7	96.7	33.3	4078	3926	3901	3783	3977	0.009	0.006	0.006	0.004	0.007
2016	52.5	61.0	100.1	34.7	4220	4043	4014	3875	4104	0.013	0.009	0.008	0.006	0.011
2017	54.2	62.9	102.8	35.9	4379	4175	4142	3985	4245	0.017	0.012	0.012	0.009	0.014
2018	56.0	64.9	105.7	37.1	4561	4327	4289	4108	4408	0.021	0.016	0.016	0.012	0.018
2019	58.0	67.2	109.1	38.5	4745	4482	4438	4231	4573	0.029	0.020	0.019	0.015	0.023
2020	59.8	69.2	111.9	39.8	4941	4639	4590	4364	4743	0.036	0.026	0.024	0.018	0.030
2021	61.5	71.2	114.7	40.9	5124	4792	4739	4490	4906	0.047	0.033	0.030	0.022	0.036
2022	63.3	73.1	117.5	42.2	5319	4960	4903	4629	5082	0.059	0.040	0.038	0.027	0.046
2023	65.3	75.5	120.9	43.6	5528	5129	5064	4763	5265	0.068	0.049	0.045	0.033	0.058
2024	67.3	77.7	123.8	45.0	5735	5298	5227	4898	5447	0.082	0.059	0.056	0.039	0.065
2025	69.3	79.9	127.1	46.4	5951	5474	5397	5038	5636	0.098	0.068	0.064	0.047	0.077
2026	71.7	82.6	130.9	48.1	6153	5642	5559	5175	5817	0.118	0.079	0.073	0.054	0.091
2027	73.5	84.7	133.7	49.4	6349	5795	5704	5294	5981	0.134	0.092	0.086	0.061	0.108
2028	75.9	87.4	137.6	51.1	6567	5968	5872	5430	6171	0.154	0.107	0.100	0.069	0.123
2029	79.0	90.9	142.5	53.2	6765	6129	6027	5559	6343	0.173	0.123	0.115	0.078	0.138
2030	80.6	92.7	145.1	54.3	6999	6309	6199	5695	6542	0.192	0.137	0.129	0.090	0.156
2040	105.8	120.9	183.6	72.2	9635	8388	8190	7300	8810	0.356	0.288	0.275	0.217	0.314
2050	134.3	153.0	227.6	92.3	12796	10822	10512	9123	11467	0.472	0.408	0.395	0.330	0.428

2060	162.1	183.9	269.6	112.2	16096	13335	12913	11013	14246	0.567	0.490	0.477	0.412	0.515
2061	165.2	187.4	274.0	114.4	16430	13583	13141	11187	14528	0.575	0.499	0.485	0.418	0.524
2062	167.8	190.3	278.5	116.2	16768	13826	13378	11387	14808	0.582	0.505	0.491	0.424	0.531
2063	170.2	192.8	281.7	117.8	17088	14113	13644	11556	15088	0.590	0.511	0.498	0.432	0.539
2064	173.5	196.6	287.1	120.3	17413	14329	13872	11737	15341	0.600	0.517	$\boxed{0.506}$	0.440	0.546
2065	176.5	199.9	291.4	122.5	17702	14581	14099	11935	15613	0.609	0.526	0.512	0.445	0.556
2066	179.5	203.8	297.0	124.6	18068	14861	14362	12156	15926	0.618	0.533	0.518	0.453	0.563
2067	182.5	206.8	301.4	126.4	18421	15170	14662	12385	16232	0.627	0.539	0.526	0.459	0.570
2068	185.3	210.0	305.9	128.5	18779	15397	14880	12554	16527	0.636	0.549	0.533	0.465	0.578
2069	187.6	212.7	309.1	130.3	19103	15611	15091	12744	16750	0.643	0.555	0.540	0.470	0.585
2070	190.1	215.4	313.2	132.0	19445	15945	15391	12929	17125	0.652	0.562	0.548	0.477	0.592
2071	192.5	218.1	315.8	133.6	19738	16190	15604	13106	17366	0.660	0.569	0.554	0.484	$\boxed{0.600}$
2072	194.9	221.1	320.8	135.4	20095	16425	15858	13342	17618	0.670	0.574	0.559	0.490	0.607
2073	197.7	224.2	324.5	137.3	20390	16633	16071	13503	17873	0.676	0.582	0.567	0.496	0.613
2074	200.3	227.1	328.9	139.1	20736	16897	16304	13655	18129	0.684	0.589	0.574	$\boxed{0.500}$	0.620
2075	203.5	230.2	332.2	141.2	20951	17133	16507	13832	18400	0.693	0.594	0.580	0.505	0.627
2076	205.2	232.9	337.5	142.6	21277	17331	16727	14019	18625	0.703	$\boxed{0.599}$	0.585	0.510	0.635
2077	207.9	235.6	341.1	144.5	21565	17553	16932	14233	18899	0.714	0.606	0.591	0.515	0.642
2078	210.7	238.4	345.6	146.4	21866	17805	17177	14384	19139	0.723	0.611	0.596	0.519	0.646
2079	213.8	242.1	349.9	148.5	22144	18038	17405	14558	19415	0.732	0.617	$\boxed{0.602}$	0.524	0.653
2080	216.3	244.9	353.8	150.4	22436	18270	17626	14742	19656	0.740	0.624	0.608	0.530	0.661

Table 6. Input file for the updated rebuilding analysis. Note that these inputs for fishery selectivity and weight-at-age, numbers-at-age in 2000 and 2004, and the steepness value are superceded by values read from the MCMC.prj file.

```
#Title
Canary
# Number of sexes
2
# Age range to consider (minimum age; maximum age)
0	40
# Number of fleets
3
# First year of projection
2004
# Year declared overfished
2000
# Is the maximum age a plus-group (1=Yes;2=No)
1
# Generate future recruitments using historical recruitments (1) historical
recruits/spawner (2) or a stock-recruitment (3)
3
# Constant fishing mortality (1) or constant Catch (2) projections
1
# Fishing mortality based on SPR (1) or actual rate (2)
1
# Pre-specify the year of recovery (or -1) to ignore
-1
# Fecundity-at-age
#
3.80E-05	3.80E-05	3.80E-05	0.000162861	0.00184254	0.0120233
	0.0506613	0.147419	0.318907	0.553672	0.822968
	1.09879	1.36261	1.60522	1.82361	2.018	2.19001
	2.34176	2.47539	2.59291	2.69616	2.78678
	2.86625	2.93589	2.99684	3.05017	3.09678	3.1375
	3.17306	3.20408	3.23114	3.25473	3.27529	3.2932
	3.30881	3.32239	3.33422	3.34452	3.35348
	3.36128	3.36806
# Age specific information (Females then males) weight selectivity
# female wt and selex fleet 1=trawl
0.037	0.037	0.053	0.166	0.353	0.577	0.792	0.986	1.166	1.339	1.51	1.679
	1.843	2.001	2.148	2.285	2.41	2.523	2.626	2.718	2.801	2.875	2.941
	2.999	3.051	3.097	3.137	3.172	3.203	3.23	3.254	3.275	3.293	3.309
	3.323	3.335	3.345	3.355	3.363	3.37	3.376
0	0	0	0.0006	0.0046	0.0254	0.0955	0.2333	0.4052	0.5603	0.6722	0.7417
	0.7803	0.7994	0.8073	0.809	0.8073	0.804	0.7998	0.7954	0.7909	0.7865	0.7824
```

	0.7785	0.775	0.7718	0.7689	0.7664	0.7641	0.7621	0.7603	0.7587	0.7574	0.7562
	0.7551	0.7542	0.7534	0.7527	0.7521	0.7516	0.7511				
# female wt and selex fleet 2=nontrawl											
0.037	0.037	0.05	0.155	0.326	0.536	0.748	0.947	1.137	1.321	1.502	1.679
	1.849	2.012	2.164	2.306	2.437	2.556	2.663	2.759	2.845	2.921	2.988
	3.047	3.1	3.146	3.186	3.221	3.252	3.279	3.303	3.324	3.342	3.357
	3.371	3.383	3.394	3.403	3.41	3.417	3.423				
0	0	0.0001	0.0018	0.0139	0.0577	0.1593	0.3209	0.5053	0.6697	0.7938	0.8775
	0.9297	0.9606	0.9782	0.988	0.9934	0.9964	0.998	0.9989	0.9994	0.9997	0.9998
	0.9999	1	1	1	1	1	1	1	1	1	1
	1	1	1	1	1	1	1				
# female wt and selex fleet 3=recreational											
0.037	0.037	0.062	0.176	0.309	0.437	0.572	0.714	0.854	0.997	1.157	1.345
	1.558	1.776	1.982	2.166	2.328	2.469	2.593	2.702	2.797	2.88	2.953
	3.016	3.072	3.121	3.163	3.2	3.232	3.261	3.285	3.307	3.325	3.342
	3.356	3.368	3.379	3.388	3.396	3.403	3.41				
0.0003	0.0003	0.0008	0.0409	0.3284	0.7803	0.9718	0.8794	0.6905	0.5131	0.3765	0.2808
	0.2174	0.1767	0.1507	0.1341	0.1232	0.1159	0.1109	0.1074	0.1049	0.1031	0.1017
	0.1006	0.0998	0.0991	0.0986	0.0982	0.0979	0.0976	0.0974	0.0972	0.097	0.0969
	0.0968	0.0967	0.0966	0.0965	0.0965	0.0964	0.0964				
# male wt and selex fleet 1=trawl											
0.037	0.037	0.059	0.182	0.373	0.584	0.78	0.953	1.108	1.25	1.382	1.506
	1.62	1.724	1.817	1.9	1.973	2.036	2.091	2.138	2.178	2.212	2.241
	2.266	2.287	2.305	2.32	2.332	2.343	2.352	2.36	2.366	2.371	2.376
	2.38	2.383	2.386	2.388	2.39	2.392	2.393				
0	0	0	0.0008	0.0062	0.0332	0.1173	0.2758	0.4743	0.6597	0.8006	0.8934
	0.9486	0.9785	0.9932	0.999	1	0.9984	0.9957	0.9925	0.9892	0.9862	0.9834
	0.9809	0.9788	0.9769	0.9753	0.9739	0.9727	0.9717	0.9709	0.9702	0.9696	0.9691
	0.9686	0.9683	0.968	0.9677	0.9675	0.9673	0.9672				
# male wt and selex fleet 2=nontrawl											
0.037	0.037	0.056	0.169	0.344	0.544	0.737	0.914	1.077	1.23	1.372	1.504
	1.624	1.732	1.829	1.914	1.988	2.053	2.109	2.157	2.198	2.233	2.263
	2.288	2.31	2.328	2.343	2.356	2.367	2.376	2.384	2.39	2.396	2.401
	2.404	2.408	2.41	2.413	2.415	2.416	2.418				
0	0	0.0001	0.0023	0.0172	0.0651	0.1663	0.3171	0.4843	0.634	0.7505	0.8337
	0.8903	0.9276	0.952	0.9677	0.9779	0.9846	0.989	0.9919	0.994	0.9954	0.9964
	0.9971	0.9976	0.998	0.9983	0.9985	0.9987	0.9988	0.999	0.999	0.9991	0.9992
	0.9992	0.9993	0.9993	0.9993	0.9993	0.9994	0.9994				
# male wt and selex fleet 3=recreational											
0.037	0.037	0.068	0.189	0.322	0.45	0.584	0.723	0.858	0.989	1.122	1.262
	1.406	1.545	1.672	1.783	1.878	1.958	2.026	2.083	2.132	2.172	2.206
	2.235	2.259	2.28	2.297	2.311	2.324	2.334	2.342	2.35	2.356	2.361
	2.365	2.369	2.372	2.374	2.376	2.378	2.38				
0.0003	0.0003	0.001	0.0566	0.3936	0.8454	1	0.8932	0.7136	0.5522	0.4269	0.335
	0.2699	0.2251	0.1945	0.1734	0.1587	0.1482	0.1406	0.1349	0.1307	0.1274	0.1248

0.1228 0.1212 0.12 0.1189 0.1181 0.1174 0.1168 0.1164 0.116 0.1157 0.1154
0.1152 0.115 0.1149 0.1147 0.1146 0.1145 0.1145
M and initial age-structure for 2004
female
0.06 0.06 0.06 0.06 0.06 0.06 0.06 0.0641414 0.0682827
0.0724241 0.0765654 0.0807068 0.0848481 0.0889895
0.0931308 0.0931308 0.0931308 0.0931308 0.0931308
0.0931308 0.0931308 0.0931308 0.0931308 0.0931308
0.0931308 0.0931308 0.0931308 0.0931308 0.0931308
0.0931308 0.0931308 0.0931308 0.0931308 0.0931308
0.0931308 0.0931308 0.0931308 0.0931308 0.0931308
0.0931308 0.0931308
196.309 172.862 152.333 123.561 69.6801 93.9562
258.776 105.084 98.161 127.003 212.959 150.977
87.9514 129.371 80.0138 64.6072 59.8895
35.9335 29.5418 14.4934 35.5668 21.0718
9.04251 12.7051 9.334 3.11781 4.50744 3.95273
2.18302 2.28984 1.87866 1.41981 1.17918
0.715485 0.472064 0.403646 0.424542 0.381926
0.273987 0.2054 2.25308
male
0.06 0.06 0.06 0.06 0.06 0.06 0.06 0.06 0.06 0.06 0.06 0.06
0.06 0.06 0.06 0.06 0.06 0.06 0.06 0.06 0.06 0.06 0.06
0.06 0.06 0.06 0.06 0.06 0.06 0.06 0.06 0.06 0.06 0.06
0.06 0.06 0.06 0.06 0.06 0.06 0.06
196.309 172.862 152.333 123.561 69.6593 93.8179
258.058 105.017 98.6002 128.654 217.841
155.895 91.4869 134.795 83.1082 66.1958
59.9837 35.1084 28.2924 13.7383 33.7682
20.2994 8.93796 12.9585 9.81795 3.36164
4.94088 4.37515 2.42662 2.54572 2.07895
1.55518 1.27287 0.758189 0.489321 0.407954
0.417722 0.365907 0.255851 0.187343 2.05869
Initial age-structure female then male for year 2000 (Ydeclared)
88.6505 120.258 335.905 140.122 136.467 184.105
318.135 230.151 136.288 203.284 127.289
103.577 96.3896 57.8577 47.4205 23.2091
56.8455 33.6257 14.4112 20.2264 14.8462
4.95519 7.15896 6.27433 3.46345 3.63135
2.97817 2.25003 1.86817 1.13325 0.747538
0.639076 0.67205 0.604503 0.433607 0.325026
0.278582 0.269905 0.284131 0.305275 2.42644
88.6505 120.258 335.905 140.12 136.328 183.102
314.187 226.133 133.165 196.473 121.027
96.1679 86.8863 50.7059 40.7535 19.7435
48.4326 29.066 12.7799 18.5069 14.0079 4.79234

7.03892 6.22943 3.45345 3.62153 2.95653
2.21107 1.80929 1.0775 0.695287 0.579594 0.593405
0.51975 0.363393 0.266072 0.223315 0.212382
0.219973 0.23307 2.03463

Year for Tmin Age-structure
2000
Number of simulations
6000
recruitment and biomass
Number of historical assessment years
90
Historical data
year recruitment spawner in B0 in R project in R/S project

1915	4760	34921	1	0	0
1916	4760	34921	0	0	0
1917	4744	34698	0	0	0
1918	4720	34370	0	0	0
1919	4696	34034	0	0	0
1920	4680	33820	0	0	0
1921	4664	33606	0	0	0
1922	4651	33437	0	0	0
1923	4641	33294	0	0	0
1924	4628	33130	0	0	0
1925	4617	32988	0	0	0
1926	4605	32824	0	0	0
1927	4587	32590	0	0	0
1928	4573	32407	0	0	0
1929	4559	32228	0	0	0
1930	4547	32066	0	0	0
1931	4531	31865	0	0	0
1932	4516	31671	0	0	0
1933	4506	31547	0	0	0
1934	4499	31459	0	0	0
1935	4493	31380	0	0	0
1936	4486	31291	0	0	0
1937	4479	31209	0	0	0
1938	4473	31138	0	0	0
1939	4469	31090	0	0	0
1940	4467	31053	0	0	0
1941	4461	30982	0	0	0
1942	4454	30891	0	0	0
1943	4449	30832	0	0	0
1944	4420	30476	0	0	0
1945	4369	29856	0	0	0
1946	4253	28492	0	0	0
1947	4181	27668	0	0	0

1948	4142	27223	0	0	0
1949	4115	26922	0	0	0
1950	4088	26634	0	0	0
1951	4051	26226	0	0	0
1952	3213	25829	0	0	0
1953	3211	25456	0	0	0
1954	3259	25128	0	0	0
1955	3356	24732	0	0	0
1956	3519	24333	0	0	0
1957	3760	23911	0	0	0
1958	4061	23266	0	0	0
1959	4359	22592	0	0	0
1960	4393	21968	0	0	0
1961	3904	21314	0	0	0
1962	3237	20768	0	0	0
1963	2732	20207	0	0	0
1964	2493	19704	0	0	0
1965	2556	19472	0	0	0
1966	2969	19206	0	0	0
1967	3563	18322	0	0	0
1968	3353	18103	0	0	0
1969	2642	17760	0	0	0
1970	2503	17700	0	0	0
1971	3009	17587	0	0	0
1972	3871	17401	0	0	0
1973	3600	17113	0	0	0
1974	3646	16446	0	0	0
1975	3343	16046	0	0	0
1976	2339	15655	0	0	0
1977	3052	15420	0	0	0
1978	2494	14993	0	0	0
1979	1236	14192	0	0	0
1980	2636	13313	0	0	0
1981	2527	12248	0	0	0
1982	1268	11498	0	0	0
1983	2135	9989	0	0	0
1984	2722	8670	0	0	0
1985	876	8332	0	0	0
1986	1426	7843	0	0	0
1987	1350	7488	0	0	0
1988	1667	6715	0	0	0
1989	1276	6078	0	0	0
1990	1097	5209	0	0	0
1991	1245	4547	0	0	0
1992	626	3684	0	0	0
1993	846	2954	0	0	0

1994	990	2456	0	0	0
1995	509	2377	0	0	0
1996	348	2280	0	0	0
1997	336	2013	0	0	0
1998	757	1725	0	0	0
1999	255	1376	0	0	0
2000	177	1239	0	0	0
2001	296	1350	0	0	0
2002	344	1475	0	0	0
2003	367	1597	0	0	0
2004	393	1730	0	0	0

Number of years with pre-specified catches
3
catches for years with pre-specified catches
2004 38
2005 47
2006 47
Number of future recruitments to override
0
Process for overiding (-1 for average otherwise index in data list)
Which probability to product detailed results for (1=0.5; 2=0.6; etc.)
2
Steepness sigma-R Auto-correlation
0.321245 0.4 0
Target SPR rate (FMSY Proxy)
0.5
Target SPR information: Use (1=Yes) and power
0 20
Discount rate (for cumulative catch)
0.1
Truncate the series when 0.4B0 is reached (1=Yes)
0
Set F to FMSY once 0.4B0 is reached (1=Yes)
0
Percentage of FMSY which defines Ftarget
0.9
Maximum possible F for projection (-1 to set to FMSY)
2
Conduct MacCall transition policy (1=Yes)
0
Defintion of recovery (1=now only;2=now or before)
2
Results for rec probs by Tmax (1) or 0.5 prob for various Ttargets (2)
1
Definition of the "40-10" rule
10 40

```
# Produce the risk-reward plots (1=Yes)
0
# Calculate coefficients of variation (1=Yes)
0
# Number of replicates to use
1
# Random number seed
-89102
# Conduct projections for multiple starting values (0=No;else yes)
1
# File with multiple parameter vectors
MCMC.PRJ
# Number of parameter vectors
1000
# User-specific projection (1=Yes); Output replaced (1->6)
1       9       0       0.5
# Catches and Fs (Year; 1/2/3 (F or C or SPR); value); Final row is -1
2007    3       .887
-1      -1      -1
# Split of Fs (2004     0.27    0.05    2.1)
2004    .112    .021    .867
-1      1       1       1
# Time varying weight-at-age (1=Yes;0=No)
0
# File with time series of weight-at-age data
HakWght.Csv
```

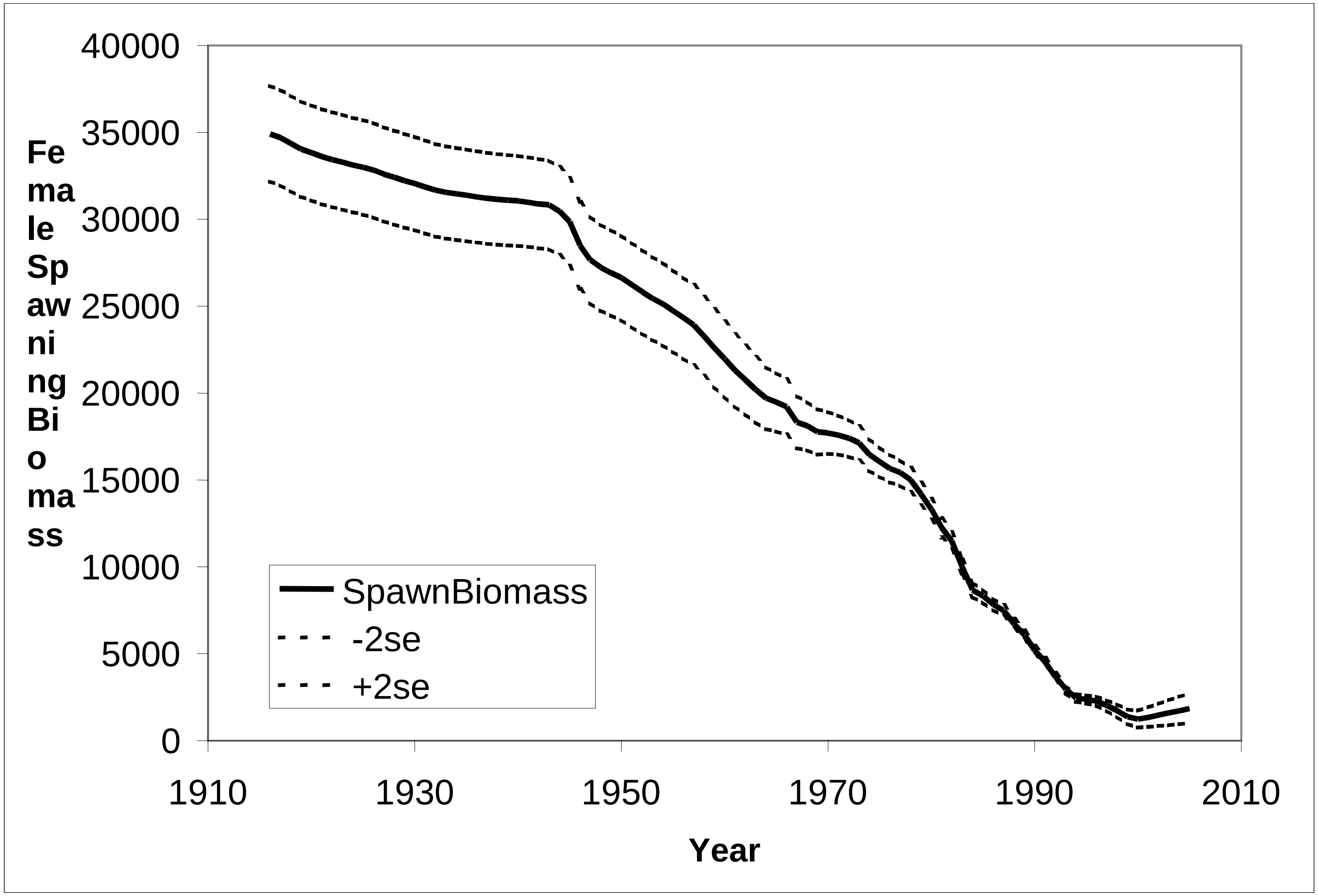


Figure 1. Estimated time series of spawning stock biomass with +/- 2 standard errors of the estimate.

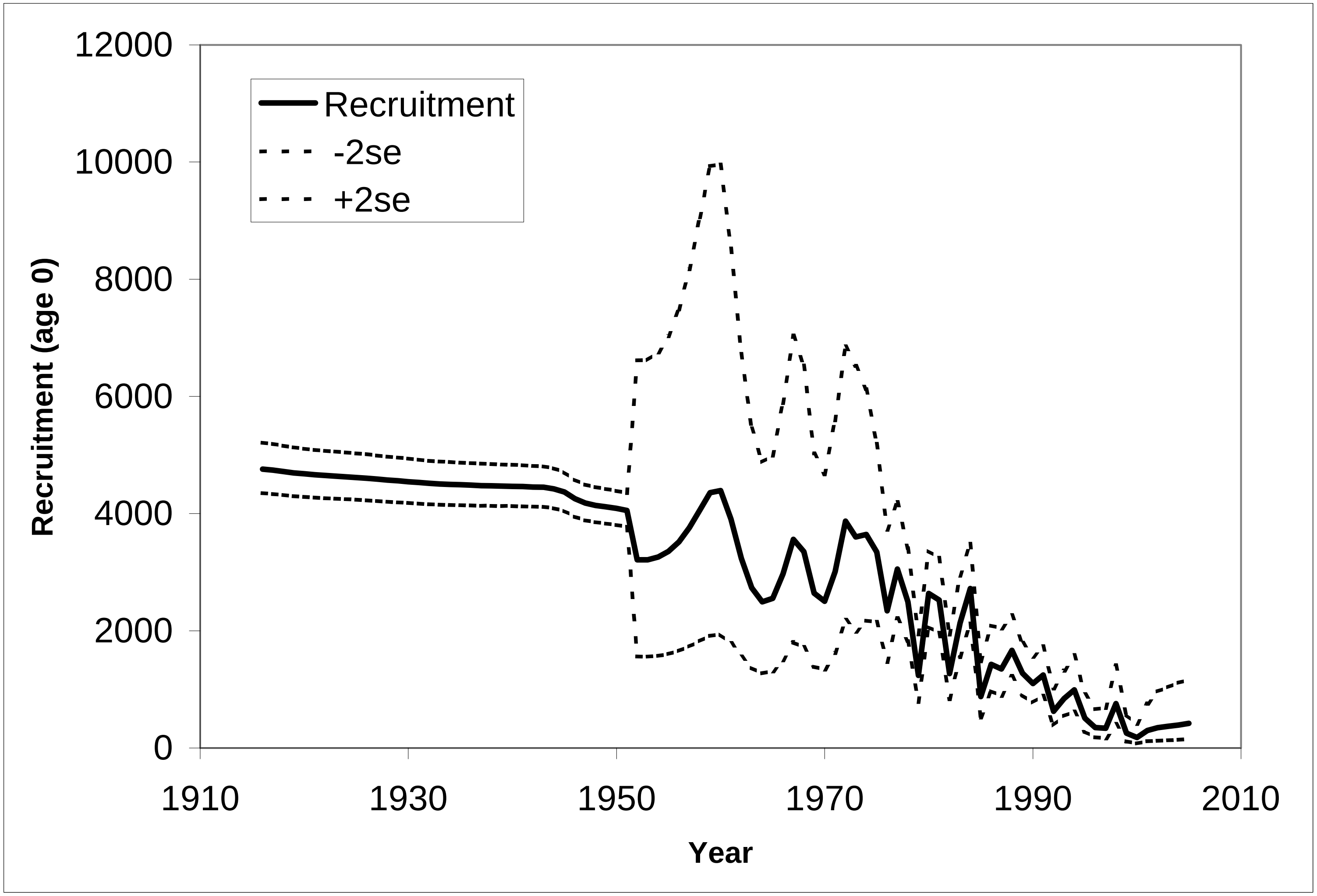


Figure 2. Estimated time series of recruitment with +/- 2 standard errors of the estimate.

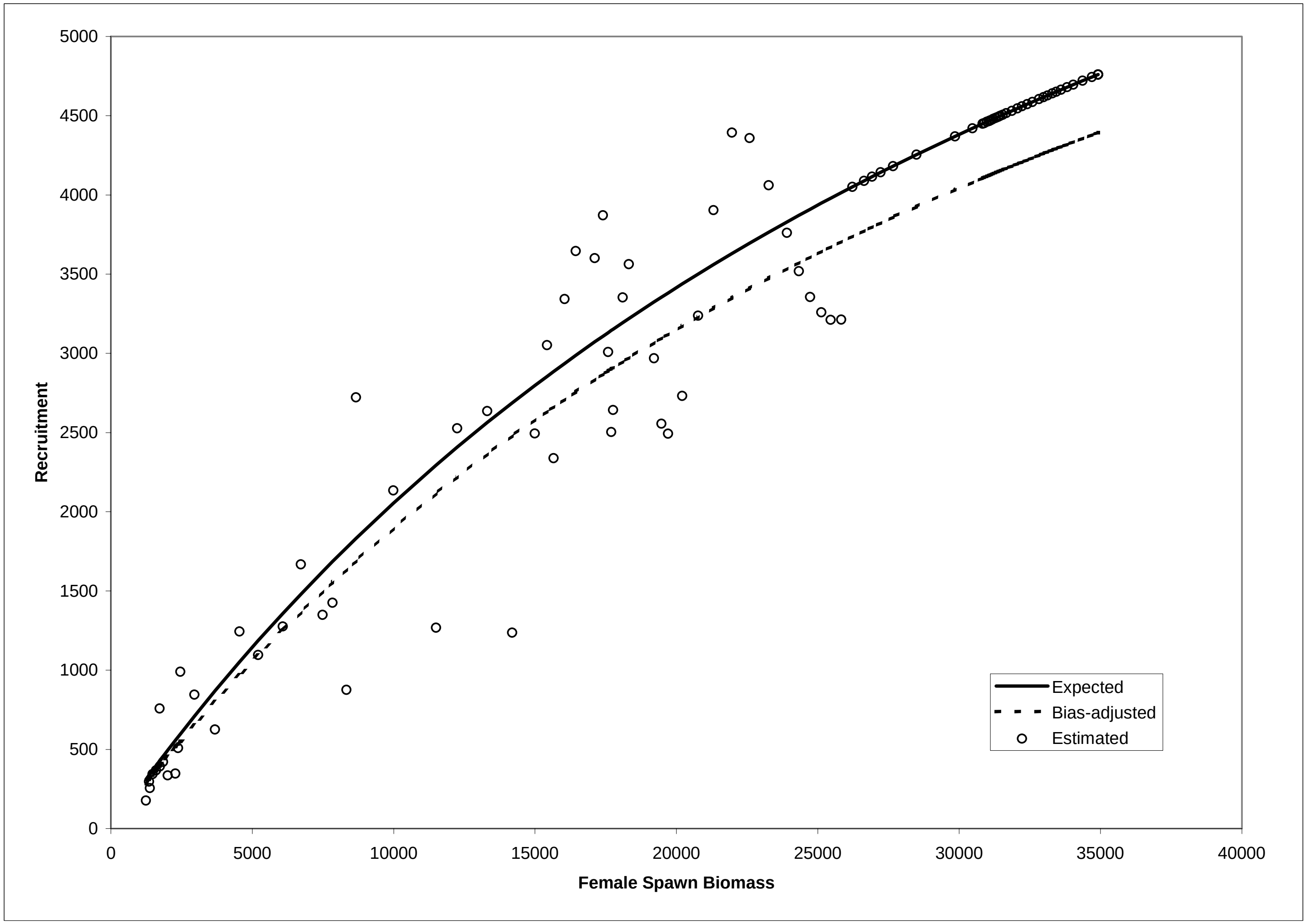


Figure 3. Spawner-recruitment relationship with steepness of 0.32.

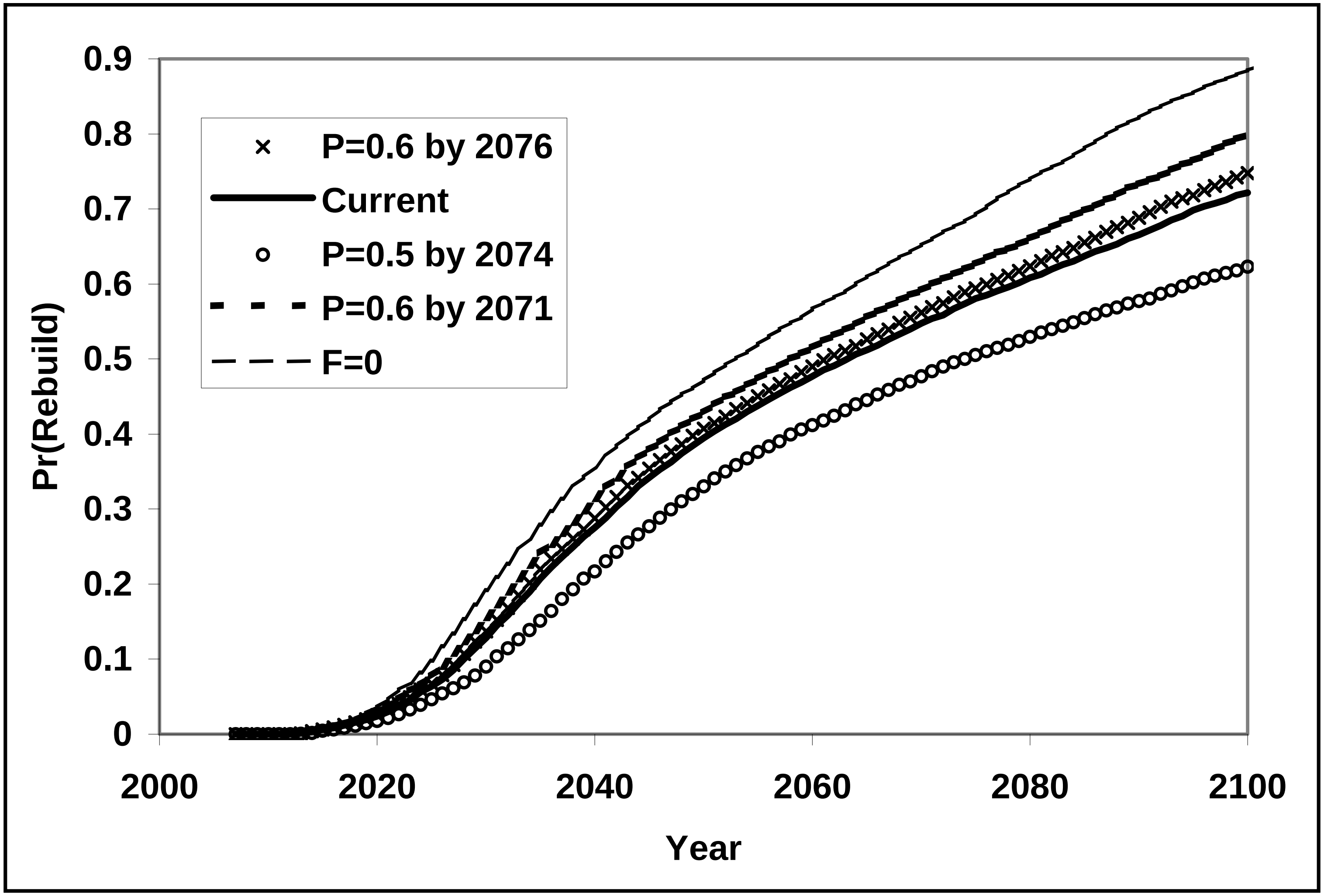
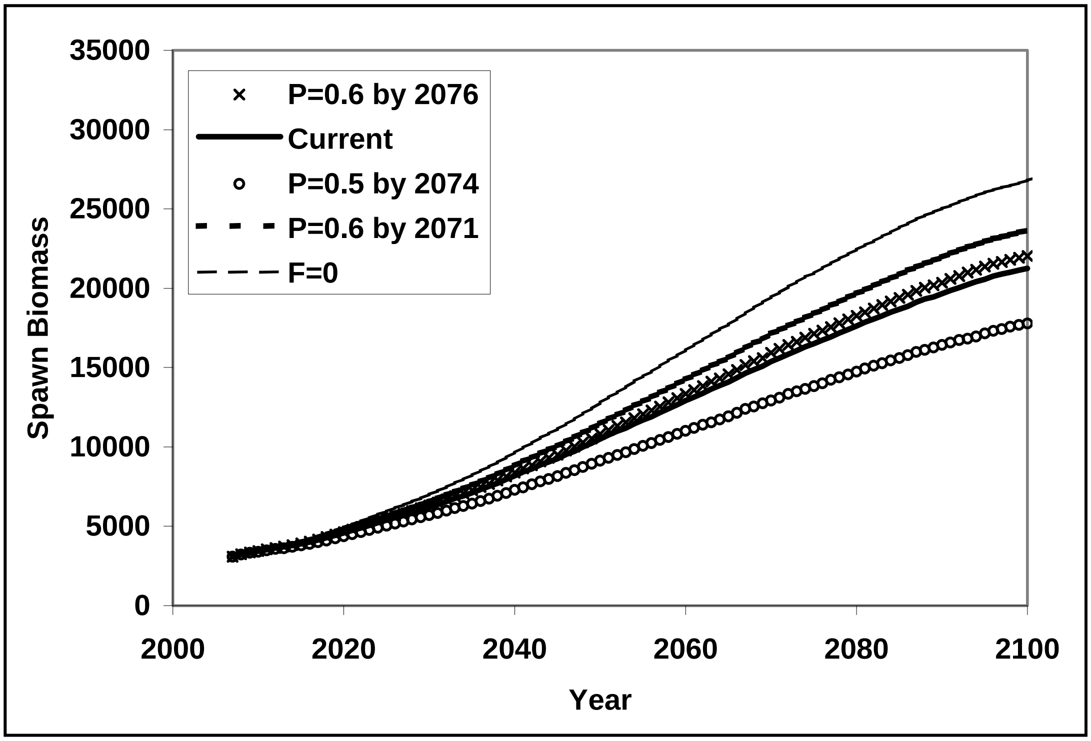


Figure 4. Alternative rebuilding scenarios.



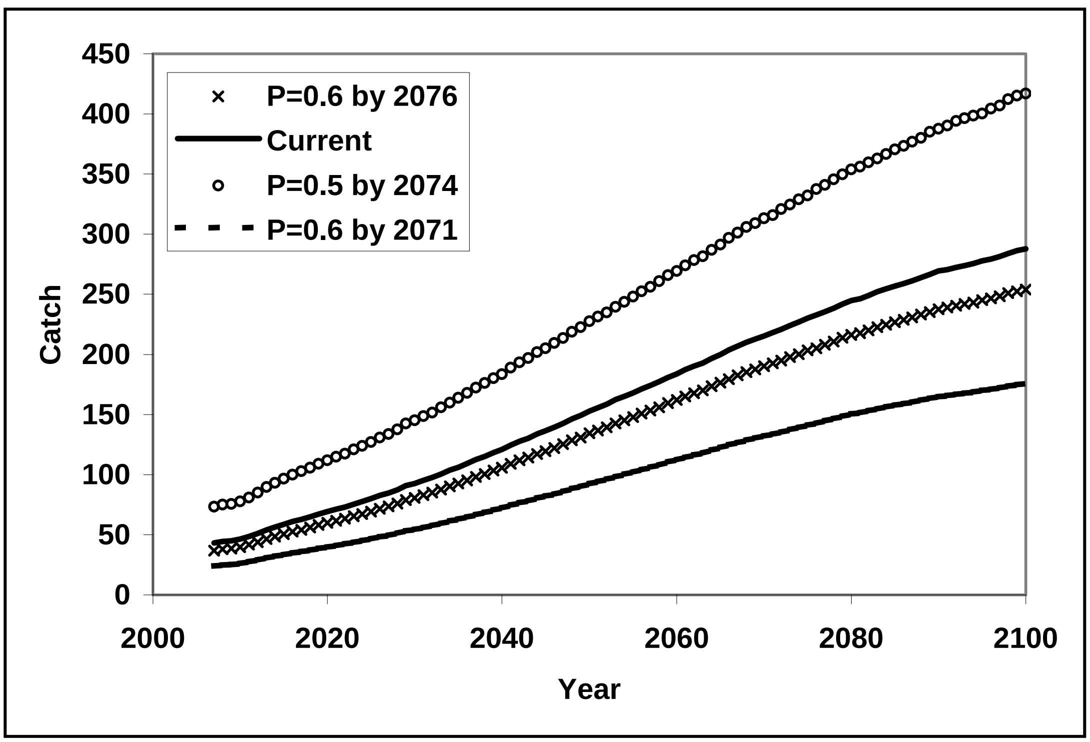


Figure 5. Catch and spawning biomass for F=0 and 4 alternative harvest strategies.

Rebuilding analysis for widow rockfish in 2005

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Introduction

In 1998, the PFMC adopted Amendment 11 of the Groundfish Management Plan, which established a minimum stock size threshold of 25% of unfished spawning potential. Based on the stock assessment in 2000 (Williams et al. 2000), widow rockfish was formally declared to be overfished in 2001, thereby requiring the development of a Rebuilding Plan. The 2003 stock assessment (He et al. 2003b) estimated that the spawning output in 2002 was just below 25% of unfished spawning output. However, in the most recent stock assessment (He et al. 2005), the base model estimated that the population has never been overfished, although one of alternative models did indicate that the population was overfished in early 2000s. This rebuilding analysis provides information needed to develop the Rebuilding Plan for widow rockfish, and is in accord with the SSC Terms of Reference for Groundfish Rebuilding Analyses.

Data and Parameters

This rebuilding analysis uses the SSC Default Rebuilding Analysis program as implemented by Punt (2005) (Version 2.8a, April 2005). Historical estimates of spawning output and recruitment are taken from the 2005 assessment by He et al. (2005). Life history parameters and selectivity are based on a simplification of the two-area, two-sex, four-fishery selectivity model used in the assessment (Appendix A). The rebuilding analyses are based on a coastwide population. However, fecundity- and weight-at-age differ between the southern and northern areas. Therefore, spatially-averaged fecundity- and weight-at-age, based on a weighting factor computed from the total catches for two areas from the last seven years, are used in the rebuilding analysis. The age-specific selectivity pattern is calculated by averaging selectivity functions for four fisheries, using weighting factors computed from the total catches by each fishery over the last five years. Fecundity-at-age, weight-at-age and selectivity-at-age are presented in Figures 1 and 2. These functions are very similar to those used in the 2002 and 2003 rebuilding analysis for widow rockfish (MacCall and Punt 2001, He et al. 2003a).

Management Reference Points

***B_{MSY}*:** The rebuilding target is the spawning output that produces MSY, B_{MSY}. B_{MSY} cannot be determined easily, but experience in other fisheries has shown that $\mathrm{B_{MSY}}$ is often near 40% of the average initial unfished spawning output (B_0), and this value ($B_{40\%}$) is used here as a proxy for B_{MSY} (see the SSC's Terms of Reference). Values of B_0 are estimated by multiplying mean recruitment by the spawning output-per-recruit at F=0. As in the previous rebuilding analysis, the average recruitment used when computing B_0 was based on the pre-fishery recruitments (the 1958-79 year-classes). The following table shows the current population status from the base model in the stock assessment, and the population status estimated in the 2003 rebuilding analysis.

Estimated parameter	Value (2005)	Value (2003)
Estimated B_0 (millions of eggs)	49,676	43,580
Rebuilding target (millions of eggs)	19,870	17,432
Current spawning output (millions of eggs)	15,444	9,756
Percent of B_t/B_0 (depletion rate)	31.09%	22.39%

Mean generation time: If the stock cannot be rebuilt within ten years, then the maximum time allowed for rebuilding, T_{max}, is the length of time required to rebuild at F=0 (T_{min}) plus one mean generation time. Mean generation time can be estimated from the net maternity function (product of survivorship and fecundity at age), and for widow rockfish is estimated to be 17 years, which is slightly different from the value estimated in the 2003 rebuilding analysis (16 years, He et al. 2003a).

Simulation Model

The simulation model tracks numbers at age, with age 20 being treated as a plus-group. Fecundity-, weight-, and selectivity-at-age are given in Appendix A and plotted in Figures 1 and 2. When computing $T_{\min}$, the population simulations begin with the age-structure at the start of 2001 because 2001 was the year in which widow rockfish was declared to be overfished. The 2004 age-structure was used for estimating the Optimal Yield (OY) for 2006 and beyond. The detailed specifications of the simulation model are given by Punt (2005).

Initial test runs were conducted to determine the number of simulations needed to achieve stable outputs. The test was conducted using the base model from the stock assessment with 500, 1,000, 2,000, 3,000, 5,000, and 10,000 simulations. The results showed that the outputs did not change much with increasing numbers of simulations once the number of simulations reached 2,000. Therefore, all of the model runs in this rebuilding analysis are based on 2,000 simulations.

Twelve simulation scenarios were constructed from a combination of four stock assessment models and three methods of generating future recruitments. Four stock assessment models are: Model T1, Model M015, Model T2, and Model M011 (He et al. 2005). Model T2 is the base model. Selection of these models is based on different values of recruitment steepness, natural mortality, and fishery selectivity. Details on these models are in He et al. (2005). Three methods of generating future recruitment are: (1) future recruitment for all years is generated using the stock-recruitment relationship estimated in the stock assessment; (2) future recruitment for all years is generated by re-sampling historical recruits-per-spawner ratios; and (3) future recruitment from 2005 to 2007 is pre-specified using the juvenile (age 0 fish) survey indices from the NMFS Santa Cruz Laboratory, and future recruitment for all other years is generated by re-sampling historical recruits-per-spawner ratios. Method 3 was used in the 2003 rebuilding analysis, because the juvenile (age-0 fish) survey conducted by the Santa Cruz Laboratory indicated a strong recruitment of age-0 fish in 2002 (Fig. 8 in He et al. 2005). This 2002 year-class is not included in the stock assessment, but could potentially impact estimates of future population size. The 2005 STAR panel pointed out that there is great uncertainty associated with using the juvenile survey data.

The total catch of widow rockfish in 2005 is estimated at 284mt in all simulations, which is the same as the harvest guideline (OY) for 2005.

Rebuilding Projections

The rebuilding projections used $B_{40\%}$ as the rebuilding targets for the models. Table 2 lists the Optimum Yield (OY) for 2006, the constant fishing mortality (*F*, expressed as SPR) from 2006, the probability that the population will be rebuilt by $T_{\max}$ ($P_{\max}$), and median time in years from 2001 until the population will be rebuilt with 50% probability (T_{target}) for nine rebuild strategies and the four assessment models. Results for three methods of generating future recruitments are presented in Table 2a, Table 2b, and Table 2c, respectively. The first five rebuilding strategies apply constant fishing mortality rates from 2004 that correspond to five probabilities of being rebuilt by T_{max} (50%, 60%, 70%, 80%, and 90%, P_{max} = 0.5, 0.6, 0.7, 0.8, and 0.9, respectively). The sixth rebuilt is to set $T_{target} = T_{mid}$, where T_{mid} is the middle year between $T_{\min}$ and $T_{\max}$, and to set the probability of rebuilding by T_{mid} to be 50%. The seventh rebuilding strategy is no fishing ($F = 0$), the eighth is the "40:10" control rule, and the ninth is the ABC rule.

Figure 3 shows time series of the probability of the spawning output exceeding the target for six rebuilding strategies and a scenario of no fishing for the base model. Two other rebuilding strategies (40:10 rule and ABC rule) have zero probability of the spawning output exceeding the target. Also, comparisons of spawning biomass over target between the base assessment model (Model T2) and other assessment models indicates that Model M011 predicts initial increases of spawning biomass and then continuous decline of spawning biomass (Fig. 4). This suggests that it would be inadequate to use Model M011 as an assessment model to predict OY in the near future, although the model estimates the current depletion rate to be 38.49% (Table 15, He et al. 2005).

Table 3 shows Optimum Yields for the next 10 years (2007-2016) under the eight rebuilding strategies for four assessment models. In this table, future recruitments are generated using the stock-recruitment relationship. Table 4 shows the same information but with future recruitments generated by re-sampling recruits-per-spawner ratios in past years. Table 5 is same as Table 4 but with pre-specified 2005-2007 recruitments.

In general, Model M015 predicts the smallest OYs while Model M011 predicts the largest OYs, regardless of how future recruitments are generated. The OY for 2007 predicted by Model T2 (base model) is 1,352mt (Table 3), which is much greater than the OY for 2005 (284mt). This prediction is based on using the stock-assessment relationship for generating future recruitment and the default P_{max} for widow rockfish. Model M015 predicts the least OY for 2006 (538mt) while Model M011 predicts the most OY for 2006 (4503mt) (Table 3). As noted previously, Model M011 will have decreasing spawning biomass trend in the future (Figure 4).

Projections with future recruitments generated by re-sampling recruits-per-spawner ratios have higher OYs than those with future recruitments generated by the stock-recruitment relationship (Tables 3 and 4). This is the case for all four stock assessment models. If future recruitments are generated by re-sampling recruits-per-spawner ratios and with pre-specified 2005-2007 recruitments, projections have even higher OYs than those without pre-specified recruitments (Tables 4 and 5). It is evident that the projections largely depend on how future recruitments are generated. The following analyses are based on using the stock-recruitment relationship, which is believed to be more reasonably estimated in the current assessment than those in the past assessments.

Table 6 shows projected OYs for 2007-2016 from the base assessment model (Model T2) for six rebuilding runs requested for species currently managed under rebuilding plans (Appendix B). These runs have pre-specified probabilities of recovery, recovery times, and different fishing mortality (SPR) rates as in the current (2005) rebuilding plan. If the current SPR is used in the projections (Runs #1, #3, and #5), projected OYs are lower than if the current T_{target} or T_{max} are used (Runs #2 and #4). However, Runs #1, #3, and #5 still have higher OYs (447mt for 2007, for example) than those estimated in the 2003 rebuilding analysis (OY is 289mt for 2006, He et al. 2004a).

A decision table, which is copied from the 2005 assessment (He et al. 2005), is presented in Table 7. States of nature are presented by four assessment models. Management actions include the catches predicted by each of these four models. Future recruitments are generated using the stock-recruitment relationship. It is important to notice again that if management actions use the catches predicted by Model M011, all four models predict that the population will decline and be more depleted in the future than the current level.

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Table 1. Specifications of four stock assessment models based on different recruitment steepness, natural mortality and selectivity (He et al. 2005). Probability for each model is assigned by the 2005 STAR Panel. Model T2 is the base model.

Model name	Recruitment steepness	Natural mortality	Selectivity	Probability
Model T1	0.45	0.125	Double logistic / logistic	0.2
Model M015	0.25	0.150	Double logistic	0.1
Model T2 (base model)	0.28	0.125	Double logistic	0.4
Model M011	0.32	0.110	Double logistic	0.3

Table 2. Optimum yield (OY, mt) for 2006, spawner per recruit rate (SPR), probability of recovery by $T_{\max}$ ($P_{\max}$), and the year in which the probability of rebuild is 0.5 (T_{target}) for nine rebuilding strategies. Future recruitments are generated using three methods: Table 2a – using the stock-recruitment relationship; Table 2b – by re-sampling recruits-per-spawner ratios in past years; and Table 2c – by resampling recruits-per-spawner ratios in past years and with pre-specified 2005-2007 recruitments. NA = not applicable.

Table 2a: Future recruitments are generated using the stock-recruitment relationship.

Model		Rebuilding strategy								
		$P_{\max}=50\%$	$P_{\max}=60\%$	$P_{\max}=70\%$	$P_{\max}=80\%$	$P_{\max}=90\%$	T_{mid} & P_{mid}=50%	$F=0$	40:10	ABC
Model T1	OY	2457	2276	2091	1881	1626	2034	0	2569	3861
	SPR	0.633	0.653	0.675	0.701	0.734	0.682	1.0	NA	NA
	$P_{\max}$	49.9	60.0	69.9	80.1	89.9	72.8	100.0	13.2	2.5
	T_{target}	2029	2025	2023	2021	2019	2023	2012	2070	NA
Model M015	OY	687	538	389	201	0.2	545	0	3121	5114
	SPR	0.906	0.926	0.946	0.971	1.0	0.924	1.0	NA	NA
	$P_{\max}$	50.1	69.9	70.0	80.0	88.4	59.5	88.4	0	0
	T_{target}	2048	2042	2037	2032	2028	2042	2028	NA	NA
Model T2	OY	1551	1352	1148	903	609	1328	0	4249	5334
(base model)	SPR	0.812	0.834	0.857	0.886	0.921	0.837	1.0	NA	NA
	$P_{\max}$	50.1	60.0	69.9	79.9	90.0	61.1	98.5	0	0
	T_{target}	2033	2027	2023	2020	2017	2027	2013	NA	NA
Model M011	OY	4415	4388	4378	4375	4375	4413	0	5531	5574
	SPR	0.575	0.577	0.578	0.578	0.578	0.575	1.0	NA	NA
	$P_{\max}$	50.0	59.9	70.6	79.6	90.8	50.4	100.0	1.8	1.6
	T_{target}	2011	2008	2007	2007	2007	2010	2007	NA	NA

Table 2b: Future recruitments are generated by re-sampling recruits-per-spawner ratio in past years.

Model		Rebuilding strategy								
		$P_{\max} = 50\%$	$P_{\max} = 60\%$	$P_{\max} = 70\%$	$P_{\max} = 80\%$	$P_{\max} = 90\%$	T_{mid} & P_{mid}=50%	$F = 0$	40:10	ABC
Model T1	OY	2590	2476	2341	2190	1940	2205	0	2569	3851
	SPR	0.619	0.631	0.646	0.663	0.693	0.661	1.0	NA	NA
	P_{max}	50.1	59.9	70.0	79.9	90.0	78.7	100.0	11.9	0.7
	T_{target}	2030	2028	2026	2023	2021	2024	2012	2054	NA
Model M015	OY	809	682	559	413	231	647	0	3122	5115
	SPR	0.890	0.907	0.923	0.942	0.967	0.911	1.0	NA	NA
	P_{max}	50.0	60.0	70.0	79.9	89.9	62.9	95.7	0.0	0.0
	T_{target}	2045	2040	2036	2033	2029	2039	2026	NA	NA
Model T2	OY	1754	1593	1415	1231	929	1525	0	4298	5335
(base model)	SPR	0.791	0.808	0.827	0.848	0.882	0.815	1.0	NA	NA
	P_{max}	50.1	60.0	69.9	80.0	89.9	63.7	99.8	0	0
	T_{target}	2032	2027	2024	2021	2018	2026	2012	NA	NA
Model M011	OY	4444	4381	4378	4376	4374	4444	0	5531	5573
	SPR	0.573	0.577	0.578	0.578	0.578	0.573	1.0	NA	NA
	P_{max}	50.1	59.5	69.8	80.5	91.6	50.5	100	0.7	0.4
	T_{target}	2011	2008	2007	2007	2007	2010	2007	NA	NA

Table 2c: Future recruitments are generated by re-sampling recruits-per-spawner ratio in past years and with pre-specified 2005-2007 recruitments.

Model		Rebuilding strategy								
		$P_{\max} = 50\%$	$P_{\max} = 60\%$	$P_{\max} = 70\%$	$P_{\max} = 80\%$	$P_{\max} = 90\%$	T_{mid} & P_{mid}=50%	$F = 0$	40:10	ABC
Model T1	OY	2865	2727	2612	2460	2260	2456	0	2572	3865
	SPR	0.590	0.604	0.616	0.633	0.655	0.634	1.0	NA	NA
	P_{max}	50.1	60.1	70.0	80.1	90.0	80.3	100.0	19.1	0.6
	T_{target}	2027	2025	2022	2021	2019	2019	2011	2046	NA
Model M015	OY	1027	903	763	627	402	855	0	3161	5121
	SPR	0.864	0.879	0.896	0.914	0.944	0.885	1.0	NA	NA
	P_{max}	50.1	60.0	69.9	80.1	90.0	63.4	98.6	0	0
	T_{target}	2036	2032	2028	2025	2022	2030	2018	NA	NA
Model T2	OY	2190	2049	1905	1738	1549	1967	0	4254	5340
(base model)	SPR	0.747	0.761	0.775	0.793	0.813	0.769	1.0	NA	NA
	P_{max}	50.0	59.9	69.9	79.9	90.0	65.9	100.0	0	0
	T_{target}	2026	2021	2018	2015	2013	2020	2011	NA	NA
Model M011	OY	4624	4595	4593	4587	4572	4573	0	5532	5573
	SPR	0.561	0.563	0.563	0.563	0.564	0.564	1.0	NA	NA
	P_{max}	50.0	60.0	69.8	80.2	90.5	85.5	100.0	0	0
	T_{target}	2011	2011	2011	2011	2010	2010	2007	NA	NA

Table 3. Projected Optimal Yields (OY, mt) for 2006-2015 for four alternative assessment models. Model T2 is the base model. Future recruitments are generated using the stock-recruitment relationship.

Model	Year	Pmax=0.5	Pmax=0.6	Pmax=0.7	Pmax=0.8	Pmax=0.9	Pmid=0.5	40-10 Rule	ABC Rule
T1	2007	2458	2277	2091	1881	1626	2034	2569	3862
	2008	2487	2312	2131	1925	1672	2075	2731	3802
	2009	2465	2298	2125	1927	1681	2072	2758	3679
	2010	2434	2275	2109	1917	1679	2058	2733	3562
	2011	2415	2262	2102	1916	1683	2052	2711	3473
	2012	2421	2272	2114	1930	1699	2065	2708	3439
	2013	2450	2302	2145	1961	1730	2096	2752	3452
	2014	2479	2333	2177	1994	1761	2128	2799	3463
	2015	2523	2376	2221	2038	1803	2173	2859	3484
	2016	2550	2405	2251	2067	1834	2202	2912	3484
M015	2007	687	538	389	201	0	546	3121	5114
	2008	709	556	403	209	0	565	3118	4897
	2009	707	556	404	210	0	564	2954	4569
	2010	691	544	396	207	0	552	2719	4224
	2011	675	533	388	203	0	541	2504	3944
	2012	663	524	382	200	0	532	2340	3766
	2013	661	523	382	200	0	530	2246	3666
	2014	660	523	382	200	0	530	2170	3581
	2015	665	527	385	203	0	535	2120	3510
	2016	668	530	388	204	0	538	2070	3411
T2 (base)	2007	1554	1352	1148	903	609	1328	4249	5334
	2008	1588	1385	1180	931	631	1362	4161	5144
	2009	1572	1375	1175	930	633	1353	3899	4842
	2010	1532	1343	1150	913	623	1321	3583	4523
	2011	1493	1311	1125	895	613	1291	3305	4260
	2012	1464	1287	1106	881	605	1267	3102	4087
	2013	1456	1282	1103	880	605	1262	2980	3995
	2014	1449	1277	1099	878	604	1257	2875	3913
	2015	1455	1283	1105	884	609	1263	2805	3851
	2016	1452	1282	1106	885	611	1262	2729	3767
M011	2007	4529	4503	4493	4491	4490	4528	5547	5628
	2008	4465	4440	4431	4429	4428	4463	5321	5471
	2009	4307	4284	4276	4274	4273	4305	4952	5215
	2010	4130	4109	4101	4100	4099	4128	4579	4954
	2011	3983	3964	3957	3956	3955	3982	4279	4742
	2012	3888	3869	3862	3860	3859	3886	4058	4606
	2013	3841	3823	3816	3815	3814	3839	3921	4532
	2014	3781	3764	3757	3756	3755	3780	3781	4444
	2015	3746	3729	3723	3722	3721	3745	3681	4374
	2016	3693	3678	3672	3671	3670	3692	3562	4289

Table 4. Projected Optimal Yields (OY, mt) for 2006-2015 for four alternative assessment models. Model T2 is the base model. Future recruitments are generated by re-sampling recruits-per-spawner ratios in past years.

Model	Year	Pmax=0.5	Pmax=0.6	Pmax=0.7	Pmax=0.8	Pmax=0.9	Pmid=0.5	40-10 Rule	ABC Rule
T1	2007	2590	2477	2341	2190	1939	2205	2569	3862
	2008	2614	2506	2375	2228	1983	2243	2734	3803
	2009	2582	2480	2356	2216	1980	2230	2752	3675
	2010	2514	2418	2301	2170	1946	2183	2680	3512
	2011	2487	2396	2284	2157	1940	2169	2639	3425
	2012	2478	2389	2279	2155	1944	2168	2625	3372
	2013	2506	2419	2310	2187	1975	2200	2652	3384
	2014	2551	2464	2356	2232	2020	2245	2725	3414
	2015	2605	2518	2411	2288	2075	2301	2819	3453
	2016	2654	2568	2461	2338	2126	2350	2901	3473
M015	2007	809	682	559	413	231	647	3122	5115
	2008	835	705	579	428	240	669	3128	4906
	2009	835	706	581	431	243	671	2983	4605
	2010	816	691	570	423	239	657	2758	4260
	2011	801	680	561	417	236	646	2567	4019
	2012	790	671	554	413	233	638	2418	3838
	2013	786	668	552	412	233	636	2313	3743
	2014	787	669	553	413	234	637	2245	3663
	2015	794	676	560	418	237	644	2214	3597
	2016	802	683	565	423	240	650	2173	3505
T2	2007	1754	1593	1415	1231	929	1524	4250	5335
	2008	1789	1629	1451	1265	960	1560	4172	5153
	2009	1778	1622	1448	1266	964	1555	3936	4882
	2010	1730	1582	1415	1239	947	1517	3630	4567
	2011	1698	1555	1393	1222	936	1492	3401	4348
	2012	1671	1531	1373	1207	927	1471	3210	4180
	2013	1660	1523	1367	1201	924	1463	3085	4085
	2014	1657	1521	1367	1203	927	1462	2998	4021
	2015	1668	1532	1377	1213	936	1472	2940	3971
	2016	1677	1543	1389	1225	946	1484	2887	3900
M011	2007	4559	4497	4495	4492	4491	4558	5548	5629
	2008	4499	4442	4440	4438	4436	4499	5336	5481
	2009	4371	4319	4316	4314	4313	4371	5009	5265
	2010	4188	4140	4138	4136	4135	4188	4639	4998
	2011	4093	4047	4045	4043	4043	4092	4411	4851
	2012	4008	3964	3962	3960	3960	4008	4219	4726
	2013	3957	3915	3913	3912	3911	3957	4078	4651
	2014	3926	3886	3884	3883	3882	3926	3964	4589
	2015	3890	3851	3850	3848	3847	3890	3856	4518
	2016	3858	3821	3819	3818	3817	3858	3756	4445

Table 5. Projected Optimal Yields (OY, mt) for 2006-2015 for four alternative assessment models. Model T2 is the base model. Future recruitments are generated by re-sampling recruits-per-spawner ratios in past years and with pre-specified 2005-07 recruitments.

Model	Year	Pmax=0.5	Pmax=0.6	Pmax=0.7	Pmax=0.8	Pmax=0.9	Pmid=0.5	40-10 Rule	ABC Rule
T1	2007	2865	2727	2612	2460	2260	2453	2572	3865
	2008	2903	2770	2659	2512	2316	2504	2779	3841
	2009	2993	2862	2753	2606	2410	2599	3000	3900
	2010	3102	2972	2862	2715	2517	2707	3244	3992
	2011	3165	3036	2928	2782	2585	2774	3424	4028
	2012	3162	3038	2933	2791	2599	2784	3477	3984
	2013	3110	2992	2893	2757	2572	2750	3412	3880
	2014	3110	2996	2898	2765	2584	2759	3399	3852
	2015	3106	2995	2901	2772	2597	2766	3385	3809
	2016	3126	3019	2927	2802	2628	2795	3402	3796
M015	2007	1027	903	763	626	402	855	3126	5121
	2008	1067	940	796	655	422	891	3194	4970
	2009	1128	995	845	696	450	943	3335	4983
	2010	1194	1054	896	740	479	1000	3530	5059
	2011	1233	1090	928	767	498	1035	3644	5038
	2012	1230	1089	928	768	500	1034	3559	4846
	2013	1192	1057	902	747	487	1004	3310	4534
	2014	1166	1034	884	732	478	983	3082	4313
	2015	1143	1015	868	721	471	965	2880	4097
	2016	1133	1007	862	716	469	958	2731	3931
T2	2007	2190	2049	1905	1738	1549	1967	4254	5340
	2008	2239	2099	1955	1789	1598	2018	4237	5207
	2009	2321	2179	2034	1865	1670	2097	4284	5200
	2010	2409	2265	2117	1944	1744	2181	4381	5237
	2011	2452	2308	2159	1986	1784	2225	4404	5196
	2012	2429	2289	2144	1974	1777	2208	4264	5024
	2013	2355	2222	2083	1920	1730	2144	3989	4764
	2014	2305	2176	2042	1884	1700	2101	3769	4581
	2015	2259	2134	2005	1852	1672	2062	3562	4406
	2016	2233	2112	1986	1836	1660	2041	3394	4264
M011	2007	4734	4707	4705	4699	4684	4685	5552	5633
	2008	4697	4671	4669	4663	4650	4651	5397	5526
	2009	4740	4715	4714	4708	4695	4696	5342	5531
	2010	4807	4783	4781	4776	4763	4764	5356	5574
	2011	4809	4786	4785	4779	4767	4768	5317	5546
	2012	4723	4701	4699	4694	4682	4683	5152	5417
	2013	4544	4524	4522	4517	4507	4507	4840	5183
	2014	4439	4420	4418	4414	4404	4405	4615	5036
	2015	4327	4309	4308	4303	4294	4295	4380	4880
	2016	4232	4215	4214	4210	4201	4202	4182	4743

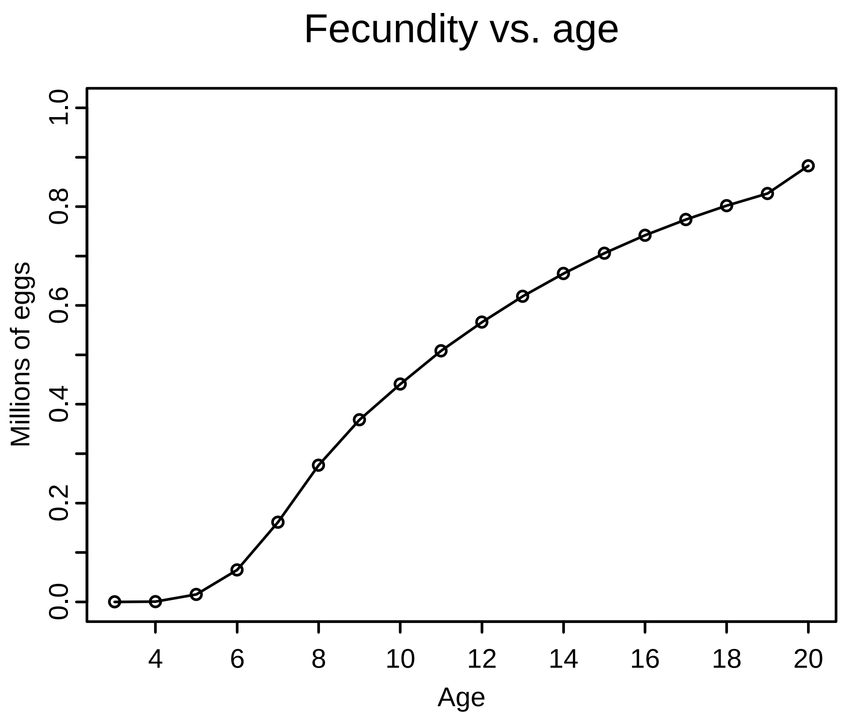
Table 6. Projected Optimal Yields (OY, mt) for 2007-2016 from the base model (Model T2) for nine rebuilding runs with pre-specified probabilities of recovery, recovery times, and different SPR (fishing mortality) rates. Specifications for some runs are in Appendix B. SPR rates and recovery time are either old (estimated in the 2003 rebuilding analysis) or new (estimated in specific runs). Future recruitments are generated using the stock-recruitment relationship.

	Run #1	Run #2	Run #3	Run #4A	Run #4	Run #5	Run #6	Run#6	Run#6 (40:10 rule)
Probability of recovery	0.9625 (estimated)	0.5 (Fixed)	0.9765 (estimated)	0.8 (Fixed)	0.6 (P_0, Fixed)	0.9395 (estimated)	0.6 (P_0, Fixed)	0.8	<0.001
Recovery time	2038 (Old Ttarget)	2038 (Old Ttarget)	2042 (Old Tmax)	2042 (Old Tmax)	2042 (Old Tmax)	2033 (New Tmax)	2033 (New Tmax)	2033 (New Tmax)	N/A
SPR	0.936 (Old)	0.798 (New)	0.936 (Old)	0.855 (New)	0.810 (New)	Old	0.834 (New)	0.886 (New)	N/A
Fishing mortality	0.0093	0.0354	0.0093	0.0243	0.0329	0.0093	0.0283	0.0188	N/A
2007	447	1683	447	1162	1568	447	1352	903	4249
2008	464	1716	464	1194	1601	464	1385	931	4161
2009	466	1696	466	1189	1586	466	1375	930	3899
2010	460	1650	460	1163	1544	460	1343	913	3583
2011	453	1606	453	1138	1505	453	1311	895	3305
2012	447	1575	447	1118	1476	447	1287	881	3102
2013	448	1564	448	1115	1468	448	1282	880	2980
2014	448	1556	448	1111	1460	448	1277	878	2875
2015	452	1561	452	1118	1467	452	1283	884	2805
2016	454	1557	454	1118	1463	454	1282	885	2729

Table 7 (next page). Decision table copied from the 2005 stock assessment (He et al. 2005). States of nature are represented by four alternative models. Management actions include the catches predicted by each of these four alternative models. Future recruitments are generated using the stock-recruitment relationship. It is important to notice that if management actions use the catches predicted by Model 011, all four models predict that the population will decline and be more depleted in the future than the current level. Series in bold font show decreasing population abundance. Also notice that catch for 2006 for Model M011 is not pre-specified because of difficulty in obtaining rebuilding results.

Management action	Year	Total catch (mt)	State of Nature: Model T1 Spawning output	Model T1 Depletion (%)	Model M015 Spawning output	Model M015 Depletion (%)	Model T2 (base) Spawning output	Model T2 (base) Depletion (%)	Model M011 Spawning output	Model M011 Depletion (%)
Model T1	2005	285	8992	25.3	12052	25.8	15444	31.1	20351	38.5
	2006	289	9746	27.4	12546	26.8	16018	32.2	21030	39.8
	2007	2277	10655	30.0	13234	28.3	16839	33.9	21149	40.0
	2008	2312	11092	31.2	13477	28.8	17230	34.7	21625	40.9
	2009	2298	11361	31.9	13524	28.9	17407	35.0	21910	41.4
	2010	2275	11527	32.4	13408	28.7	17421	35.1	22058	41.7
	2011	2262	11648	32.8	13195	28.2	17328	34.9	22135	41.9
	2012	2272	11754	33.0	12933	27.7	17185	34.6	22166	41.9
	2013	2302	11880	33.4	12697	27.2	17016	34.3	22139	41.9
	2014	2333	12030	33.8	12465	26.7	16847	33.9	22111	41.8
	2015	2376	12214	34.3	12292	26.3	16720	33.7	22088	41.8
Model M015	2005	285	8992	25.3	12052	25.8	15444	31.1	20351	38.5
	2006	289	9746	27.4	12546	26.8	16018	32.2	21030	39.8
	2007	538	10655	30.0	13234	28.3	16839	33.9	21149	40.0
	2008	556	11459	32.2	13832	29.6	17590	35.4	21989	41.6
	2009	556	12113	34.1	14248	30.5	18150	36.5	22665	42.9
	2010	544	12663	35.6	14493	31.0	18548	37.3	23213	43.9
	2011	533	13153	37.0	14618	31.3	18824	37.9	23683	44.8
	2012	524	13604	38.3	14668	31.4	19035	38.3	24093	45.6
	2013	523	14058	39.5	14715	31.5	19182	38.6	24427	46.2
	2014	523	14512	40.8	14751	31.6	19331	38.9	24751	46.8
	2015	527	14997	42.2	14844	31.8	19512	39.3	25079	47.4
Model T2 (base)	2005	285	8992	25.3	12052	25.8	15444	31.1	20351	38.5
	2006	289	9746	27.4	12546	26.8	16016	32.2	21030	39.8
	2007	1352	10655	30.0	13234	28.3	16839	33.9	21149	40.0
	2008	1385	11287	31.7	13666	29.2	17421	35.1	21819	41.3
	2009	1375	11759	33.1	13907	29.7	17801	35.8	22310	42.2
	2010	1343	12129	34.1	13982	29.9	18017	36.3	22670	42.9
	2011	1311	12449	35.0	13950	29.8	18125	36.5	22955	43.4
	2012	1287	12746	35.8	13864	29.7	18170	36.6	23190	43.9
	2013	1282	13061	36.7	13788	29.5	18184	36.6	23363	44.2
	2014	1277	13382	37.6	13718	29.3	18206	36.6	23530	44.5
	2015	1283	13748	38.7	13700	29.3	18270	36.8	23717	44.9
Model M011	2005	285	**8992**	**25.3**	**12052**	**25.8**	**15444**	**31.1**	**20351**	**38.5**
	2006	4388	**9746**	**27.4**	**12546**	**26.8**	**16018**	**32.2**	**21030**	**39.8**
	2007	4503	**10655**	**30.0**	**13234**	**28.3**	**16839**	**33.9**	**21149**	**40.0**
	2008	4440	**10624**	**29.9**	**13025**	**27.9**	**16771**	**33.8**	**21162**	**40.0**
	2009	4285	**10425**	**29.3**	**12624**	**27.0**	**16483**	**33.2**	**20969**	**39.7**
	2010	4109	**10159**	**28.6**	**12101**	**25.9**	**16058**	**32.3**	**20665**	**39.1**
	2011	3964	**9901**	**27.8**	**11538**	**24.7**	**15577**	**31.4**	**20330**	**38.4**
	2012	3869	**9679**	**27.2**	**10988**	**23.5**	**15102**	**30.4**	**19996**	**37.8**
	2013	3823	**9546**	**26.8**	**10515**	**22.5**	**14661**	**29.5**	**19664**	**37.2**
	2014	3764	**9446**	**26.6**	**10083**	**21.6**	**14242**	**28.7**	**19351**	**36.6**
	2015	3729	**9415**	**26.5**	**9735**	**20.8**	**13914**	**28.0**	**19080**	**36.1**

Figure 1. Fecundity-at-age and weight-at-age by sex for widow rockfish as used in the rebuilding analyses.



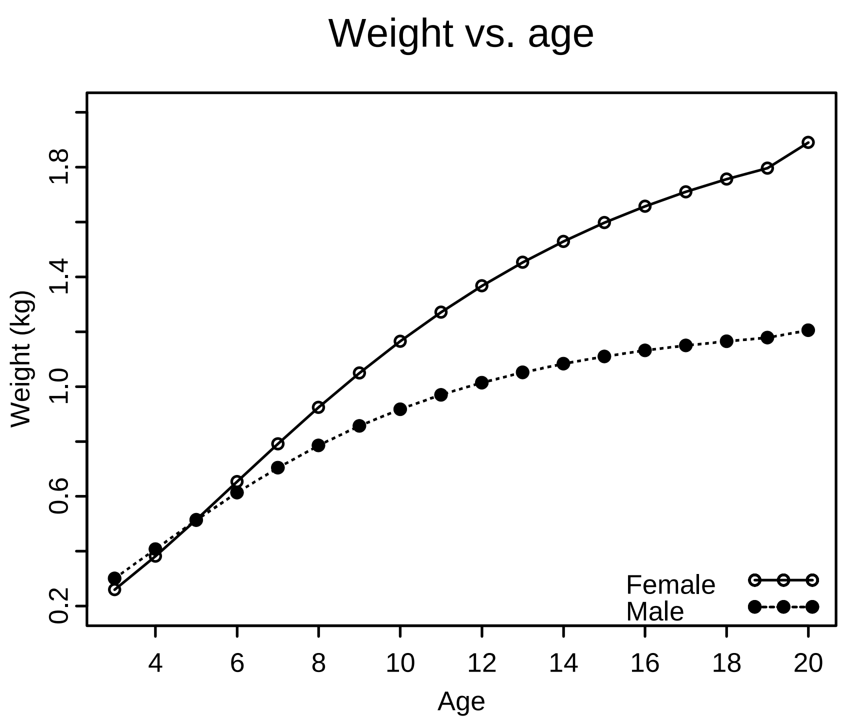


Figure 2. The selectivity pattern for widow rockfish used in the rebuilding analyses.

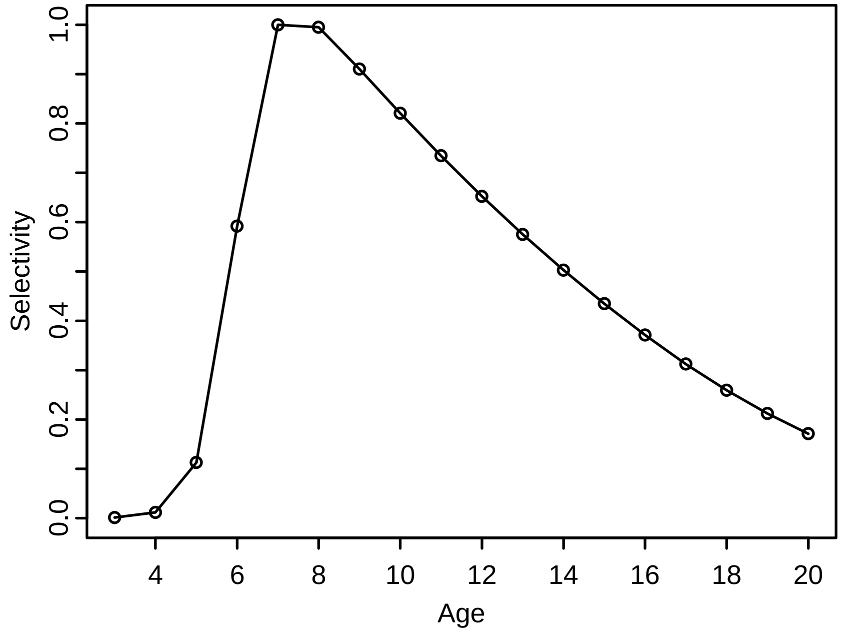
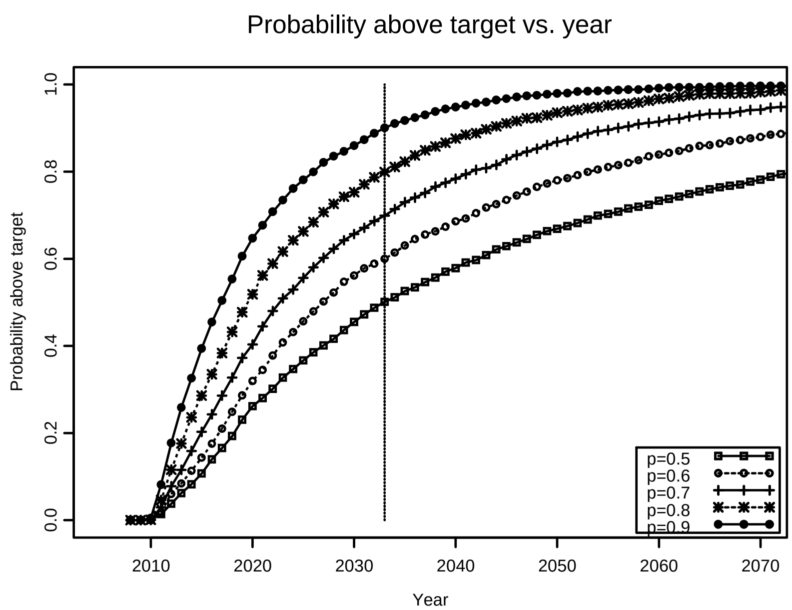


Figure 3. Time-series of the probability of the spawning output exceeding the target ($0.4B_0$) for five rebuilding strategies of $P_{\max} = 0.5 - 0.9$ (upper panel) and two rebuilding strategies of T_{mid} and no fishing (lower panel). The results are the base model (Model T2) with future recruitments generated using the stock-recruitment relationship. The vertical lines are new T_{target}.



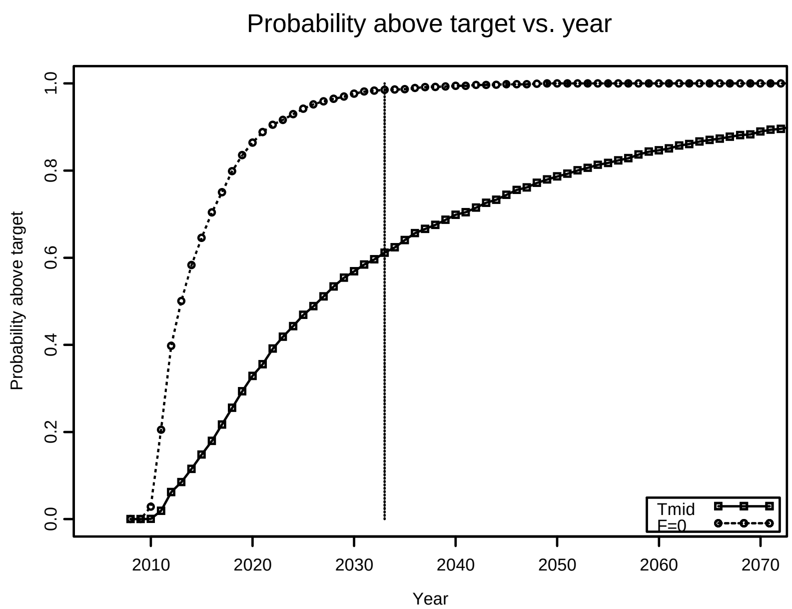
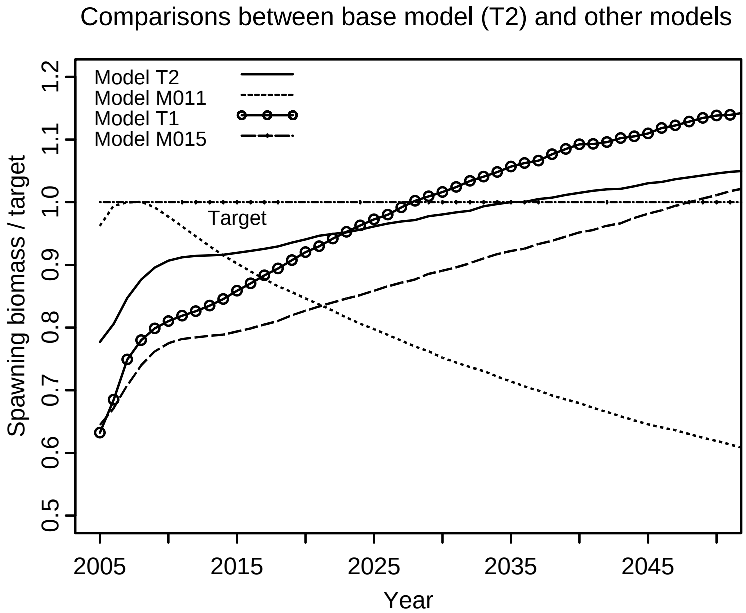


Figure 4. Time series of spawning biomass over target for the base model (T2) and other models. Targets are defined as P_{max} =60%. Future recruitments are generated using the stock-recruitment relationship. Notice that the harvest strategies are different before and after recovery occurs. Also notice that Model M011 predicts an initial increases of spawning biomass and then continuous decline of spawning biomass.



Appendix A. The "rebuild.dat" file used in the rebuilding analysis for Model T2. Model T2 is the stock assessment base model.

```
# Rebuild.dat for 2005 widow rebuiding
Widow (RecruitOverRiding=0, UseXHhPrior=1, PowCoefficientSCLabIndex=?)
# Number of sexes
2
# Age range to consider (minimum age; maximum age)
3 20
# Number of fleets to consider
1
# First year of the projection
2005
# Year declared overfished
2001
# Is the maximum age a plus-group (1=Yes;2=No)
1
# Generate future recruitments using historical recruitments (1), historical recruits/spawner (2), or a stock-recruitment (3)
3
# Constant fishing mortality (1) or constant Catch (2) projections
1
# Fishing mortality based on SPR (1) or actual rate (2)
2
# Pre-specify the year of recovery (or -1) to ignore
-1
# Fecundity-at-age
# A blank comment line - needed for the program to run
 0.0001 0.0002 0.0151 0.0645 0.1612 0.2765 0.3685 0.4409 0.5083 0.5663 0.6184 0.6648 0.7059 0.7422 0.7741 0.8021 0.8266
0.8829
# Age specific information (Females then males), weight and selectivity
# Females
```

0.2595 0.3814 0.5152 0.6538 0.7916 0.9244 1.0495 1.1655 1.2714 1.3673 1.4532 1.5298 1.5977 1.6576 1.7103 1.7566 1.7970 1.8899
0.0011 0.0117 0.1129 0.5920 1.0000 0.9950 0.9105 0.8210 0.7346 0.6525 0.5752 0.5027 0.4346 0.3711 0.3125 0.2592 0.2120 0.1712
Males
0.3001 0.4071 0.5131 0.6131 0.7042 0.7853 0.8562 0.9174 0.9698 1.0142 1.0517 1.0833 1.1097 1.1318 1.1502 1.1656 1.1784 1.2053
0.0011 0.0117 0.1129 0.5920 1.0000 0.9950 0.9105 0.8210 0.7346 0.6525 0.5752 0.5027 0.4346 0.3711 0.3125 0.2592 0.2120 0.1712
Age specific information (Females then males), natural mortality and numbers at age
Females
0.1250 0.1250 0.1250 0.1250 0.1250 0.1250 0.1250 0.1250 0.1250 0.1250 0.1250 0.1250 0.1250 0.1250 0.1250 0.1250 0.1250 0.1250
8821.83 7651.89 9287.03 8870.50 2911.46 1861.43 1470.15 2207.72 2168.79 1535.05 3930.71 2004.23 838.17 640.11 790.19 264.72 505.85 4741.80
Males
0.1250 0.1250 0.1250 0.1250 0.1250 0.1250 0.1250 0.1250 0.1250 0.1250 0.1250 0.1250 0.1250 0.1250 0.1250 0.1250 0.1250 0.1250
8821.83 7651.89 9287.03 8870.50 2911.46 1861.43 1470.15 2207.72 2168.79 1535.05 3930.71 2004.23 838.17 640.11 790.19 264.72 505.85 4741.80
Initial age-structure (for Tmin)
12910.05 4245.58 2742.71 2235.07 3441.90 3375.30 2372.11 6030.39 3054.12 1269.36 964.01 1184.08 394.90 751.57 795.60 639.59 513.07 5027.01
12910.05 4245.58 2742.71 2235.07 3441.90 3375.30 2372.11 6030.39 3054.12 1269.36 964.01 1184.08 394.90 751.57 795.60 639.59 513.07 5027.01
Year for Tmin Age-structure
2001
Number of simulations
2000
Recruitment and Spanwer biomasses
Number of historical assessment years
47
Historical data: Year, Recruitment, Spawner biomass, Used to compute B0, Used to project based
on R, Used to project based on R/S
1958 34509 44904 1 0 0
1959 34837 44906 1 0 0
1960 35136 44922 1 0 0
1961 35165 44996 1 0 0
1962 33910 45168 1 0 0
1963 32743 45437 1 0 0
1964 29179 45759 1 0 0
1965 31198 46084 1 0 0
1966 23707 46351 1 0 0
1967 37326 45676 1 0 0
1968 39174 44743 1 0 0
1969 40118 44157 1 0 0
1970 41811 43994 1 0 0
1971 44367 44042 1 0 0
1972 40465 44391 1 0 0
1973 89102 45063 1 0 0
1974 32175 45835 1 0 0
1975 12357 46972 1 0 0
1976 10109 48588 1 0 0
1977 16332 50426 1 0 0
1978 21602 51386 1 0 0
1979 10252 51001 1 0 0
1980 38903 49123 1 0 0
1981 57581 42492 1 0 0
1982 20937 34716 1 0 0
1983 66061 27663 0 0 0
1984 77951 25244 0 0 0
1985 28033 24086 0 0 0
1986 28601 23757 0 1 1
1987 28770 24357 0 1 1
1988 22501 24756 0 1 1
1989 9962 24891 0 1 1
1990 24254 23705 0 1 1
1991 15480 22428 0 1 1

```
1992     15827     21660 0 1 1
1993     29059     20622 0 1 1
1994     43799     19016 0 1 1
1995     13461     17848 0 1 1
1996     15161     16806 0 1 1
1997     12223     16474 0 1 1
1998      6587     16406 0 1 1
1999      7052     16567 0 1 1
2000      9623     16306 0 1 1
2001     25820     15664 0 1 1
2002     23850     15241 0 1 1
2003     17341     15138 0 1 1
2004     17644     15337 0 1 1
# Number of years with pre-specified catches
2
# Catches for years with pre-specified catches
2005 285
2006 289
# Number of future recruitments to override
3
# Process for overiding (-1 for average otherwise index in data list)
2005 0 0
2006 0 0
2007 0 0
# Which probability to product detailed results for (1=0.5,2=0.6,etc.)
2
# Steepness and sigma-R and auto-correlations
  0.280964  0.500000 0.000000
# Target SPR rate (FMSY Proxy)
0.500000
# Target SPR information: Use (1=Yes) and power
0 20
# Discount rate (for cumulative catch)
0.100000
# Truncate the series when 0.4B0 is reached (1=Yes)
0
# Set F to FMSY once 0.4B0 is reached (1=Yes; 2=Apply 40:10 rule after recovery)
0
# Percentage of FMSY which defines Ftarget
0.900000
# Maximum possible F for projection (-1 to set to FMSY)
2
# Conduct MacCall transition policy (1=Yes)
0
# Defintion of recovery (1=now only;2=now or before)
2
# Results for rec probs by Tmax (1) or 0.5 prob for various Ttargets
1
# Definition of the 40-10 rule
10 40
# Produce the risk-reward plots (1=Yes)
0
# Calculate coefficients of variation (1=Yes)
0
# Number of replicates to use
20
# First Random number seed
-89102
# Conduct projections for multiple starting values (0=No;else yes)
0
# File with multiple parameter vectors
MCMC.PRJ
# Number of parameter vectors
100
# User-specific projection (1=Yes); Output replaced (1->6)
1 7 0 0.5
# Catches and Fs (Year; 1/2 (F or C); value); Final row is -1
2007 1 0.000000
```

2010 1 0.000000
2100 1 0.000000
-1 -1 -1
Split of Fs
2005 1
-1 1
Time varying weight-at-age (1=Yes;0=No)
0
File with time series of weight-at-age data
HakWght.Csv

20

4

Appendix B: Rebuilding Runs Requested for Species Currently Managed Under Rebuilding Plans

During recent weeks, there has been considerable dialogue regarding the most appropriate measures for evaluating the adequacy of rebuilding progress for species that are currently managed under rebuilding plans. A conference call was held last Friday (including participants from the NW Center, NW Region, Council staff, and the SSC) to discuss the uncertainties that have emerged since the June Council meeting. Following that call, an effort was made to identify a set of rebuilding runs which would allow authors to complete the analytical work that may be required by the Council (and advisors) and NMFS to evaluate rebuilding adequacy later this year. These runs are described in the table below. We are hopeful that there will be no need for any additional runs by authors who complete these six. Authors should be sure to address A) - C) below before proceeding to D).

A. Convert the current F to an SPR (this can be achieved straightforwardly given the biological parameters – reported in the rebuilding analysis).
B. Define how B_0 is to be calculated for the current rebuilding analysis (from the assessment; based on average recruitment over the early years, etc.)
C. Define how future recruitment is to be generated.
D. Do the following analyses. Report, T_{MIN}, T_{MAX}, T_{TARGET}, SPR/F, Probability of recovery by T_{MAX}, probability of recovery by T_{TARGET}.

For runs #1 and 2, the existing T_{TARGET} should be substituted for T_{MAX} in Puntalyzer setup. Run #1 will provide the likelihood of achieving T_{TARGET} with the current SPR, which can then be compared to the 50% likelihood estimated originally. Run #2 provides the SPR that restores a 50% likelihood of rebuilding by T_{TARGET}. Similarly, run #3 estimates the likelihood of rebuilding by the existing T_{MAX} with the current SPR, and run #4 estimates the SPR that would be required to restore a P_0 likelihood of rebuilding in T_{MAX}. Runs #5 and 6 provide comparable outputs relative to the "new" T_{MAX}, as calculated using outputs from 2005 assessments.

Run #	Prob (recovery)	By	Based on
#1 (default)	Estimated	Current T_{TARGET}	Current SPR
#2 (T_{TARGET} with 50% prob)	0.5	Current T_{TARGET}	Estimated SPR
#3 (#1 based on T_{MAX})	Estimated	Current T_{MAX}	Current SPR
#4 (#2 based on T_{MAX})	P_0	Current T_{MAX}	Estimated SPR
#5 (#3 with re-estimated T_{MAX})	Estimated	T_{MAX} (re-estimated)	Current SPR
#6 (#4 with re-estimated T_{MAX})	P_0	T_{MAX} (re-estimated)	Estimated SPR

Rebuilding Analysis for Yelloweye Rockfish for 2005

September 28, 2005

Tien-Shui Tsou and Farron R. Wallace
Washington State Department of Fish and Wildlife

Summary

The rebuilding analysis for yelloweye rockfish was first conducted in 2002 based upon the 2001 assessment (Wallace 2001). Methot and Piner (2002) updated the rebuilding analysis based upon the 2002 assessment (Methot *et al*. 2003). This document updates those results based upon the new assessment update (Wallace *et al*. 2005) reviewed in August of 2005.

As in the last rebuilding analysis, future recruitment is based upon the estimated spawner-recruit relationship with a steepness of 0.437 and Sigma R = 0.40. Age specific fishery selectivity, body weight, and maturity data were updated. The estimated mean generation time is 44 years, same as that reported in the previous rebuilding analysis. In the absence of fishing, the stock is estimated to rebuild by 2036. Based on current SPR (SSC runs 1, 3, and 5), the probability of rebuild by T_{TARGET} and T_{MAX} is lower than 1%. The following table summarizes results from SSC runs 2, 4, and 6, where SPR rates were re-estimated, and 10-year OY projects under each scenario.

	SSC run 2	SSC Run 4	SSC Run 6
P_0	0.5	0.8	0.8
Rebuild by T_{TARGET}	2058	--	--
Rebuild by T_{MAX}	--	2071	2080
SPR	0.764	0.744	0.717
F	0.0114	0.0126	0.0143
2007	16.8	18.5	21.0
2008	17.0	18.8	21.3
2009	17.3	19.0	21.5
2010	17.5	19.2	21.7
2011	17.7	19.4	22.0
2012	17.9	19.6	22.2
2013	18.1	19.9	22.4
2014	18.3	20.1	22.6
2015	18.6	20.3	22.9
2016	18.8	20.6	23.1

Introduction

The first and second full assessments for yelloweye rockfish were conducted in 2001 (Wallace 2001) and 2002 (Methot *et al*. 2003). Both assessments were length-based models and used an earlier version of the Stock Synthesis program (Methot 1990). Wallace (2001) conducted two area assessments by using data from California and Oregon. Methot *et al*. (2003) incorporated Washington catch and age data, and treated the stock as one single assemblage off the California, Oregon, and Washington (W-O-C) coast. Their results indicated that the stock was depleted at 24% of B_0 in 2002. A subsequent rebuilding analysis was conducted (Methot and Piner 2002) and the estimated rebuilding parameters were adopted by the PFMC in 2004 (PFMC 2004). The parameters in the 2004 rebuilding plan are as follows:

Year stock declared overfished:	2002
Year rebuilding plan adopted:	2004
B_0:	3,875 mt
B_{MSY}:	1,550 mt
$B_{CURRENT}$ (% OF B0):	24% in 2002
T_{MIN}:	2027
T_{MAX}:	2071
P_{MAX}:	80%
T_{TARGET}:	2058
Harvest control rule:	F = 0.0153

Based on the harvest control rule (F = 0.0153), the optimum yield (OY) for 2004 was determined to be 22 mt.

This rebuilding analysis is based upon the updated yelloweye rockfish stock assessment conducted in 2005 (Wallace *et al*. 2005). Wallace *et al*. (2005) used Stock Synthesis 2 modeling framework to estimate model parameters and management quantities. As in the 2002 assessment, the stock was treated as a single stock off the W-O-C coast. Catch time series for each State used in the 2002 assessment were entirely revised; however, none of the abundance indices were revised. Age and length compositions collected since 2001 were appended to the model and ageing error was revised. Results from 2005 assessment indicated that depletion level of yelloweye rockfish in 2004 was at 21% of B_0, which is further depleted than the 24% in Method *et al*. (2003). The purpose of this document is to use results from the most recent assessment (Wallace *et al*. 2005) to update estimates of the potential rate of rebuilding of yelloweye rockfish.

Methods

We followed the guidelines from the SSC Terms of Reference for Groundfish Rebuilding Analyses dated 20 April 2005 and used the SSC Default Rebuilding Analysis as implemented by Punt (April 2005, version 2.8a). Life history parameters, age structures, and historical estimates of spawning output and recruitments are taken from Wallace *et al*. (2005). The age-specific selectivity pattern is calculated by averaging selectivity functions for seven fisheries (Wallace *et al*. 2005), weighted by total catches of each fishery over the last five years. For estimating B_0, 1953 – 1990 recruitments are selected. Future recruitments are generated by using the Beverton-Holt spawner-recruit relationship with a steepness of 0.437 and Sigma R = 0.40, which is the same as in the previous rebuilding analysis.

A set of six rebuilding runs was requested in the SSC Terms of Reference for species currently managed under rebuilding plans.

Run #	Prob (recovery)	By	Based on
#1 (default)	Estimated	Current T_{TARGET}	Current SPR
#2 (T_{TARGET} with 50% prob)	0.5	Current T_{TARGET}	Estimated SPR
#3 (#1 based on T_{MAX})	Estimated	Current T_{MAX}	Current SPR
#4 (#2 based on T_{MAX})	P_0	Current T_{MAX}	Estimated SPR
#5 (#3 with re-estimated T_{MAX})	Estimated	T_{MAX} (re-estimated)	Current SPR
#6 (#4 with re-estimated T_{MAX})	P_0	T_{MAX} (re-estimated)	Estimated SPR

To compute current SPR rate for three of the six SSC runs, effort was made to re-construct 2002 rebuilding analysis by using current rebuilding computer application (Punt 2005, version 2.8a). We could not get a solution using the materials and methods documented in the Methot and Piner (2002) without substantially increasing steepness of the spawner-recruitment curve. It is to be noted that age specific weight, selectivity, and maturity data used in this rebuilding analysis were re-estimated in 2005 stock assessment; hence they are different from those used in the 2002 rebuilding analysis. Also, Methot and Piner (2002) used ages 3 – 70 and we used ages 0 – 70.

Results

The results from this analysis indicate that the yelloweye rockfish stock is behind in rebuilding schedule and will take longer time to rebuild then as indicated in the 2002 rebuilding analysis (Methot and Piner 2002). New T_{MIN} of 2036 and T_{MAX} of 2080 are 9 years longer than the T_{MIN} of 2027 and T_{MAX} of 2071 reported in the previous analysis (Table 1). Probabilities of recovery by current T_{TARGET} (2058) and T_{MAX} (2071) based on current SPR are low (Table 2). Probability of recovery by re-estimated T_{MAX} (2080) with current SPR is also low. The current harvest control rule (F = 0.0153) is too high to rebuild the stock by current T_{TARGET} and current T_{MAX} (Tables 3 and 4). Based on SSC run 6 settings (Table 5), where T_{MAX} and SPR are re-estimated and P_o = 80%, OY is projected to be 21.0 mt in 2007 and the stock is estimated to rebuild in year 2076. The longer recovery period predicted in this analysis may be due to the lower depletion level in 2004 and the re-estimated biological parameters in the 2005 assessment.

Literature Cited

Methot, R.D. 1990. Synthesis model: an adaptive framework for analysis of diverse stock assessment data. Int. N. Pac. Fish. Comm. Bull. 50:259-277.

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Methot, R.D., F.R. Wallace, and K.R. Piner 2003. Status of the Yelloweye rockfish (*Sebastes ruberrimus*) off the U.S. west coast in 2002. Pacific Fishery Management Council.

PFMC. 2004. Appendix H to Amendment 16-3 to the Pacific coast groundfish fishery management plan. Yelloweye rockfish (*Sebastes ruberrimus*) draft rebuilding plan. Adopted April 2004. Pacific Fishery Management Council.

Wallace, F.R., T. Tsou, and T.H. Jagielo. Status of the Yelloweye rockfish (*Sebastes ruberrimus*) off the U.S. West Coast in 2005. Pacific Fishery Management Council.

Table 1. Key parameters re-estimated in this rebuilding analysis.

FMSY proxy	0.032
FMSY SPR / SPR(F=0)	0.5
Virgin SPR	39.20
Generation time	44
Minimum Rebuild Time (from ydecl, 2002)	34
Maximum Rebuild Time (from yinit, 2004)	73
Virgin Spawning Output	7329
Target Spawning Output	2932
Current Spawning Output	1596
Spawning Output (ydecl)	1501
T_{MIN}	2036
T_{MAX}	2080
Prob (<0.4B0) in ydecl	1
Prob (<0.25 B0) in ydecl	1

Table 2. Summary of the six requested rebuilding runs to evaluate progress towards rebuilding. Estimated values are in bold.

Run #	Prob (recovery)	By	Based on	SPR	2007 OY
1	**0.000**	2058	Current SPR	0.591	34.6
2	0.5	2058	estimated SPR	**0.764**	**16.8**
3	**0.001**	2071	Current SPR	0.591	34.6
4	0.8	2071	estimated SPR	**0.744**	**18.5**
5	**0.003**	**2080**	Current SPR	0.591	34.6
6	0.8	**2080**	estimated SPR	**0.717**	**21.0**

Table 3. Summary table for analyses based on current T_{TARGET} (SSC runs 1 and 2).

Rebuild by current T_{TARGET} = 2058	P_{MAX}					F=0	Current SPR
	0.5	0.6	0.7	0.8	0.9		
Fishing rate	0.0114	0.0108	0.0102	0.0092	0.0082	0	User Specified
SPR RATE	0.764	0.773	0.785	0.802	0.821	0.000	0.591
2007 OY	16.8	16	15	13.6	12.1	0	34.6
Prob to rebuild by T_{MAX}	50.1	60.1	69.9	80.1	90.0	100.0	0.1
Median time to rebuild	51	49.1	47.3	44.8	42.5	29.6	-1
Prob overfished after rebuild	0	0	0	0	0	0.0	0.0
Median time to rebuild (yrs)	2058	2056.1	2054.3	2051.8	2049.5	2036.6	
Probability above current spawning outptut in 100 years	100	100	100	100	100	100.0	100.0
Probability above current spawning outptut in 200 years	100	100	100	100	100	100.0	100.0
Probability below 0.01B0 in 100 years	0	0	0	0	0	0.0	0.0
Probability below 0.01B0 in 200 years	0	0	0	0	0	0.0	0.0
Lower 5th percentile, spawning output / target in Tmax	0.901	0.914	0.929	0.951	0.977	1.203	0.685
Median spawning output / target in Tmax	1	1.015	1.031	1.055	1.083	1.330	0.780
Upper 5th percentile, spawning output / target in Tmax	1.115	1.131	1.149	1.176	1.206	1.478	0.9

Table 4. Summary table for analyses based on current T_{MAX} (SSC runs 3 and 4).

Rebuild by current T_{MAX} = 2071	P_{MAX}					F=0	Current SPR
	0.5	0.6	0.7	0.8	0.9		
Fishing rate	0.0149	0.0142	0.0134	0.0126	0.0115	0	User Specified
SPR RATE	0.708	0.718	0.731	0.744	0.761	0.000	0.591
2007 OY	21.9	20.9	19.7	18.5	17	0	34.6
Prob to rebuild by T_{MAX}	50	60.0	69.9	80.0	89.9	100.0	0.1
Median time to rebuild	64	61	57.4	54.5	51.4	29.6	-1
Prob overfished after rebuild	0	0	0	0	0	0.0	0.0
Median time to rebuild (yrs)	2071	2068	2064.4	2061.5	2058.4	2036.6	
Probability above current spawning outptut in 100 years	100	100	100	100	100	100.0	100.0
Probability above current spawning outptut in 200 years	100	100	100	100	100	100.0	100.0
Probability below 0.01B0 in 100 years	0	0	0	0	0	0.0	0.0
Probability below 0.01B0 in 200 years	0	0	0	0	0	0.0	0.0
Lower 5th percentile, spawning output / target in Tmax	0.883	0.901	0.922	0.944	0.972	1.361	0.685
Median spawning output / target in Tmax	1	1.02	1.044	1.068	1.099	1.528	0.780
Upper 5th percentile, spawning output / target in Tmax	1.121	1.142	1.169	1.195	1.229	1.699	0.9

Table 5. Summary table for analysis based on the re-estimated T_{MAX} (SSC runs 5 and 6).

Rebuild by re-estimated T_{MAX} = 2080	P_{MAX}					F=0	Current SPR
	0.5	0.6	0.7	0.8	0.9		
Fishing rate	0.0162	0.0156	0.015	0.0143	0.0134	0	User Specified
SPR RATE	0.687	0.696	0.706	0.717	0.731	0.000	0.591
2007 OY	23.9	23	22	21	19.7	0	34.6
Prob to rebuild by T_{MAX}	49.9	60.0	69.9	80.0	89.9	100.0	0.3
Median time to rebuild	73	68.5	64.6	61.3	57.4	29.6	-1
Prob overfished after rebuild	0	0	0	0	0	0.0	0.0
Median time to rebuild (yrs)	2080	2075.5	2071.6	2068.3	2064.4	2036.6	
Probability above current spawning outptut in 100 years	100	100	100	100	100	100.0	100.0
Probability above current spawning outptut in 200 years	100	100	100	100	100	100.0	100.0
Probability below 0.01B0 in 100 years	0	0	0	0	0	0.0	0.0
Probability below 0.01B0 in 200 years	0	0	0	0	0	0.0	0.0
Lower 5th percentile, spawning output / target in Tmax	0.886	0.904	0.923	0.943	0.97	1.473	0.7
Median spawning output / target in Tmax	1	1.019	1.04	1.063	1.092	1.645	0.8
Upper 5th percentile, spawning output / target in Tmax	1.128	1.149	1.172	1.197	1.23	1.833	0.9

Appendix. Input data for SSC runs 5 and 6

#1 Title
Yelloweye - STAR panel model (2005 base model)
#2 Number of sexes
1
#3 Age range to consider (minimum age; maximum age)
0 70
#4 Number of fleets
1
#5 First year of projection (Yinit, last year of assessment)
2004
#6 Year declared overfished (Ydecl, the first year of zero OY)
2002
#7 Is the maximum age a plus-group (1=Yes;2=No)
1
#8 Generate future recruitments using historical recruitments (1) historical recruits/spawner (2) or a stock-recruitment (3)
3
#9 Constant fishing mortality (1) or constant Catch (2) projections
1
#10 Fishing mortality based on SPR (1) or actual rate (2)
1
#11 Pre-specify the year of recovery (or -1) to ignore
-1
#12 Fecundity-at-age
#0 1 2 3 4 5 6 7 8 9 10 11 12 13
14 15 16 17 18 19 20 21 22 23 24 25 26
27 28 29 30 31 32 33 34 35 36 37 38 39
40 41 42 43 44 45 46 47 48 49 50 51 52
53 54 55 56 57 58 59 60 61 62 63 64 65
66 67 68 69 70
0 0 0 0.00001 0.00001 0.00002 0.00012 0.00059 0.00257
0.00986 0.03223 0.08614 0.18720 0.33964 0.53421
0.75494 0.98649 1.21780 1.44239 1.65719 1.86122
2.05459 2.23789 2.41187 2.57722 2.73459 2.88453
3.02746 3.16379 3.29381 3.41782 3.53605 3.64873
3.75606 3.85825 3.95547 4.04793 4.13579 4.21922
4.29842 4.37353 4.44474 4.51221 4.57610 4.63657
4.69377 4.74786 4.79898 4.84728 4.89289 4.93595
4.97659 5.01493 5.05109 5.08518 5.11732 5.14761
5.17615 5.20303 5.22835 5.25219 5.27417 5.29485
5.31432 5.33264 5.34988 5.36610 5.38135 5.39570
5.40920 5.42189
#13 Age specific information (Females then males) weight selectivity
weighted average selectivity from 7 fisheries
0.0021 0.0118 0.0331 0.1309 0.1383 0.1880 0.2668 0.3610 0.4679 0.5859 0.7134 0.8491 0.9915
1.1390 1.2905 1.4446 1.6003 1.7564 1.9122 2.0668 2.2196 2.3698 2.5171 2.6610 2.8012
2.9374 3.0693 3.1968 3.3199 3.4384 3.5523 3.6615 3.7663 3.8665 3.9622 4.0536 4.1408
4.2238 4.3028 4.3779 4.4492 4.5169 4.5811 4.6420 4.6996 4.7542 4.8059 4.8547 4.9009
4.9445 4.9857 5.0246 5.0613 5.0959 5.1285 5.1593 5.1884 5.2157 5.2415 5.2657 5.2886
5.3096 5.3293 5.3479 5.3654 5.3819 5.3973 5.4119 5.4256 5.4385 5.4507
0.0000 0.0000 0.0000 0.0033 0.0045 0.0152 0.0431 0.0975 0.1746 0.2583 0.3374 0.4097 0.4772
0.5419 0.6039 0.6619 0.7139 0.7586 0.7953 0.8242 0.8458 0.8609 0.8705 0.8753 0.8762
0.8739 0.8691 0.8623 0.8539 0.8445 0.8343 0.8237 0.8128 0.8019 0.7911 0.7805 0.7701

0.7601 0.7505 0.7413 0.7325 0.7241 0.7162 0.7086 0.7015 0.6948 0.6885 0.6825 0.6769
0.6717 0.6667 0.6621 0.6577 0.6536 0.6497 0.6461 0.6427 0.6395 0.6366 0.6338 0.6311
0.6287 0.6265 0.6244 0.6224 0.6206 0.6188 0.6172 0.6156 0.6142 0.6128

#14 M and initial age-structure
for both female and male

0.045 0.045 0.045 0.045 0.045 0.045 0.045 0.045 0.045 0.045 0.045 0.045 0.045 0.045
0.045 0.045 0.045 0.045 0.045 0.045 0.045 0.045 0.045 0.045 0.045 0.045 0.045
0.045 0.045 0.045 0.045 0.045 0.045 0.045 0.045 0.045 0.045 0.045 0.045 0.045
0.045 0.045 0.045 0.045 0.045 0.045 0.045 0.045 0.045 0.045 0.045 0.045 0.045
0.045 0.045 0.045 0.045 0.045 0.045 0.045 0.045 0.045 0.045 0.045 0.045 0.045
0.045 0.045 0.045 0.045 0.045

99.1905 91.8831 83.9813 76.7590 71.5077 70.7876 64.6572
59.9013 50.4972 37.8697 31.0196 29.2413 27.0497
31.9434 42.4556 45.8211 39.1614 35.8022 45.0433
63.8793 67.0023 38.1170 27.2053 24.9897 25.8319
27.3087 13.2838 8.3970 7.9898 11.0186 12.2653 8.2142 6.6661
6.5892 8.9204 7.3214 4.1168 2.8078 2.1887 1.8787 1.7494 1.7485 1.8423 1.9926 2.1214
2.1031 1.9362 1.7787 1.7398 1.8629 2.3107 2.2559 2.2013 2.1467 2.0917 2.0366 1.9816
1.9272 1.8738 1.8214 1.7700 1.7194 1.6695 1.6201 1.5713 1.5231 1.4753 1.4282 1.3817
1.3359 31.3499

#15 Initial age-structure for Tmin

91.8993 83.9960 78.2496 77.4634 70.7692 65.6012 55.3610
41.5805 34.1181 32.2154 29.8439 35.2864 46.9488
50.7188 43.3844 39.6934 49.9720 70.9085 74.4082
42.3446 30.2301 27.7726 28.7110 30.3531 14.7642
9.3322 8.8787 12.2427 13.6259 9.1238 7.4029 7.3161 9.9027 8.1261 4.5685
3.1152 2.4279 2.0837 1.9400 1.9386 2.0424 2.2087 2.3511 2.3305 2.1453 1.9706 1.9273
2.0634 2.5591 2.4982 2.4376 2.3769 2.3159 2.2547 2.1936 2.1332 2.0740 2.0160 1.9590
1.9028 1.8475 1.7928 1.7388 1.6853 1.6324 1.5802 1.5287 1.4780 1.4280 1.3790 31.8758

#16 Year for Tmin Age-structure (Yinit or Ydecl)
2002
#17 Number of simulations
1000
recruitment and biomass
#18 Number of historical assessment years
52
Historical data
#19 year recruitment spawner in B0 in R project in R/S project

1953	194.30	7616.60	1	1	0
1954	196.46	7363.68	1	1	0
1955	154.67	7363.68	1	1	0
1956	141.06	7326.69	1	1	1
1957	140.76	7289.63	1	1	1
1958	149.44	7252.56	1	1	1
1959	158.08	7215.57	1	1	1
1960	154.98	7178.72	1	1	1
1961	141.07	7142.12	1	1	1
1962	125.93	7105.83	1	1	1
1963	114.87	7069.88	1	1	1
1964	109.85	7034.18	1	1	1
1965	112.03	6998.34	1	1	1
1966	123.02	6961.55	1	1	1
1967	147.50	6922.62	1	1	1
1968	200.21	6880.39	1	1	1
1969	326.23	6834.18	1	1	1
1970	360.41	6783.93	1	1	1

1971	239.10	6721.78	1	1	1
1972	215.49	6643.59	1	1	1
1973	234.98	6545.60	1	1	1
1974	308.68	6429.03	1	1	1
1975	242.44	6292.86	1	1	1
1976	152.44	6136.51	1	1	1
1977	137.49	5961.41	1	1	1
1978	184.57	5769.40	1	1	1
1979	318.52	5570.13	1	1	1
1980	250.69	5332.85	1	1	1
1981	200.59	5091.07	1	1	1
1982	180.00	4576.07	1	1	1
1983	208.12	4243.87	1	1	1
1984	303.84	3940.69	1	1	1
1985	243.25	3774.49	1	1	1
1986	146.13	3574.64	1	1	1
1987	100.69	3456.59	1	1	1
1988	97.26	3281.88	1	1	1
1989	102.34	3088.85	1	1	1
1990	86.72	2831.84	0	0	0
1991	60.54	2664.92	0	0	0
1992	48.05	2411.94	0	0	0
1993	49.01	2159.36	0	0	0
1994	49.27	1962.46	0	0	0
1995	57.19	1859.49	0	0	0
1996	72.68	1738.52	0	0	0
1997	82.26	1642.82	0	0	0
1998	84.79	1520.40	0	0	0
1999	88.71	1505.68	0	0	0
2000	85.64	1449.61	0	0	0
2001	87.87	1483.79	0	0	0
2002	91.90	1501.40	0	0	0
2003	96.12	1550.05	0	0	0
2004	99.19	1595.52	0	0	0

#20 Number of years with pre-specified catches
3
#21 catches for years with pre-specified catches
2004 22
2005 26
2006 27
#22 Number of future recruitments to override
0
#23 Process for overiding (-1 for average otherwise index in data list)
#24 Which probability to product detailed results for (1=0.5; 2=0.6; 3=0.7; 4=0.8; 5=0.9; 6=Ttarget of Tmin+0.75(Tmax-Tmin); 7="F=0"; 8="40-10" rule; 9=ABC rule)
4
#25 Steepness sigma-R Auto-correlation (0.437 and 0.4 form yeye base model, same as in 2002 rebuilding)
0.437 0.40 0.00
#26 Target SPR rate (FMSY Proxy)
0.5
#27 Target SPR information: Use (1=Yes) and power
0 20
#28 Discount rate (for cumulative catch)
0.1
#29 Truncate the series when 0.4B0 is reached (1=Yes)
0

#30 Set F to FMSY once 0.4B0 is reached (1=Yes)
0
#31 Percentage of FMSY which defines Ftarget (see equation 7c and instrucion for #33)
0.9
#32 Maximum possible F for projection (-1 to set to FMSY, it is recommended the -1 be used, see instruciont #32)
-1
#33 Conduct MacCall transition policy (1=Yes)
0
#34 Defintion of recovery (1=now only;2=now or before, 2 is less conservative and should be for "rebuilt" case)
1
#35 Results for rec probs by Tmax (1) or 0.5 prob for various Ttargets (2)
1
#36 Definition of the "40-10" rule (should not be changed unless the "40-10" rule is changed)
10 40
#37 Produce the risk-reward plots (1=Yes,, don't do this untill the final calculation)
0
#38 Calculate coefficients of variation (1=Yes)
0
#39 Number of replicates to use (at least 10, this number is ignored unless #38 is 1)
20
#40 Random number seed (a number between -1 and -99999)
-34530
#41 Conduct projections for multiple starting values (0=No based on the "best estimates" ;else yes)
0
#42 File with multiple parameter vectors
MCMC.PRJ
#43 Number of parameter vectors (only matters if #41 is not zero)
100
#44 User-specific projection (1=Yes); Output replaced (1->9); type (0, 1, 2, 3); value (only used when type is not 0)
1 6 0 0.5
#45 Catches and Fs (Year; 1 or 2 (F/SPR or C); value); Final row is -1
2007 3 0.591
-1 -1 -1
#46 Split of Fs (first year MUST be Yinit)
2004 1
2005 1
2006 1
-1 1
Time varying weight-at-age (1=Yes;0=No)
0
File with time series of weight-at-age data
HakWght.Csv